RUSSIAN MOTORCYCLES

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Repair Manual

750cc All Models

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INTRODUCTION

This Manual covers the service and repair of Ural motorcycles, model years 2001 thru 2006. Covered in this manual, replacement and/or repair of damaged parts, mechanical techniques, special tools, and testing procedures. This manual has been designed for use by qualified service technicians, mechanics, and engineers.

During service/repair always check positive and negative clearances between mating sufaces to determine if they are within factory tolerences specified in each chapter of this manual.

Always replace components that are beyond the service limit outlined in each section. Always use quality measurement instruments.

Instruction for disassembly and reassembly can be found in respective sections.

I
PREPARING THE MOTORCYCLE FOR REPAIRS

Irrespective of the type of anticipated repair work:
- Wash the motorcycle;
- Determine its technical condition.

For this purpose inspect visually and try out the separate units and the motorcycle in running.
Therefore, before estimating the technical condition of motorcycles that are brought for repairs in running condition, adjust:
- Spark-plug gaps;
- Valve drive clearances;
- Carburetors at idle speed, at medium speed as well as synchronous operation of the cylinders;
-Brake controls;
-Clutch controls;
-Lean out and toe-in of the motorcycle and sidecar wheels.

Adjust the clearances, carburetors, etc. as described in Owner Manuals for motorcycles "Ural" models Tourist, Patrol, Gear-up, Retro, and Troyka or as given
in respective sections of this Manual.

Also check presence and condition of oil in the engine crankcase, sump, gearbox, and final drive housing, front fork legs and in the rear suspension and sidecar wheel suspension shock absorbers. Top up, if necessary.

II.
DETERMINING THE TECHNICAL CONDITION OF THE MOTORCYCLE

The technical condition of the motorcycle and of its separate units changes in the course of prolonged service. Quite a number of troubles, especially in the engine, may remain unnoticed for a considerable time and are usually due to wear of major parts.
As the major and even less important parts get worn-out, the engine loses power, while the fuel and oil consumption rises. Intensified noises in separate units appear while running. In the course of operation, various damages are inflicted to the parts, either of mechanical nature or due to fatigue and corrosion. Excessive play in joints becomes apparent. All this affects the dynamic, economical and service features of the motorcycle.
The diagnosis and remedy of troubles in due time prolong the service life of the motorcycle. Therefore periodic check-up of the technical condition of the motorcycle is quite essential.
To estimate the technical condition of the motorcycle:
1. Make sure that all the equipment of the motorcycle is complete.
2. Determine the condition of the motorcycle by checking:
- Freewheeling distance
- Maximum speed developed in high gear
- Fuel consumption.
3. Determine the condition of the engine by checking:
- The rate of oil consumption
- Compression in the cylinders
- Abnormal noises or knocks
- Local heating and overheating
- Oil leaks
- The performance of engine at different speeds and loads.

4. Determine the condition of the clutch mechanism as follows:
- Check for separation of disks when the clutch is engaged;
- Check for smooth engagement of the clutch;
- See if there is slipping of the clutch;
- See if there are noises when the clutch is engaged.
5. Determine the condition of the gearbox by checking:
- Proper engagement of the kick-starter pawl;
- Timely return of the kick-starter pedal;
- Easy and accurate shifting of gears;
- The gears for jumping out-of-mesh;
- Any oil leaks;
- Overheating of parts;
- For any abnormal noises.
6. Determine the condition of the drive shaft and the final drive by checking:
- Oil leaks;
- Local heating of parts;
- Excessive play in the flexible coupling joints, the universal joint, the toothed gearing, the wheel hub articulation;
- Excessive run-out of the drive shaft;
- Condition of the flexible coupling.
7. Determine the condition of the wheels by checking:
- Wear and possible damage to the tires;
- Cracks and dents in the wheel rim;
- Wear of the brake drum inner surface;
- Wear of the wheel hub bearings;
- Axle play and radial run-out of the wheel rim and tire;
- The wheel spokes for intactness and uniform tension.
8. Determine the condition of the front fork by checking:
- Play in the steering column;
- Play of the fork legs in the fork cross-piece, also play in the bridge and in the fork bottom tips;
- Smooth performance with motorcycle running;
- Any hard knocks while running;
- Springs for seizure;
- The shock absorbers for leaks of fluid;
- Condition of casings and guards;
- Proper tightening of the fasteners.
9. Determine the condition of the motorcycle frame by checking:
- Damages and cracks;
- Condition of the rear mudguard;
- Fasteners for proper tightening.
10. Determine the condition of the rear suspension by checking:
- Smooth performance when the motorcycle is running;
- Hard bumps in running;
- Leaks of fluid from the shock absorber;
- Condition of the silent blocks;
- Play in the joints.
11. Determine the condition of the fuel tank by checking:
- Gasoline leaks from welded seams and joints;
- Proper function of the gasoline cock;
- Intactness of hoses;
- Dents and damages in the tank shell.
12. Determine the condition of the exhaust system by checking:
- Tightness of joints;
- Dents and damages.

13. Determine the condition of the controls by checking:
- Condition of the handlebar with twist grips and levers, and their respective performance;
- The throttle control twist grip for easy rotation;
- Intactness of the cable sheath and the cables;
- Working condition and proper functioning of the front, rear and side-car wheels;
- The braking action of the brakes.
- Parking brake operability
14. Determine the condition of the sidecar by checking:
- Noises in the hinged joints of the side-car to the frame;
- Smooth working condition of the wheel suspension;
- For hard knocks;
- Leaks of fluid from the shock absorbers;
- Condition of the sidecar mudguard, sidecar body, its frame, the cushion and seat back, the cover and the windshield.
15. Determine the condition of the electrical equipment by checking:
- Operations of the ignition lock, light switch, turn indicators, emergency ignition switch, "day-night" switch;
- Performance of the ignition system, the horn, the pilot lights;
- Condition of the wiring and plug-and-socket connections;
- Condition and operation of the speedometer.
A qualified mechanic of a service station or a repair shop will determine the condition of the engine by listening for and analyzing the abnormal noises and knocking, and diagnose possible troubles. The basic indications for investigating noises in a running engine with the help of a stethoscope are listed in Table 1.

Table 1

Determining the Technical Condition of Engine by major Noises and Knocks

Point (joint of parts) where knocking is possible	Thermal condition of engine	Engine running mode	Zone where knocking is audible	Nature of knocks	Conclusion about adequacy for further service
Piston pin to connecting rod small end	Warm	Under load with sudden change to higher speed	Cylinder area	Clear sharp metallic clink	Discontinue motorcycle operation. Should knocks disappear if the ignition is retarded, adjust delayed ignition. If this does not help, remove carbon deposit from combustion chamber and, if need be, replace piston pin, selecting one to match the color marking of connecting rod small end.
Piston pin to piston boss	Same	Same	Same	Knocking is less clear and becomes louder once engine heats up	Same
Piston to cylinder	Cold	Idle speed	Same	Brittle metallic clink which increases with speed variation and becomes less audible when engine is warmed up. Similar knocks are audible when piston pin gets seized in connecting rod small end	Continue operation, if clink disappears after warming-up of engine. When repairing, replace piston Discontinue operation. Replace piston and piston pin
Connecting rod big end to crankpin	Any	At idle speed and especially when motorcycle "drags" in travel with throttle valve lowered only partially (minor engine speed decrease)	Central portion of engine crankcase	Dull knocks of medium volume	Discontinue operation. Repair the engine

Point (joint of parts) where knocking is possible	Thermal condition of engine	Engine running mode	Zone where knocking is audible	Nature of knocks	Conclusion about adequacy for further service
Main bearing to crank shaft	Warm	Under load and once throttle valves are suddenly open	Engine crankcase at points of bearings location	Dull low-tone knocks	Discontinue operation. Repair the engine
Timing gear	Same	Idle running	In the area of gears location	Frequent (clattering) metallic rolling rattling (inconstant as to its tone)	Operation is possible. When repairing engine, replace faulty gears
Valves to valve seats	Warmed	Idle running and free wheeling	Cylinder heads	Frequent ringing knocks which increase with speeding up irrespective of engine load	Motorcycle operation is possible. Readjust clearance. Grind-in valves, when repairing
Clutch discs	Any	Clutch engaged	Clutch cavity	Clear metallic clink	Operation can be continued. Inspect clutch when repairing engine
Flywheel to crankshaft	Any	Idle running, clutch released	Rear end of engine	Dull loud knocking which disappears once clutch is fully engaged	Discontinue motorcycle operation. Remove clutch, flywheel, check key joint, remount flywheel and fasten reliably
Alternator gear to camshaft gear	Any	Variable	Front top portion of engine	Frequent rolling metalic ratting squeal	Having adjusted clearance between gears (by turning alternator frame), continue to run the motorcycle normally
Breather to front cover	Warmed	Idle running	Front end of engine	Frequent metallic clink	Operation can be continued. Inspect breather, having removed timing cover at first chance

Table 2

Trouble Shooting and Remedy

Trouble	Cause	Symptoms and diagnosing	Remedy
Engine fails to start :	I. Gasoline is supplied to carburetors, no sparking		
	a) no gap between plug electrodes, carbon deposit or dirt in spark plugs, breakdown of insulator	a) undo spark plug, connect body to "ground" and check for sparking between electrodes	a) change faulty spark plugs, or - depending on their condition - adjust gap or clean
	b) Microprocessor unit failed		b) Replace microprocessor unit
	c) faulty ignition coil	c) if there is no spark when checking as described in Point 6 ignition coil is out of order	c) Replace faulty ignition coil
	d) break in low-voltage wiring	d) remove front cover, switch on the ignition, close distributor contacts, bring a screwdriver to	d) recover wiring
	e) kill switch	core of ignition coil. If low voltage circuit is intact, screwdriver will be attracted to core. If screwdriver is not attracted to core, there is breakdown in circuit	e) move to start position

Engine wont start	2. Weak or no compression in engine: a) no clearances in valve timing mechanism b) overtight valves due to carbon deposit or valve head burnt c) burnt or broken piston rings 3. Clutch slipping	 a) when depressing the kick -starter, engine crankshaft turns freely with no sign of compression in engine b) when depressing the kick -starter, engine crankshaft turns freely with no sign of compression stroke evident in all cylinders or in one of them c) breather smoking 3. Engine crankshaft fails to turn when kick - starter is depressed	 a) adjust clearances properly b) repair engine, grind in or repair valves c) repair engine, clean or change piston rings 3. Adjust clutch controls. If clutch continues to slip, repair it (disassembly and inspection being necessary)
Engine missing, uneven run, only one cylinder functioning	1. Lean mixture: a) erratic feed of gasoline to carburetor b) carburetor jets or misbalancing channel of floating chamber clogged 2. Faulty spark plugs 3. Poor contact of battery terminals 4. Poor sparking 5. Mixture too rich due to float chamber flood a) float needle valve either dirty or leaky b) float is leaky c) carburetor jet loose 6. Carburetor missadjusted 7. Piston rings sticking or damaged 8. Valves not tight in seats due to carbon deposit	1. Backfire in carburetor Check timing or loose rotor 2. Same as in p. 2, trouble 1 of engine 3. Pilot lamp is blinking 4. Wrong gap between side dischargers Wire pulled out of coil a) engine smokes badly, back fire in silencer, gasoline leaks from carburetor 6. Synchronized operation of cylinders disturbed 7. Lack of compression, engine smoking, oil fouling the spark plugs 8. Lack of compression	1. Same as in p. 2, first trouble of engine 2. Same as in p. 2, trouble1 of engine 3. Restore proper contact of battery terminals 4. Adjust the gap of side dischargers to 9 mm bending them a) clean the needle valve b) repair or replace faulty float c) set jet in place 6. Readjust carburetors; 7. Repair engine, clean or replace piston ring 8. Repair the engine, de-carbonize and grind-in valves

Trouble	Cause	Symptoms and diagnosing	Remedy
Engine knocking	1. Advanced (early) ignition	1. Knocks disappear, once ignition is delayed	1. Turn distributor body counter-clockwise check contact gaps
	2. Piston pins, pistons, cylinders , crankpins, main bear ings are worn	2. An expert mechanic determines the cause by listening the running engine	2. Repair the engine
Engine running well at high speed, while at medium revolutions backfire in carburetor becomes evident and at low speeds the engine stalls	1. Idle-speed jet clogged		1. Blow through idle -speed Jet
	2. Carburetors misadjusted (out of step)	2. Determine by listening engine running	2. Readjust carburetors for operation in step
	3. Misadjusted clearance between valves and tappets	3. Check clearance with f eeler It should be 0.1 -0,15 mm when the engine	3. Readjust valve clearance
Engine fails to develop full power; with throttle completely open, motorcycle fails to speed up	1. Late ignition Possible bad rotor	1. Power increases once ignition is advanced	1. Turn distributor body clockwise.
	2. Untight fit of valves to their seats due to carbon deposit	2. Lack of compression	2. Repair the engine. Remove carbon and grind in valves
	3. Piston rings sticking or damaged	3. Lack of compression, engine smoking, spark plugs fouled with oil	3. Repair the engine. Clean or change piston rings
	4. Cylinders and pistons worn badly	4. Verify them by measuring in repair shop	4. Repair engine. Recondition or replace cylinders and pistons in repair shop
	5. Valve springs broken		5. Change springs
Engine overheats	1. Mixture too rich:	1. Engine fails to develop speed when running idle:	1. Clean float chamber of dirt, repair and adjust fuel system:
	a) carburetor flooded due to poor fit of fuel needle valve	a) check whether gasoline flows out of float chamber (chamber flood)	a) check condition of fuel valve and fuel level in float chamber
	b) clogged air cleaner		b) take off air cleaner and wash it
	c) carburetor throttle needle misadjusted		c) readjust carburetor
	2. Mixture too lean:		
	a) throttle needle misadjusted	a) engine fails to develop speed under load	a) readjust carburetor
	b) air leaks at carburetor -to-cylinder head joints	b) backfire in carburetor	b) tighten up nuts fastening the carburetor to cylinder head. Should air leaks continue, change gasket
	3. Late timing	3. Power increases, once ignition is advanced	3. Turn distributor body clockwise.

Trouble	Cause	Symptoms and diagnosing	Remedy
High oil consumption	1. Piston rings burnt or damaged	1. Smoke emits from breather, engine smokes, spar k plugs wet with oil	1. Repair the engine. Chan ge piston rings
	2. Cylinder face or piston worn	2. Same as in p. 1	2. Repair the engine. Rebore cylinders or replace them
	3. Breather seat in gearbox cover worn	3. Oil dripping from breather duct	3. Repair the engine
	4. Holes for draining oil from cylinder heads clogged	4. Heavy carbon on spark plug electrodes, spark plugs oily and engine smokes	4. Repair the engine
Oil leaks under alternator, under oil pump drive gear plug, at engine-to-gearbox joint and under timing box cover	Breather jammed and its driving pin sheared	With engine running, gases are blocked up in crankcase; heavy oil leaks through joints	Repair the engine
Squealing sound in breather Possible dry breather	Breather jammed in cover seat	Breather fouled with aluminum deposit and scoring of locating surface in cover seat	Repair the engine
Power Transmission			
Clutch slips	1. Clutch fails to engage fully due to misadjusted controls	1. Check whether clutch lever play is sufficient	1. Readjust controls by turning the adjusting screw so as to provide clutch lever tip play within 5 to 8 mm
	2. Driven disks oily	2. Check when dismantling or inspecting	2. Dismantle the clutch. Wash disks in gasoline, eliminate cause of oil clogging
Clutch fails to release fully (drags)	Misadjusted clutch gear (lever excessive play)	Check play of clutch lever located on handlebar	Readjust clutch gear by turning the adjusting screw out, so as to provide full release of clutch and play of clutch lever within 5 to 8 mm at the tip
When kick-starter is depressed, its pedal moves down, but engine crankshaft fails to turn	1. Pawl, pawl pin or teeth of kick-starter ratchet are either worn or damaged. Clutch slips	1. Having engaged gear, depress kick-starter. If motorcycle remains still -it is kick-starter that it faulty; if kick -starter is operated, but crankshaft fails to turn - then clutch is slipping	1. Repair the gearbox. Change pawl or reverse its position Change pawl pin. Change gear. Check proper adjustment of clutch controls. If need be, readjust it
	2. Pawl spring is damaged or weak		2. Repair the gearbox. Change pawl spring
Kick-starter pedal fails to return in top returns slowly	Kick-starter return spring weak or broken or spring pin sheared	Check and make sure that kick-starter pedal returns freely	Repair the gearbox. -Change spring or pin

Trouble	Cause	Symptoms and diagnosing	Remedy
Gears won't shift	Adjusting screws of foot pedal shift mechanism are misadjusted	Operating the pedal does not results in reaching the position where the gear engages	Adjust screws according to the Manual . Change the ratchet
Won't shift to 1st gear	Push reverse lever forward		
Gear change foot pedal fails to return	Return spring either weak or damaged	Gear shifting is faultless, but foot pedal fails to return after being depressed	Repair gearbox. Change return spring
Gear disengages spontaneously with motorcycle running	1. Gear change foot mechnism out of adjustment		1. Readjust gear change foot mechanism
	2. Gear shifting fails due to wear of quadrant indexing flutes or due to bent gearshift quadrant		2. Repair gearbox. Recover indexing flutes or change quadrant together with its shaft, straighten out bent quadrant
	3. Teeth of gear shift sleeves worn out		3. Repair the gearbox
Reverse gear disengages Spontaneously with motorcycle reverse running	Gear teeth faces of reverse gear worn out	1.Knocks when gear shifting	Repair gearbox. Replace the gear
Shifting of gears is difficult	1. The clutch cant be disengaged, slips		1. Adjust the clutch drive
	2. Seizing of gear shifting forks on shaft or in quadrant slots, splines of shift sleeves are badly worn		2. Repair the gearbox. Inspect and replace worn parts, if required
Noise in gearbox	1. Gearing teeth worn out		1. Repair the gearbox. Change worn out gears
	2. Clutch or main shaft bearings worn		2. Same Change worn out bearings
Gear noise in final drive	Backlash between teeth of gears too small or too great (0.1 to 0.3 mm being tolerated)	Remove final drive and send to repair shop for check-up	Repair the final drive. If need be, change it or its separate parts
Overheating of final drive casing	1. Wear or damage of parts Readjust brakes	1. Dismantle and check in a repair shop	1. Repair the final drive. Change the drive or worn parts
	2. Play of brake pedal misadjusted	2. No or small play of brake pedal	2. Adjust play correctly

Trouble	Cause	Symptoms and diagnosing	Remedy
Running Gear			
Rattling in front fork	1. Play of steering column in thrust bearings	1. Brake down the front wheel and by pushing motorcycle to and from by handlebar determine play in thrust bearings (by hand)	1. Eliminate play by tightening the bearings
	2. Fork leg tube bushings badly worn	2. Set motorcycle up on rear stand, raise front wheel. If excessive play is evident when moving legs up and down, this is a sign of front fork being damaged	2. Repair the fork, check condition of parts, change bushings
	3. Fork leg tips or springs turned out		3. Undo binding nuts and check; screw up tips or springs, if necessary
Oil leaks out of front fork	1. Front fork leg seals worn or damaged	1. Oil stains on fork leg tips. Check condition of seals	1. Change seals
	2. Fork leg tip seals or their nuts loose	2. Check tightening of nuts or seals	2. Screw in nuts or seals
Shock absorber squeaking	1. Rod unscrewed out of end piece	1. Cocking of cover. Dismantle shock absorber and check condition of parts	1. Screw rod in completly
	2. Carrier spring broken	2. Same	2. Change spring
Stiffness of suspension (bumpy)	1. Sagging of carrier spring	1. Check condition of spring	1. Change spring
	2. Too much effort required for shock absorber to expand or contract	2. Dismantle shock absorber, check for clogging of gauged ducts in piston and in lower valve (serviceable shock)	2. Wash parts and prime shock absorber with fresh fluid (serviceable shock)
Fork rotation is difficult	1. Steering damper bolt too tight		1. Loosen bolt by turning it anticlockwise
	2. Steering column bearing are too tight	2. Change tightening repeatedly and try rotation	2. Adjust tightening

Trouble	Cause	Symptoms and diagnosing	Remedy
Steering damper loose (fails to be tigh - tened up)	Steering damper friction washers oily or soiled	Disassemble damper and examine washers	Clean friction washers, check faces do not grease or lube this part
Wheel spokes broken	Wrong tensioning of spokes or tensioning not uniform	Examine and check tension of spokes by setting motorcycle on stand and turning the wheel; by pressing the wrench lightly to spokes, determine by sound if spokes are tensioned uniformly or not	Repair the wheels. Change broken spokes and readjust proper tension of all spokes
Play of wheel on axle and wobble of wheel in frame plane	1. Gland nut loose and out of position	1. Check by visual inspection	1. Drive the gland nut home, then slacken by 1/8 of a revolution and lock it
	2. Bushings or wheel roller bearings worn out Loose axle	2. First make sure that the cause of trouble is not as described in p. 1 and 2. Without removing the wheel check for wobble	2. Repair the wheel. Adjust tightening of bearings. In case parts are replaced, pack them with grease
	3. Wheel spoke tension loose due to long service	3. With motorcycle set on stand, rotate the wheel. Check run -out which should be within1.5 mm on wheel rim	3. Readjust proper tension of all wheel spokes
Fluid leaks from shock absorber (serviceable shock)	1. Fluid container nut loose	1. Oil leaks from under nut	1. Tighten up fluid container nut
	2. Shock absorber rod damaged or worn; scores, dents are evident	2.Fluid leaks along rod	2. Change the rod
	3. Seal damaged or worn	3. Same.	3. Change the seal
Shock absorber piston rod travels freely (no load) in the beginning of extension or compression stroke	1. Lack of fluid		1. Add fluid if necessary
	2. Working cylinder has not enough fluid		2. Pump shock absorber several times (making full strokes with rod)
Rear wheel suspension swinging in ex - cessive, knocks audible when fully extended	1. Lack of fluid		1. Add fluid, if necessary
	2. Low fluid viscosity		2. Prime with fluid of proper grade
	3. Rebound valve leaky due to damage or clogging		3. Repair the shock absorber. Disassemble valve, wash it, replace damaged parts
	4. Rebound valve spring resilience is reduced		4. Repair the shock absorber. Change the spring
	5. Piston relief valve leaky		5. Repair the shock absorber . Wash valve, check circular edges and, if necessary, lap in, otherwise change piston
	6. Piston broken or deep scores are evident	6. Fluid leaks along rod	6. Repair the shock absorber Change piston

Trouble	Cause	Symptoms and diagnosing	Remedy
Shock absorber is knocking	1. Deteriorated rubber bushings or end fastening silent blocks 2. Bolts fastening the shock absorber are loose	1. Check fastening and condition of parts 2. Check fastening bolts	1. Change worn parts 2. Tighten up bolts
Controls			
Carburetor throttle control grip is diffi - cult to twist	1. Adjusting screw too tight 2. Slide is seized Check cable routing	 2. Lubricate it and see if this will help. Pull out cable sheaths from twist grip housing and by twisting the grip and lowering cable sheath determine cause of slide seizing	1. Loosen and lock adjusting screw 2. Lubricate the slide. If twisting is still difficult, remove twist grip, examine it and lubricate
	3. Sheath is out of shape or control cable damaged	3. Check cable and sheath condition by outside inspection, check for seizing of cable in the sheath	3. Change damaged cable or sheath. If the cables get seized, remove them, wash and lubricate
Once hand is removed from twist grip, it turns spontaneously	1. Adjusting screw loose	1. Trouble is remedied as soon as adjusting screw is tightened up	1. Readjust and lock screw
	2. Spring that brakes twist grip is broken	2. Tightening of adjusting screw does not remedy trouble	2. Repair the twist grip. Remove twist grip and replace
Rear wheel or side car wheel fails to be braked	1. Rear brake pedal play misadjusted	1. Readjust and try out rear brake action	1. Reduce play of brake pedal by turning wing nut on brake link clockwise and simultaneously checking wheel rotation. Leave a slight play of pedal for heat expansion.
	2. Brake shoe linings of rear wheel brake oily or dirt	2. After readjustment, as instructed in p. 1, brake shoes are slipping	2. Remove wheel, wash brake shoes in gasoline and wipe dry. If oiling persists, check quantity and quality of oil in final drive and condition of the seal
	3. Brake shoe linings worm out	3. After readjustment, as in structed in p. 1, brake shoes are slipping	3. Using adjusting bolts, readjust clearance of brake shoes
Front wheel fails to be braked	1. Same as for rear wheel	1. Same as for rear wheel	1. Reduce play of brake lever by turning out adjusting screw in brake cover; simultaneously check rotation of wheel. Leave a slight play for heat expansion.

Trouble	Cause	Symptoms and diagnosing	Remedy
Brakes overheat	1. No play in foot brake pedal or front brake lever, resulting in brake shoes being constantly pressed to drum	1. Set up motorcycle on the stand, check rotation of wheels without depressing pedal and lever	1. Set up motorcycle on the stand. Turn wing nut of brake pull rod counterclock wise until rear wheel revolves freely. By turning in adjusting screw on brake drum cover of front wheel ob tain free rotation of wheel. After adjusting, check brake performance
	2. Brake cam pin seized	2. Cam is stuck in position which corresponds to braking action and fails to return into initial position	2. Lubricate cam. If trouble persists, take wheel off, remove brake cam, wash or reface it, if necessary
	3. Brake cam seized due to large turn angle, caused by worn linings of brake shoes	3. Cam stuck in position cor - responding to maximum separation of shoes and fails to return	3. Using adjusting bolts re-adjust clearance of brake shoes
Electrical Equipment			
With ignition lock key turned in first R. H. position, pilot lamp fails to light up	1. Kill switch "Off"	1. Check, if "ground" is "On"	1. Switch on "ground"
	2. Lamp is blown	2. Check condition of bulb	2. Change faulty bulb
	3. No contact on term inals of pilot lamp socket		3. Restore contact
	4. Safety fuse of ignition system is blown	4. Check, if safety fuse is intact	4. Change faulty fuse
	5. No contact: a)on battery terminals b) on terminals of ground c) on battery terminal c) on alternator d) on terminals "2" and "3" of master switch " e) on positive and ground terminals of voltage regulator f) on "ground" terminal of engine g) on safety fuse terminals of ignition system	5. Check, if contacts are clean and tightened. Check, if wiring is intact, especially wire lugs at contact terminals of safety fuse block and ignition lock	5. If necessary, clean con tact surfaces of wire lugs, restore condition of wiring, tighten up the terminals by means of screws and nuts
With ignition lock key turned in first R. H. position, pilot lamp glows, but there is no sound when horn button is depressed	1. No contact: a) on terminal of horn wire lug b) on terminal o f wires in plug -and- socket connector c) on terminal in light knob contact d) on "ground" through switch body and handlebar	Check that contacts are clean and tightened. Check that wir ing is intact, especially, wire lug at contact terminals of distributor breaker and light turn-knob	If necessary, clean contact surfaces of wire lug, recondition wiring, tighten up terminals
	2. Break in wires of some circuit link from horn to lighting switch		

Trouble	Cause	Symptoms and diagnosing	Remedy
With ignition lock key turned in first R. H. position, pilot lamp glows. When horn button is depressed horn sounds. Engine fails to start running. Weak sparking in spark plugs	1. No. contact: a) on terminals of red wires from ignition coil b) on wire terminal of ignition coil faces from low- voltage end c) on breaker terminal d) on wire terminals of ignition coil from high-voltage end	1. Check contacts for cleanliness and tightness, check that wiring is in good order in the se links of circuit	1. Clean contact surfaces of wire lugs, recondition wiring, tighten up terminals with screws for better contact
With ignition lock key turned in first R. H. position, pilot lamp glows. When switch "day -night" is switched on, there is no light	1. Fuse is blown 2. No contact on terminal of ignition lock		1. Replace fuse 2. Restore contact
With ignition lock key turn ed in first R. H. position, horn is switched on without depressing the push button	Push -button jammed		Disassemble light switch and eliminate push -button jamming
With parking light "On", sidecar side lamps fail to glow	1. Poor contact in connector	1. If wires are connected outside the connector, lamps start glowing	1. Repair connection in coupling
	2. Wire break in circuit from fuse box terminal to connector or after it	2. If wires are connected out side the connector, lamps fail t o glow	2. Reconnect wires
With parking light "On", either front or rear lamp glows	1. One of lamp bulbs is blown	1. Take out lamp bulb that is not glowing, check it by examining its filament, or connecting it directly to battery	1. Change faulty lamp bulb
	2. Break in wire past front lamp	2. After check -up, lamps proved to be in order	2. Find break in wiring and fix
While engine is running at variable speeds, pilot lamp glows steadily.	1. No contact on "~" terminal of alternator 2. Alternator is faulty		1. Clean wire lug and tighten up terminal 2. Check and replace the alternator when required
With motorcycle running, pilot lamp is blinking	1. Poor contact on "~" terminals of alternator		Clean and tighten wire lugs and terminals
Turn indicators fail to light up although their switch is on	1. Fuse blown in fuse box 2. Some internal fault of turn relay	Check fuse and flasher relay	1. Change faulty fuse 2. Change flasher relay
With turn indicator switched on, not all turn indicators glow	1. Turn indicator lamp bulb blown 2. No contact in wire terminals	Check lamp bulb contacts on wire terminals and indicator housing to "ground" contact	1. Change lamp bulb 2. Restore contacts
	3. No contact between indicator housing and "ground"		3. Restore contact

The local heating and overheating are determined by touch.
Determine the condition of the clutch mechanism by checking its performance. With the engine at rest, engage the clutch, and then depress the kick-starter—the crankshaft should remain at rest. Start the engine, release the clutch and shift over to 1st gear— the motorcycle should remain motionless. Once the clutch lever is smoothly released, the motorcycle should begin to move smoothly, without jerks.

Turn the twist grip throttle control abruptly, thus raising the throttle valve (with the gear and the clutch engaged) the motorcycle should accelerate promptly, and pick up speed with no noticeable slipping of the clutch.

Check the condition of the gearbox, the propeller shaft and the final drive by a trial performance of their mechanisms both on the run and at a standstill. The tolerated play in the final drive gearing should not exceed 0.3 mm. The run-out of the propeller shaft is tolerated within 1 mm.

Check the condition of wheels by an alternate inspection with the wheels in the air. Check the condition of wheel hub bearings by turning the wheels and rocking them from side to side. The wheels should rotate freely without noticeable play, seizing, clicks, etc.

The tolerated run-out and play of the rim is as follows: radial run-out—1.5 mm; axle play—1.5 mm; the run-out of tire (radial and axle) — 3 mm.
The uniform tensioning of spokes shall be determined by sound when slightly striking against them.

Determine the condition of the front fork, the rear suspension, that of the sidecar wheel, steering controls by inspecting at rest and testing their performance in travel. The fork should rotate freely in the steering column without any noticeable play, clicks and locking in any position whatsoever.

The tolerated play of the bottom tips of the fork legs should be within 6 mm, with the front portion of the motorcycle left in suspension. The front fork and the shock absorbers of the rear suspension, as well as of the suspension of the sidecar wheel should operate smoothly, without Jamming and cocking.

When inspecting and checking condition of the sets and separate assembly units, pay attention to condition of the anticorrosive and paint coating of the parts. As soon as some defects are noticed, find their cause by making use of Table 2.

After the inspection and check-up of the motorcycle, proceed with the necessary adjustments, minor or major disassembling and the required repairs.

III.
DISASSEMBLY AND REASSEMBLY

If the technical condition of the motorcycle, as determined by checking, requires partial or complete dismantling of separate assembly units, sets or the motorcycle proper in order to repair or change parts, try and reduce to minimize the dismantling operations. Certain units can be partially dismantled without removing them off the motorcycle.

Before commencing the partial or complete disassembly, clean the motorcycle to remove oil, dirt and grit; this will protect the friction parts of units to be dismantled from contamination.

Having cleaned the parts of carbon, remnants of bakelite varnish, etc., wash them properly and check their condition by visual inspection and measurements to evaluate the degree of their wear.

The repair shop or motorcycle servicing station should have a complete set of tools required to dismantle and reassemble the assembly units (nut wrenches, screwdrivers, pliers, etc.). The corresponding Sections of this Manual specify the use of tools or fixtures.

Remove the sidecar when performing repairs, which require partial dismantling of the units mounted on the motorcycle or their removal, as this will facilitate the access to the units and make the repair easier.

1. REMOVING AND REINSTALLING THE ENGINE WITH GEARBOX

To remove the engine together with the gearbox, proceed as follows:

- Set the motorcycle on the stand;
- Disconnect the side-car (see subsection 3); remove the gasoline tank (see subsection 5), the silencers and header pipes, the footrests, the air cleaner (see subsection 4), the storage batteries (see subsection 13);
- Disconnect the wires leading to the horn and the ignition-coil;
- Remove the housing of electronic ignition unit
- Remove spark plugs, be sure no contaminates enter the plug holes. Put the high-voltage wires with lugs under the alternator;
- Undo the cover fastening screws of carburetor throttle valves and remove the valves. Reinstall the throttle valve in the carburetor housing with the throttle valve cutout facing the inlet union. Tighten up the cover fastening screws;
- Disconnect the adjusting bolts of the clutch control cable from the clutch control lever at the gearbox and from the clutch cable sheath stop;
- Loosen the bolt fastening the speedometer drive bushing, remove the drive and shift it aside, then reinstall the bolt;
- Disconnect the wire from the contact (switch) of the neutral;
- Loosen the engine upper fastening nuts and those of the-stand bracket, remove the bracket and the engine fastening plate;
- Loosen the nuts of engine bottom fastening studs;
- Remove the spring of the rear brake lever;
- Place a support under the engine sump and remove the engine fastening studs;
- Move the engine together with the gearbox forward, disengage the flexible joint flange from the rubber coupling or the propeller shaft;
- Remove the support from under the engine sump and tilt the engine to the left so that the alternator is positioned to the left of the frame tube, then lift the engine out through the left-hand side of the frame.

It is advisable that two persons take the engine with gearbox out of the frame. Having removed the assembly put the engine on a bench.

Reverse the sequence of operations when reinstalling the engine and gearbox on the motorcycle frame.

2. REMOVING AND REINSTALLING THE GEARBOX

To take off the gearbox without removing the engine from the motorcycle:
- Remove the air cleaner, the storage battery;
- Disconnect the adjusting bolt of the clutch control cable from the clutch engaging lever at the gearbox;
- Undo the bolt of speedometer drive bushing, take out the speedometer drive and shift aside, then reinstall the bolt;
- Disconnect the wire from the contact (switch) of the neutral;
- Remove the rear wheel, the final drive, the flexible coupling joint driven flange with the flexible coupling joint driving flange of the gearbox.
- Undo three nuts and a fastening bolt located under the right-hand cylinder which fastens the gearbox to the engine crankcase;
- Shift the gearbox to the rear.
- Shift the clutch release rod to the rear until it stops and take the gearbox out of the frame.

Reinstall the gearbox on the engine in the reverse order. Before reinstalling the gearbox attend to the following:
- Check alignment of hub splines in the clutch driven disks making use of crank handle 345-316-3 or the splined end of tool 345-429-3 and, if necessary, adjust the hubs position so that the handle or the splined tool end enters easily the splined holes of both hubs:
- By turning the shaft, arrange the splines of the gearbox primary shaft to mate those of the clutch driven disks. When reinstalling the gearbox:
- Move the clutch release rod somewhat ahead;
- Insert it into the square hole of the clutch pressure plate;
- By pushing the gearbox nearer, insert the primary shaft into the splined holes of the clutch driven disks.

3. DETACHING AND ATTACHING THE SIDECAR

To detach the side-car:
- Set up the motorcycle on the stand;
- Disconnect the plug-and-socket connector leading to the sidecar lamps;
- Undo the nuts of upper bolts fastening the side-car frame tie-rods to the motorcycle and extract the bolts;
- Undo the bolts of bottom clamping holders which fasten the side-car frame to the motorcycle and loosen them approximately by 12 to 15 mm;
- Remove the sidecar wheel if your rig has a sidecar drive
- Disconnect in turn the front clamping holder, then the rear clamping holder by shifting them off the ball pin of the motorcycle frame;
- Put the sidecar aside.

Mount the sidecar onto the motorcycle as follows:
- Setting up the motorcycle on the stand, smear the ball pins of the clamping holder slightly with grease;
- Bring the sidecar to the motorcycle and place it so that the clamping holders fall directly under the ball pins of the motorcycle frame;
- Move the front clamping holders away from the seat as far as possible, raise the front end of the sidecar frame to fit the clamping holder on the front ball pin and loosely assemble them, without tightening the clamping holder;
- Proceed in the similar manner when joining the rear clamping' holder. Should the latter fail to coincide with the ball pin on the motorcycle frame, slacken off the fastening bolt nut of the holder and, turning it in one or the other sense, make the clamping holders coincide with the ball pin, tighten clamping holders and the bolt nut of the bracket;
- Bolt the tie-rods fastening the sidecar frame to the motorcycle frame and lock the bolts with nuts.
- Mount the sidecar drive.

If the holes in the tie-rod forks fail to coincide with the holes in the brackets of the motorcycle frame, undo the forks and by turning them in or out of the tie-rods adjust the proper length of the latter.

Having tightened up all the fasteners, take the motorcycle off the stand and check the camber and toe-in of the wheels. By placing wooden bars along the motorcycle wheels and the sidecar wheel, check the toe-in of the wheels. The spacing between the bars in front (along the axis of the front wheel) should be 10-12 mm less than that at the rear (along the axis of the rear wheel).
In case this difference is not sustained, release the fastening bolts of the rear bottom bracket of the clamping holder) and, by pushing it into the sidecar frame (or pulling it out), adjust the required toe-in of the wheels.
The motorcycle wheel camber is adjusted with the help of tie-rods, which fasten the sidecar frame to the motorcycle (by turning the forks into the tie-rods or out). It should be 1°- 2° lean out.
Having completed all the adjustments, check for reliability of all the fasteners clamping the sidecar to the motorcycle. The tightening torque should; be: of clamping holder bracket 49-61 Nm; of clamping holder 39-49 Nm; of sidecar tierods 137-196 Nm. Verify the correct setting of the camber and toe-in by making a run on a level road. The motorcycle should not drag to either side when running at full load.

4. REMOVING AND REINSTALLING THE INTAKE AND EXHAUST SYSTEMS

To remove the air box first loosen the screws of clamps and dismount the branch pipes from the carburetors and air box, then undo the starter fastening screw and gearbox fastening screw. Moving the box to the rear takes it out of the frame. To reinstall the air box, reverse the sequence of operations.
To remove the exhaust system:
- Unscrew nuts of the engine front fastening stud, loosen tightening bolts of clamps and remove the clamps from the stud.
- Loosen muffler fastening clamps and clamps of header pipe with the adaptor assembly, loosen mufflers nuts.
- Take out the ends of header pipes from the cylinder heads and adaptors.
- Take apart the header pipes from the adaptors/
- Moving the muffler to the rear take it out of the in assembly with adaptor.
- Reinstall the exhaust system in the reverse order.

***5.* REMOVING AND REINSTALLING THE FUEL SYSTEM**

In order to remove the gasoline tank:
- Drain gasoline out of the tank;
- Remove the hoses from the carburetor pipe unions and those connecting the gasoline tank halves;
- Remove the driver's saddle, then undo the front and rear bolts fastening the gasoline tank and, by shifting the tank back and raising its rear part, remove the tank.

Reinstall the gasoline tank in reverse sequence.
To remove the carburetor:
- Disconnect the intake branch pipes;
- Disconnect the throttle cable from the carburetor throttle
- Remove the nuts fastening the carburetors to the cylinder heads and remove the carburetor.

To reinstall the carburetor, reverse the sequence of the operations given above.

6. REMOVING AND REINSTALLING THE WHEELS

To remove the motorcycle front wheel:
- Set up the motorcycle on the stand and suspend the front wheel by inserting a back plate under the front part of the motorcycle frame;
- Screw in the front wheel brake adjustment bolt and remove the front brake cable.
- Slacken off by several turns the nut of the clamp bolt fastening the fork leg left-hand tip and turn out the wheel front axle (left-hand thread);
- Remove the front axle, while supporting the wheel, and take the protective cap off the wheel;
- When the motorcycle features the leading link front fork undo the reactive rod fastening nut from the brake plate and remove the reactive rod.
- Remove the front wheel moving it to the front.
- Separate the wheel from the brake drum cover. To reinstall the front wheel, reverse the sequence of the operations. When mounting the axle, lubricate it with motor oil. To remove the rear wheel
- When the wheel features a drum brake separate the wheel from the drum brake cover

When the motorcycle has the disc brake insert a plate about 4 mm thick to prevent the brake pads from getting out of the caliper. To reinstall the front wheel on the motorcycle, perform the above operations in reverse order. When reassembling the axle in place, lubricate it with motor oil.
To remove the rear wheel proceed as follows:
- Remove the cotter pin of the axle slotted nut, unscrew the nut, loosen the swinging fork left-hand arm clamp bolt nut and remove the axle together with the protective cap;
- When the motorcycle features the sidecar drive, disconnect the sidecar drive from the final drive.
- Undo the butterfly nut of adjustment rod of rear brake
- Shift the wheel off the brake shoes to the left and remove the wheel from the frame
To reinstall the rear wheel on the motorcycle, perform the above operations in reverse order. When reassembling the axle in place, lubricate it with motor oil. In fitting the wheel on the brake shoes, the coupling splines sometimes may not coincide; therefore turn the wheel until the coincidence of the splines is ensured. Adjust the rear wheel brake.
To remove the sidecar wheel:
- Take out the cotter pin, undo the nut and remove the protective cap;
- Insert a stand under the sidecar frame, lift the sidecar wheel and remove it.
To reinstall the sidecar wheel, reverse the sequence of the operations. Prior to mounting, lubricate the axle with motor oil. The tightening torque of wheel axles should be 54-77 Nm.

7. REMOVING AND REINSTALLING THE FINAL DRIVE

To remove the final drive together with the propeller shaft, proceed as follows:
- Set the motorcycle on the stand and remove the rear wheel (see subsection 6);
- Remove the wing nut of the rear brake tie-rod, the nuts of studs fastening the final drive to the swinging fork arm;
- Detach the final drive from the swinging fork arm and remove it from the rear. Take the flexible joint flange off the propeller shaft to facilitate its passing through the hole in the swinging fork girder. To reinstall the final drive, reverse the sequence of operations.
The tightening torque of the final drive to the swinging fork should be 30-34 Nm.

8. REMOVING AND REINSTALLING THE HANDLEBAR WITH CONTROL CABLES AND SWITCHES

To remove the handlebar with all the control cables and switches:
- Remove the gasoline tank (see subsection 5);
- Disconnect the throttle cables from the carburetors (see subsection 5), the clutch cable (see subsection 1), the front brake cable from the brake drum cover; for this purpose, turn in the adjusting screw and set it so that its slot coincides with the bracket slot. Engage the brake lever on the cover and remove the cable sheath tip from the seat in the adjusting screw, then take the cable tip out of the lever;
- Undo the master cylinder hose (for motorcycle with disc brake).
- Disconnect the switch conductors from the motorcycle wiring plug connectors;
- Undo the nuts fastening the handlebar brackets to the fork cross-piece and remove the handlebar.
If it is necessary to remove the switches, slacken clamping screws, while in the right switch undo the screw fastening the body (with spherical head).
Reverse the sequence of the operations when reinstalling the handlebar. The tightening torque of the bracket nuts should be 39-49 Nm.

9 REMOVING AND REINSTALLING THE FRONT FORK

To remove the front fork:
- Remove the front wheel (see subsection 6)
- Undo the nut of the bolt fastening electronic ignition system or horn and take the bolt out
- Undo the steering damper tightening bolt and remove all the steering damper washers
- Remove the gas tank (see subsection 5)
- By unscrewing the handlebar bracket nuts remove the handlebar;
- Remove the headlight by undoing its fastening screws to the front fork cover holders.
- After taking off the pilot lamp sockets, speedometer lamp and unscrewing the speedometer drive shaft, remove the dash board;
- Turn off tightening nuts of the fork legs and steering column stem nut, remove the washers and the fork cross-piece;
- Turn off the bolts fastening the front fender to the leg covers and the steering column bridge and remove the turn indicator relay and fuse box bracket and the front fender;
- Disconnect the wire from turn indicator terminals. As a precaution against damage, remove the turn indicator from the front fork;
- Unscrew and remove the ignition lock from the leg cover bracket;
- Turn off the bearing nut and remove the safety washer of the thrust bearing, then remove the top ring of the thrust ball bearing (when loosening the nut, hold the front fork) and seal;
- Remove the front fork, pulling it down. When taking the steering column stem out of the column, take care not to lose the balls of the top and bottom thrust bearings;
- Remove the thrust bearing balls.

To reinstall the front fork, reverse the sequence of the operations. When reassembling the steering column, make sure that all the 44 balls of the thrust ball bearings are in place and intact. Lubricate the balls in the bearing with grease Litol-24. Tighten up the bearing nut so as to ensure unobstructed rotation of the fork in the bearings, without seizing and noticeable play (tighten it to the limit, then loosen 1/6-1/8 of a turn.

The tightening torque of the steering column stem nut should be 49-61 Nm.

10. REMOVING AND REINSTALLING THE SWING OF REAR SUSPENSION (REAR WHEEL, FINAL DRIVE REMOVED)

To remove swing:
- Undo top and bottom bolts fastening spring-loaded hydraulic shock absorbers and remove the latter;
- Unbend the pin lock washer edges and screw out the pins;
- Shift the swing back and turning it, take it out of the frame. Reinstall the rear suspension by reversing the sequence of the operations given above. When mounting the swing tighten up the silent blocks fastening pins with the swing in the middle position (the fork levers should be positioned parallel to the bottom tubes of the frame). The tightening torque of the pins should be 68-88 Nm.

Reinstall the spring-loaded hydraulic shock absorbers in the reverse sequence, the tightening torque of the shock absorber bolts: top, 20-29 Nm; bottom, 35-49 Nm.

11. REMOVING AND REINSTALLING AXLE LEVER OF THE WHEEL SUSPENSION (WHEEL REMOVED)

To remove axle lever:
- Undo tie-rod nut, pull out the' brake tie rod from the bushing and remove the latter;
- Undo nut and take out the pins fastening the axle lever;
- Undo the bolt of the shock absorber top fastening;
- Shift the axle lever back and remove the shock absorber from the fastening top point;
- Take out the axle lever with the shock absorber and the brake drum from the frame.

Reinstall the lever with the shock absorber in the reverse sequence; Tighten up the nuts of the lever axle pin nuts after the stand removal from under the sidecar frame.

12. REMOVING AND REINSTALLING OF THE STARTER

To remove the starter proceed as follows:
- Disconnect wires from the battery terminals and the starter
- Slacken clamps and remove the intake branch pipe.
- Undo two bolts fastening the starter to the gearbox using hex wrench.
- Loosen air box fastenings
- Lift the air box and remove the starter.

To reinstall the starter proceed in a reverse order.
Adjust a correct mesh of starter gear with flywheel crown. The mesh is adjusted using shims between the starter and the gearbox housing.

13. REMOVING AND REINSTALLING ELECTRICAL EQUIPMENT UNITS

To remove the storage battery:
- Disconnect the wires from the storage battery terminals. To prevent short-circuiting, first disconnect the wire connected to ground and then the "plus" wire. To protect the battery posts from breaking off when joining and disconnecting the wires, make it a rule to hold the bolt from turning with the help of a wrench when unscrewing the nuts;
- Undo the nut, which holds the storage battery fastening band, and remove the storage battery.

To remove the alternator:
- Disconnect the wires from the output terminals;
- Undo the air box and take it out.
- Remove the nuts fastening the alternator and remove the alternator by shifting it to the rear.

To reinstall the alternator: reverse the sequence of the operations.
Make sure to set a proper clearance in the mesh of drive gears. Reinstall the alternator and, turning it clockwise (as viewed from the side of output terminals) till the stop, turn it in the reverse sense 3 to 4 mm (by the outer diameter of the alternator frame). Secure the alternator in this position. Check the proper clearance by starting the engine and listening-in to any abnormal noises arising in the operation of the generator. By turning the alternator to one or the other side (with the engine stopped), try to minimize the noise of the meshed gearing.
To remove the ignition coil:
- Remove the engine front cover;
- Disconnect the high- and low-voltage wires from the ignition coil terminals;
- Remove the ignition coil by turning off two screws fastening the coil to the timing gearbox cover.

Reinstall the ignition coil by reversing the sequence of the operations.

IV.
REPAIR OF THE ENGINE

1. DISASSEMBLY AND REASSEMBLING

Removing and Reinstalling the Cylinder Head (the engine may be left on the motorcycle)

Required tools and fixtures:

- Pans for draining oil from the cylinder head cover;
- 0.05 mm feeler gauge;
- Crank handle 345-316-3.

To remove the cylinder head from the engine:

- Remove the silencer and the exhaust pipe (see subsection 4), the high-voltage wire with cap from the spark plug (turn off the latter), the fuel-feeding pipe from the float chamber pipe union. First make sure that the gasoline cock is shut off' and that there are no fuel leaks.

Notes:

1. Do not perform these operations, if the engine has been removed from the motorcycle frame.
2. Where removing the right-hand cylinder head, begin with detaching the side-car (see subsection 3).

- Disconnect the carburetor intake branch;
- Remove the carburetor with gasket and the cylinder head cover, having placed a pan under the joint to drain oil remaining in the cylinder head cover;
- Set the crankshaft in the T. D. C., so that both valves of the cylinder are closed (taking into account the expansion clearance between the valves and the big rocking arm). Use the kick-starter to crank the crankshaft, but if the gearbox has been removed, make use of the crank handle 345-316-3;
- Remove the rocking arms together with rockshaft brackets, having first undone the brackets fastening nuts;
- Remove the tappet push rods;
- Remove the cylinder head and its gasket.

When removing the cylinder heads, especially when removing both of them, mark the rocking arms and the push rods so as not to mix them up when reassembling. Having removed the heads, remove deposits from them, wash and inspect.

To check the valves, for proper seating, flood the intake and exhaust ducts of the cylinder head, in turn with kerosene. Absence of leaks is ample proof of proper seating of the valve. If necessary, remove the valves; take measurements and repair (refer to Repairing the Valve Timing Mechanism).

Reinstall the cylinder head, reversing the sequence of the operations. Make sure that the piston is in its T. D. C.

See to it that with the push rod reinstalled, the rockshaft brackets of an assembled rocking arm being fitted on the studs reach freely the supporting surfaces, providing for an expansion clearance. If not, then either the push rod is not in place in the tappet cap, or the tappet remains on the raised camshaft cam, or the adjusting bolt of the rocking arm has been turned off more than necessary in the course of dismantling.

Check whether the push rod mounting is correct, turn in the adjusting bolt and, if necessary, crank the crankshaft by 180° until the tappet is completely lowered.

Remember that negligent mounting of the push rod may lead to bending of valves.

Tighten up the nuts fastening the brackets of the rockshaft in the criss-cross manner in order to ensure proper mating of the cylinder head and cylinder planes, the tightening torque should be 50-60 Nm) , then adjust the expansion clearance. Measure the clearance with the help of 0.1-0.15 mm feeler gauge between the rocking arm tip and the valve stem end. Adjust the clearance making use of the rocking arm adjusting screw. Having completed the adjustment, lock the adjusting screw with the lock nut.

Before installing the cylinder head cover in place, lubricate the rockshafts through the central oil holes in the shaft.

Removing and Reinstalling the Cylinder
(the engine may be left on the motorcycle, with the cylinder head removed)
Required tools:
- Crank handle 345-316-3 for cranking the crankshaft;
- Device 346-692 for compressing the piston rings when fitting the cylinder.
- Distance bar 346-697

To remove the cylinder:
- Set the piston in the T. D. C. position using kick-starter lever or crank handle 345-316-3 with the gearbox removed. (Fig.1)
- Turn off the cylinder fastening nuts, move the cylinder away (without jerks) by slightly rocking it and taking care not to damage the paper gasket, remove the cylinder;
- If necessary, remove the cylinder gasket.

Having removed the cylinder remove the deposits from it, wash, inspect and measure the cylinder bore. If necessary, repair (refer to Repairing the Crank Mechanism).
To install the cylinder:
- Put the paper gasket on the cylinder fastening studs, paying special attention to that the cylinder gasket does not overlap the hole for oil feed and drain.
- Put distance bar 346-697 between the piston and the engine crankcase (See Fig.2)
- Insert device with its hole onto either stud and compress the piston rings. (See Fig.2). put the cylinder onto studs, insert piston head into the cylinder and move the cylinder into the distance bar until it stops.
- Remove distance bar 346-697, undo the nut of device 346-692 and remove it.

Make sure that the sealing caps of the push rod tubes are correctly positioned (the arrow marked on the sealing cap should be in top position) and tightly fitted in place.

Removing and Reinstalling the Piston and Piston Rings
(The engine may be left on the motorcycle, with the cylinder removed)
Required tools:
- Device 345-439-3 to press out the piston pin
- Piston ring remover 346-066-3;
- Mandrel 346-035 and tapered tip for mounting the piston pin.

To remove the piston and piston rings:
- Mark the position of the piston;
- Remove the piston pin circlips;
- Fit the remover 345-439-3 and press out the piston pin (Fig.3);
- Remove the tool and take out the piston;
- Remove the piston rings with the help of remover 346-066-3 (Fig. 4).

Make sure to mark the piston rings when removing them, so as to reinstall the rings, when assembling, exactly in the same position (into the respective piston grooves and with their respective end faces pointing up), as otherwise the oil consumption will sharply rise and remain so until the rings are embedded in the new position.
Having dismantled the piston and piston rings, clean them of carbon, especially in the grooves which house the piston rings, wash, inspect thoroughly and make the required measurements. If necessary, replace the worn out parts (refer to Repairing the Crank Mechanism).
Reassemble the piston and piston rings in the following sequence:

Fig.1
Crank handle 345-316-3 to crank the engine crankshaft

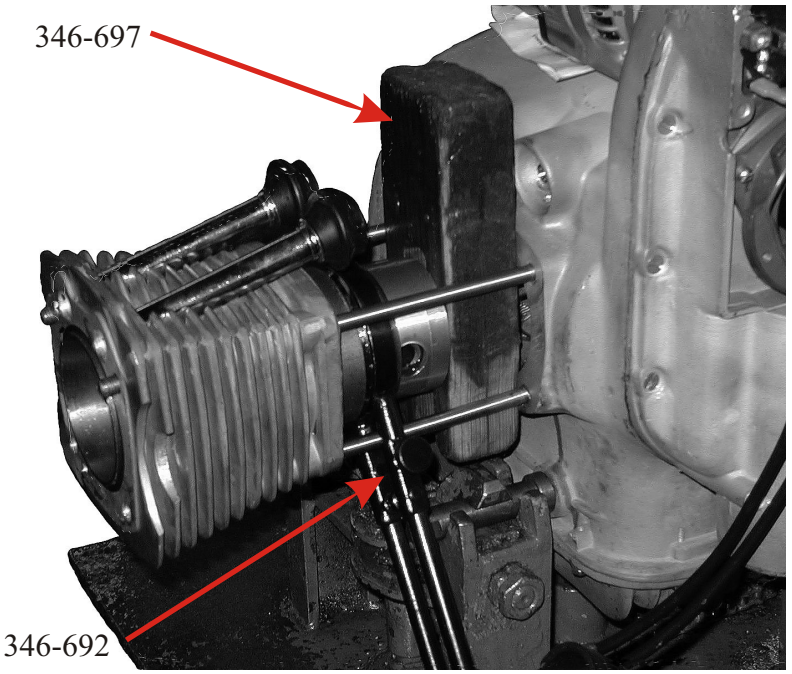

Fig.2
Compression of piston rings to insert them into the cylinder.

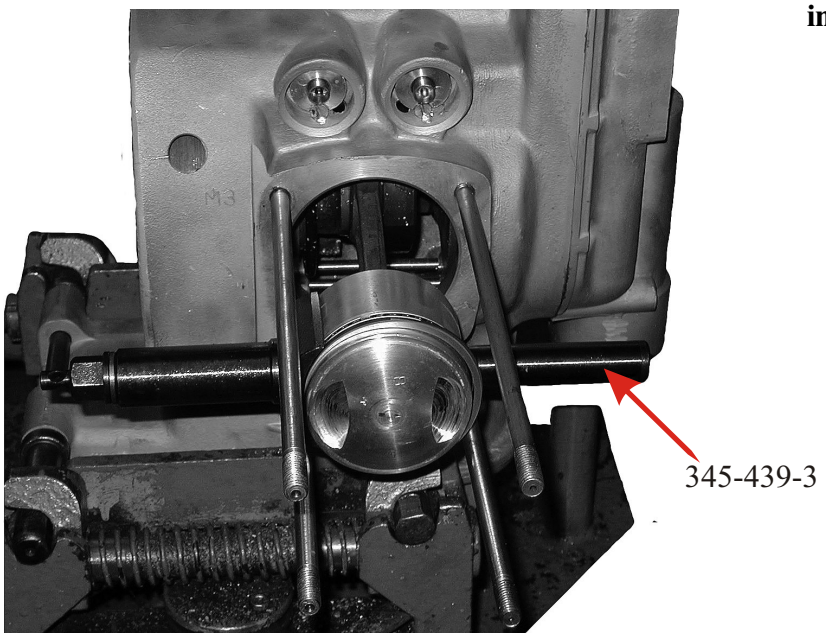

Fig. 3
Pressing out the piston pin

Fig. 4
Device 346-066-3 to remove and mount piston rings

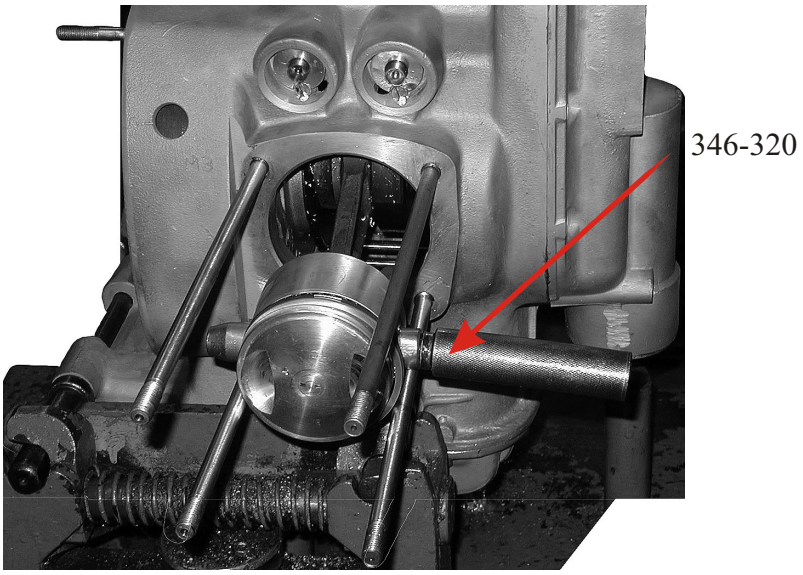

Fig. 5 Piston pin mounting

- Mount the piston rings on the piston using device 346-066-3;
- Fit the pin on the mandrel 346-320, and from the other side insert the guiding tapered tip into the piston pin hole. Cover the piston pin with oil
- Match the hole in the piston and the hole in the connecting rod small end and press the piston pin in place by hand (Fig. 5).

Usually only an expert mechanic is allowed to fit the piston pin into the piston, as the pin may get seized.

Never knock the pin in with blows, but press it out and repeat the operation, should the pin get seized. Only slight knocking against the mandrel is permissible in order to adjust the position of the pin between grooves for circlips.

Having fitted the piston pin, insert the circlips.

Removing and Reinstalling the Tappets with Guides
(The engine may be left on the motorcycle, with the cylinder removed)

- Undo the stop screws and remove the tappets with guides from the engine crankcase;
- Take the tappets out.

Take care to mark the tappets and the guides when removing them, so as not to mix them up and to reinstall them in their proper places, when re-mounting.

Having dismantled the parts, wash them, inspect, and make the required measurements. If necessary, change worn out parts (refer to Repairing the Valve Timing Mechanism). Having lubricated the tappets with motor oil, reinstall them observing the reverse sequence of the operations.

Removing and Reinstalling the Oil Filter

To remove the oil filter from the distributor box cover, unscrew the filter plug and take off the filter together with the by-pass valve arranged therein and take the filter from the plug end.

Then wash the parts, inspect them, and change the oil filter, if required. Reassemble the filter in the reverse sequence of the operations, having preliminarily soaked the filter in oil and inserted a rubber packing bushing.

When inspecting and disassembling the by-pass valve bear in mind that the valve is accurately adjusted to the oil main pressure of 0.07-0.09 MPa.

Removing and Reinstalling the Distributor Box Cover
(With the engine removed)

The required tool is tapered tip 345-317-3 for mounting the seal on the camshaft.

To remove the distributor box:

- Drain oil from the engine crankcase through the drain hole in the engine sump;
- Remove the front cover having undone the fastening screws;
- Disconnect all the wiring from the ignition coil terminals and remove the ignition coil, having undone two screws;
- Remove the distributor cover; undo the screw fastening the automatic advance timer and remove the timer together with the distributor cam;
- Take out the high-voltage wires together with the rubber bushings;
- Turn off the screws fastening the cover and remove the latter by knocking it off with light blows;
- Remove the breather;
- Replace the gasket if damaged;

Having removed the distributor box cover, wash the parts (except for the ignition coil and wiring), inspect, and make necessary measurements. If necessary, replace the worn-out parts (refer to Repairing the Engine Crankcase and Covers in Section IV), and to "Ignition System in Section XVI).

Before reassembling the cover, if the gasket has been removed, clean the surfaces of the joint from varnish remnants and apply a new coat of varnish to the surface at the joint on engine crankcase and install a new gasket, matching all the holes.
Reinstall the covers reversing the sequence of operations; make sure that the breather slot enters the driving pin, which is press-fitted into the timing driven gear. Lubricate the breather with oil, prior to reinstalling.
Make use of tapered tip 345-317-3 (Fig. 6) when mounting the timing cover so as to preclude any damage and bending of the collar edges. Center the collar (Fig.7) using mandrel 346-671-01.

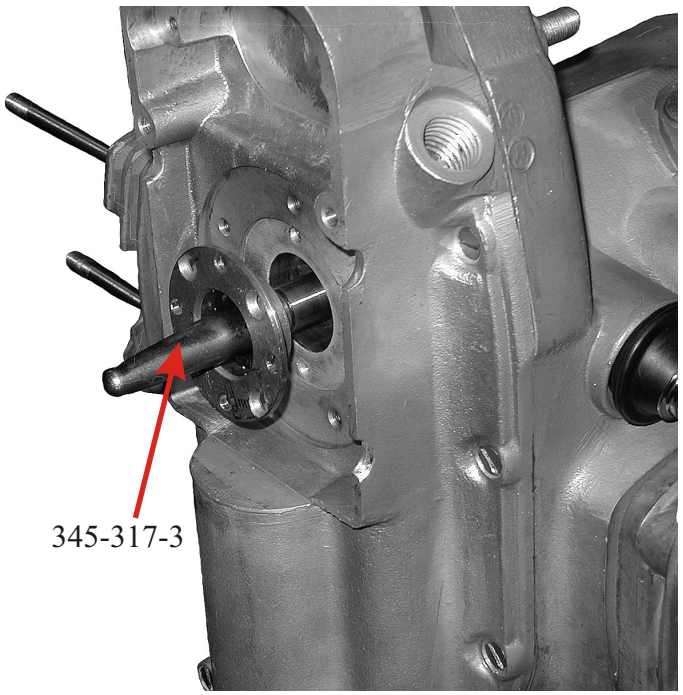

Fig.6 Mounting the collar and seal

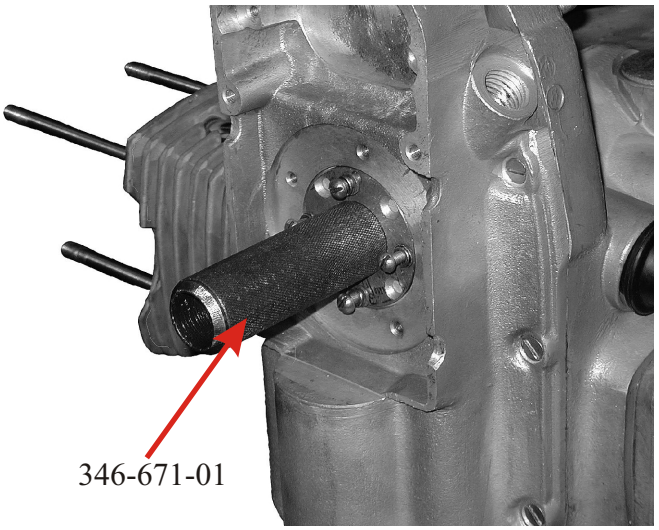

Fig. 7 Centering of collar and seal

Removing and Reinstalling the Camshaft
(with the timing covers, both cylinders and tappets removed)
Required tools are:
- backlash indicator 450-182 for measuring the backlash between the teeth of timing drive gearing;
- device 450-212 for measuring the face runout of timing drive gearing;
- mandrel 345-327-3 for removing the camshaft;
- mandrel 345-341-3 for pressing in the camshaft.

Before removing the camshaft, measure the backlash between the teeth of timing drive gearing and the runout of timing drive gearing.
For this purpose:
- undo the nuts fastening the alternator and remove the latter;
- set up the backlash indicator 450-182 and fasten it on the upper right-hand threaded hole.

Measure the clearance between the gearing teeth, then remove the tool (Fig.8)
- the clearance is measured at four spots minimum.
- set up the face runout indicator 450-212 and fasten it on the right-hand threaded hole. Measure the endplay, and then remove the tool (Fig. 9).

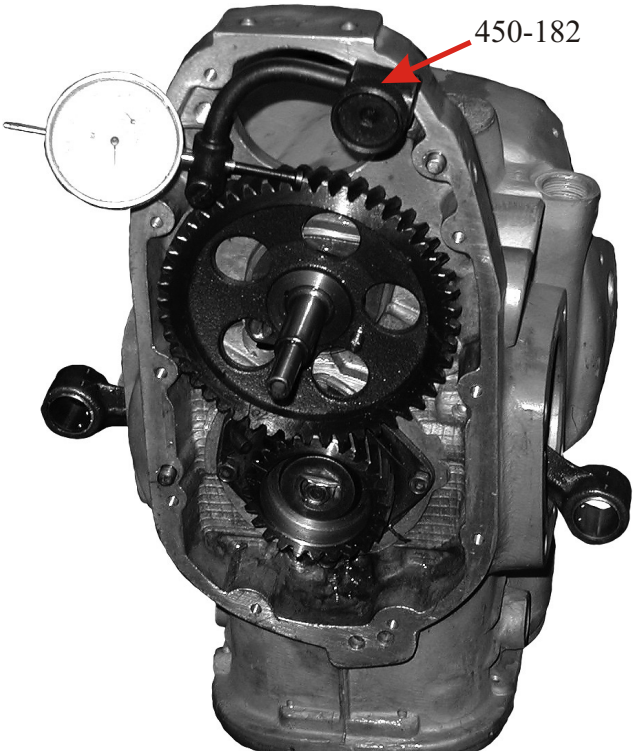

Fig. 8
Measuring the backlash in timing gears

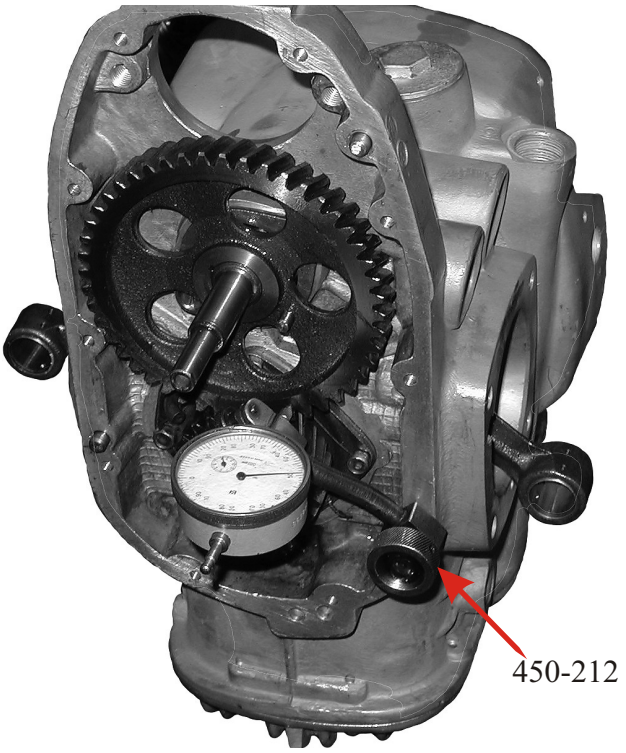

Fig. 9
Measuring the runout of timing gears

The backlash in timing gears should not be more than 0.5 mm. If otherwise, change the gear set.
The face runout should not exceed 0.1 mm for driving gear and 0.05 for driven gear.
To remove the camshaft:
- Turn off the screws fastening the camshaft flange gaining access through the holes in the timing driven gear;
- Remove the camshaft. Make use of mandrel 345-327-3, inserting it into the hole of removed guide of the left cylinder intake valve. By bringing close the camshaft cam, press out the camshaft with a turn of the mandrel (Fig. 10).
Having removed the shaft, wash the parts, inspect, and make necessary measurements.' To change worn-out parts, refer to Repairing the Valve Timing Mechanism).
To reinstall the shaft, reverse the sequence of the operations. Prior to pressing-in, lubricate the camshaft rear journal and the bearing with oil. Use mandrel 345-341-3 to press in the camshaft with slight blows, the mandrel being fitted on the shaft end and thrusting against the gear hub (Fig. 11).
Make sure that the marks on the timing gears are aligned.

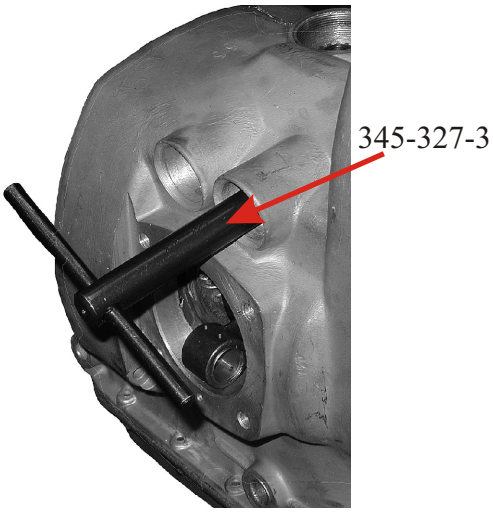

Fig. 10
Removing the camshaft

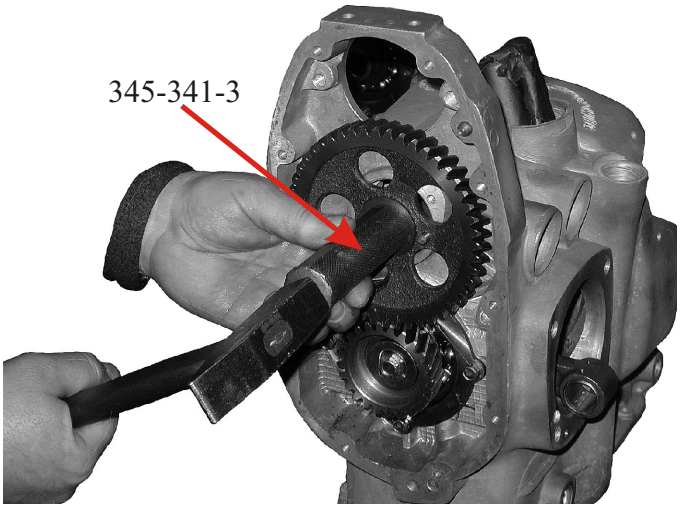

Fig. 11
Reinstalling the camshaft

Removing and Reinstalling the Clutch
(With the engine taken out of the motorcycle frame and the gearbox removed)
For reassembling the clutch tool 345-429-3 is used. To remove the clutch plates:
- Insert a screwdriver into the slits of screws fastening the clutch pressure plate and with light blows of a hammer against the screwdriver butt end knock off the metal flashes from the screw slits:
- Loosen screws fastening the thrust plate
- Fit tool 345-429-3 on studs and lock with nuts, insert its mandrel into the splined hole of the hubs of the clutch driven plates and by driving in the screw of the tool, apply the clutch (Fig. 12)
- Remove screws fastening the thrust plate
- Release the clutch by turning off the tool screw and remove the tool;
- Remove the clutch plates and springs.
Having dismantled the clutch, wash the parts, inspect, and make necessary measurements.
If necessary, repair or replace worn-out parts (refer to Repairing the Clutch Mechanism).
To reassemble the clutch:
- Insert the springs of the same color marking into the respective flywheel sockets:
- Fit the clutch pressure plate on the flywheel and make sure that the thrust planes of the springs have entered the respective recesses of the pressure plate;
- Fit the guiding pins after every second flywheel pin and reinstall - observing the given sequence - the clutch driven plate, the intermediate plate, the clutch driven plate and the thrust plate;
- Fit the splined mandrel of the tool having matched the holes in the driven plates and the clutch pressure plates;
- Fit the tool 345-429-3 and by driving in the screw of the tool compress the springs (Fig. 12);
- Having matched the holes in the thrust plate with the flywheel pin holes, turn in the screws fastening the thrust plate. Tighten the screws in a cross pattern;
- Loosen the tool screw and remove the tool;
- Punch each screw at two points drawing the plate metal into the screw slits. After that, take off the splined mandrel.

Removing and Reinstalling the Flywheel
(with the clutch removed)
Required tools and fixtures are:
- wrench 346-694 for turning off the flywheel fastening bolt;
- remover 345-042-3 for removing the flywheel; ,
- wrench 19x22 for locking the flywheel in place.
To remove the flywheel:
- unbend the lock washer of the flywheel bolt;
- fit the wrench 19x22 between the hole for spring in the flywheel and stud fastening the engine crankcase;
- using wrench 346-694 turn off the flywheel fastening bolt and remove the lock washer;
- remove wrench 19x22;
- fasten the remover 345-042-3 on the flywheel;
- by turning in the central screw of the remover, remove the flywheel from the crankshaft tapered end (Fig.13);
- take off the remover.
Having dismantled the flywheel, wash and inspect the parts; if necessary, replace worn-out parts (refer to Repairing the Clutch Mechanism).

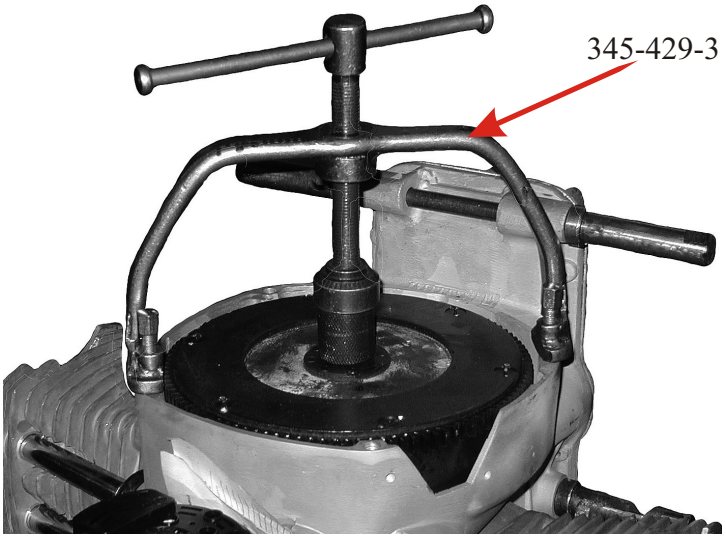

Fig. 12
Removing the clutch plates

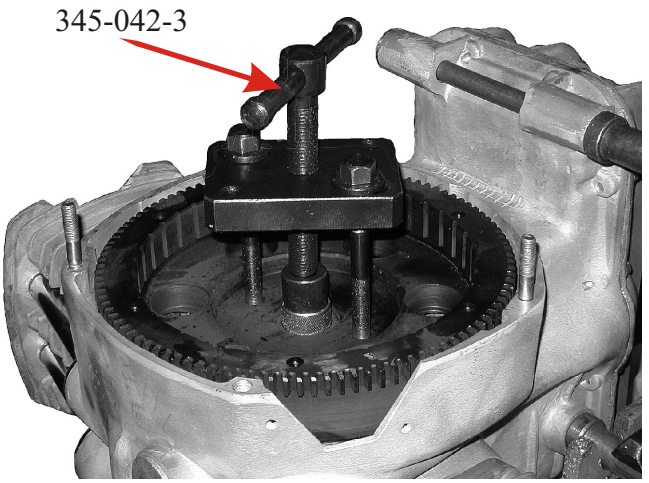

Fig. 13
Removing the flywheel

To reinstall the flywheel:
- Fit the flywheel on the tapered end of the crankshaft; make sure that the rubber seal is correctly fitted on the flywheel hub and that the key coincides with the keyway in the flywheel hub;
- Fit a lock washer on;
- Install wrench 19x22;
- Tighten up reliably the flywheel fastening bolt using wrench 348-801, the tightening torque being 216-245 Nm
- Bend over the head of the lock washer to cover one of the bolt faces;
- Remove wrench 19X22.

Removing and Reinstalling the Oil Pump
(with the engine removed and set up on a mounting stand)
To remove the oil pump:
- Drain oil from the engine crankcase through the drain hole in the sump;
- Undo the plug of the oil pump drive and remove the drive gearing;
- Undo the screws fastening the engine sump; remove the sump together with the gasket;
- Uncotter and take off the pump filter;
- Turn off two bolts fastening the pump and remove the oil' pump together with the bar (assy).

Wash and inspect the pump. If necessary, dismantle it, change worn-out parts, reassemble and check its performance. At a speed of 670 rpm the oil pump should develop a pressure of at least 0.4 MPa . Use spindle oil grade B3 for this test. The pump delivery is 80 to 100 1/h.
To reinstall the oil pump, reverse the sequence of the operations, having first reinstalled the crankshaft and the camshaft.
When remounting the oil pump, see that the sealing gasket does not overlap the oil duct and that the pump casing fits tightly the thrust surface, also see that the drive shaft rod enters the square hole of the drive gear. Having reinstalled the oil pump, proceed directly with remounting of the engine sump and screw on the plug of the oil pump drive.
The tightening torque should be for: oil pump bolt 15.7-17.6 Nm ; for engine sump 7.8-9.8Nm .

Removing and Reinstalling the Crankshaft
(With the flywheel, the camshaft, the pistons and the oil pump removed)

Required tools are:
- Puller 346-693 for removing bearing from the crankshaft front and rear journals;
- Remover 345-339-3 for removing the driving timing gear;
- Tool 346-682-01 for removing the bearing rear housing;
- Tools 246-679 and 346-680 for removing and reinstalling the lock rings.
- Mandrel 345-334-3 for pressing-off the front bearing;
- Set of tools 346-720 (stationary press) for pressing-in the crankshaft into the front bearing.

To remove the crankshaft:
- Unbend the lock washer of the bolt fastening the timing drive gear, turn off the bolt, remove the drive gear with the help of puller 345-339-3 and remove the drive gear key (Fig. 14 and 15);

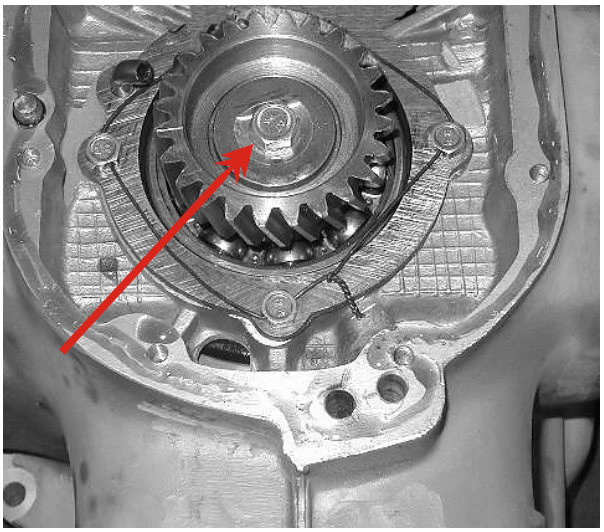

Fig.14

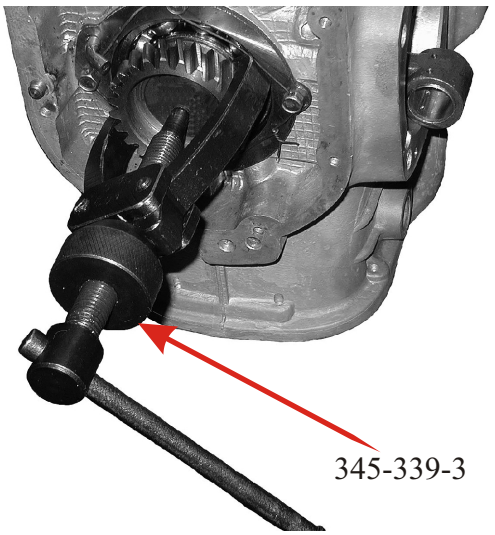

Fig.15

- Remove the seal from the rear bearing housing;
- Remove the lock rings from the rear bearing housing and crankshaft journal making use of devices 346-679 and 346-680. Using device 346-693 demount the bearing (Fig. 16) ;

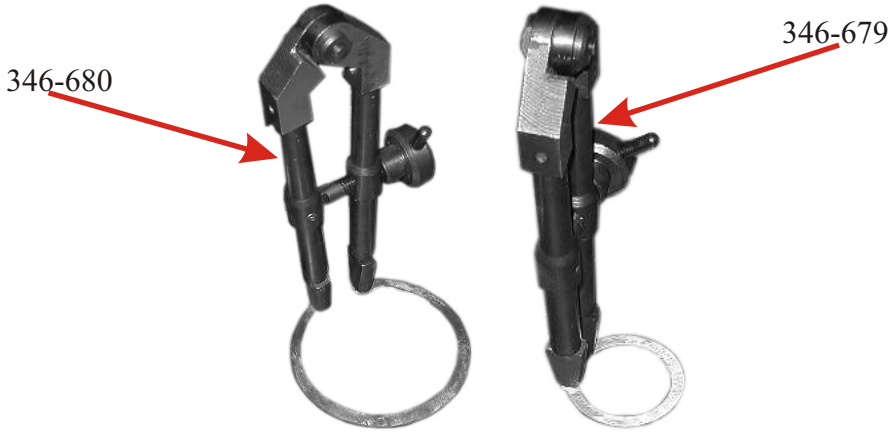

Fig. 16
Demounting the lock rings

- Turn off the bolts and remove the rear housing making use of removing tool 346-682-01Э (Fig. 17);
- Press out the crankshaft with bearing from the front housing using device set 346-720 (Fig. 18).

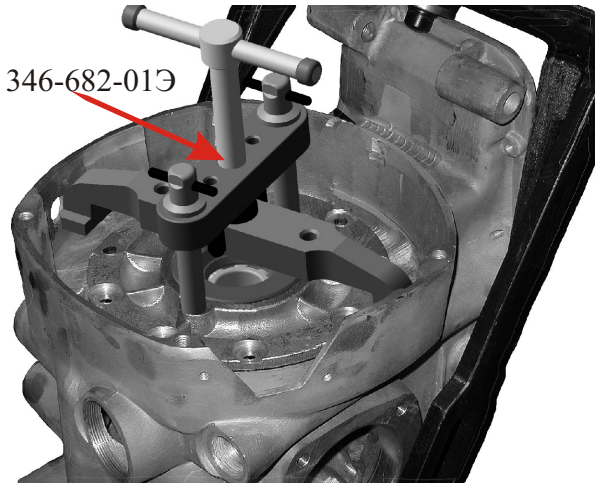

Fig. 17
Removing the rear housing

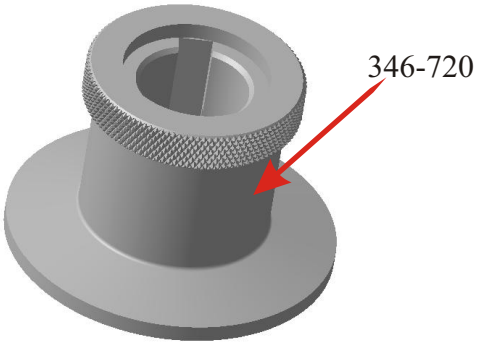

Fig. 18
Device to press out the crankshaft

- By turning the crankshaft, position the keyway of the flywheel facing up. By lifting the crankshaft front and lowering its rear portion, remove crankshaft from the engine crankcase (Figs 19 and 20);

Fig. 19
Position of the crankshaft while removing

Fig. 20
Removing and reinstalling of the crankshaft

- Use puller 346-693 (Fig. 21) to remove the bearing from the front journal of the crankshaft. (The cage of the bearing must be broken and balls displaced to position the device between internal and external cages of the bearing).
- Remove the safety wires from the bolts fastening the front bearing housing and undo the bolts.
- Making use of device set 346-720 (Fig. 22 and 23) remove the front housing from the crankcase.

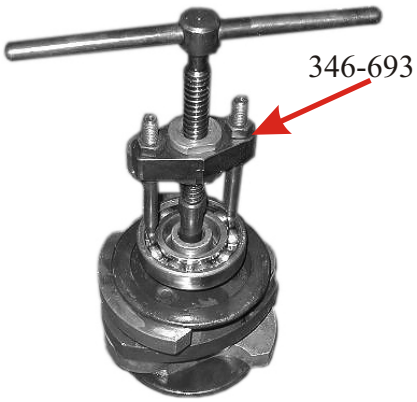

Fig. 21
Removing the bearing
from the crankshaft journal

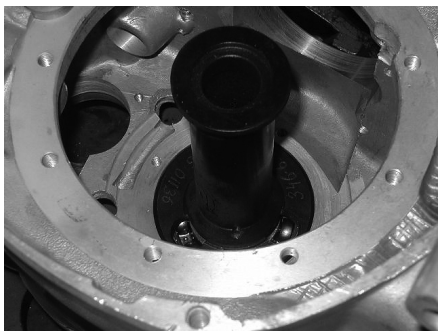

Fig. 22

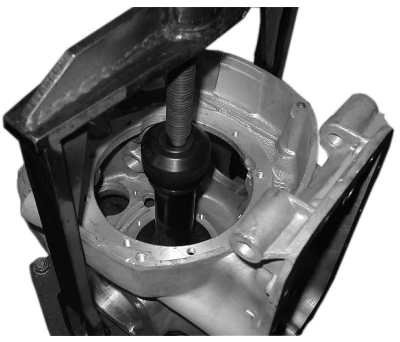

Fig. 23

Removing the front housing

Having removed the crankshaft, clean the oil catchers from accumulated grit, also the mating surfaces of the crankcase with the housings and covers, wash thoroughly and inspect all the parts, make necessary measurements. Should wear or other discrepancies from the technical requirements be revealed, replace the crankshaft.
Reinstall the crankshaft into the engine crankcase, observing the following sequence of operations:
-Press in the front housing with bearing into the crankcase using hand press and tool kit 346-720 (Fig. 24 to 29)

Fig.24

Fig.25

Fig.26

Fig.27

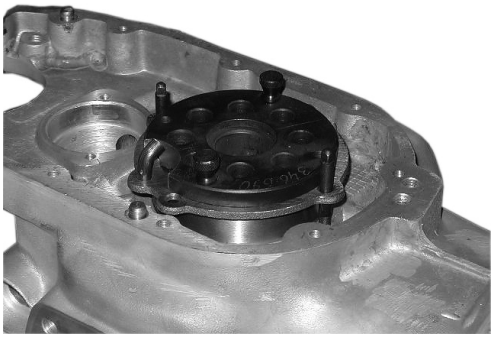

Fig.28

Fig.29

- Screw in four bolts and lock them with wire
- When positioning the crankshaft in relation to the engine crankcases as shown in Fig. 20, see to it that the keyway in the crankshaft is located on top, enter the connecting rods into the crankcase, guiding them into the holes provided for the cylinders, and tilt the crankshaft into the engine crankcase, as shown in Fig. 19;
- Insert device 346-695 between journals and web on both sides (Fig. 30);
- Press in the crankshaft into the bearing of the front housing using hand press tool kit 346-720 (Fig. 31 and 32)

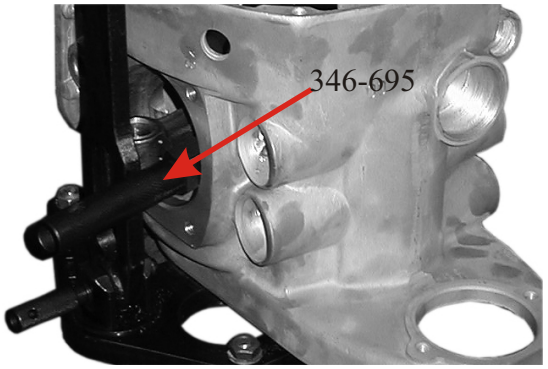

Fig.30

Fig.31

Fig.32

-Having centered the rear bearing housing relative to the fastening holes with press and kit of tools 346-720 coat the rear sealing surface of the crankcase with varnish, apply gasket on the rear housing and press in the rear bearing housing into the crankcase (33-35)

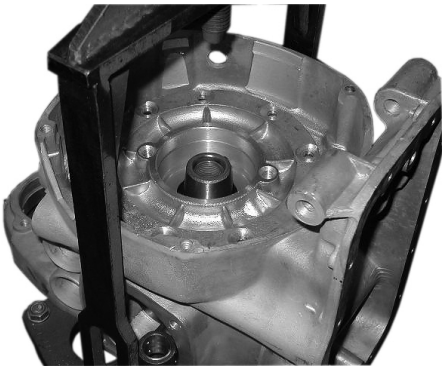

Fig.33

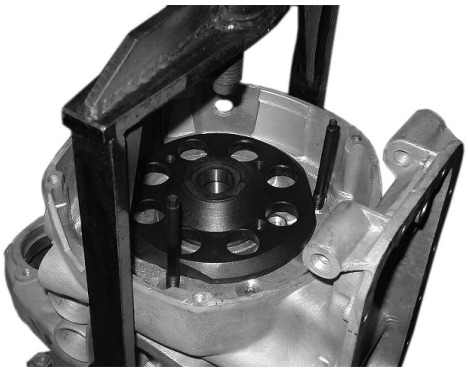

Fig.34

Fig.35

Having coated the half of thread of bolts with enamel ML-12, fasten the housing. When the bolts are reused, remove the old coating first and degrease.
Tighten the bolts in a criss-cross manner, the tightening torque being the same as for the front housing.

2. REPAIRING ENGINE UNITS AND PARTS

When repairing assembly units, remember to ensure positive or negative allowances between the mating sufaces, which should fall within the values set by the manufacture and are listed in Table 4.

The maximum tolerated limits of wear and clearances between the principal mating parts of the engine, are given in Table 5. They are used for determination of fitness of parts and assembly units for further service.

Repairing the Crank Mechanism

The following troubles in the engine will require repairing of the crank mechanism:

- Abnormal rattling in the main bearings, the connecting rod big end, the cylinder and piston group;
- Troubles in the crank mechanism parts are revealed during overhaul of the engine.

Crankshaft. Change the crankshaft if its wear exceeds the maximum tolerated limits (see Table 5); otherwise excessive wear of the friction surfaces, especially the connecting rod big end and the crankpin, will lead to engine breakdown;

Required tools and fixtures are:

- Inside caliper with measuring range of 18 to 32 and 32 to 55; the division value being 0.001 mm;
- Mandrel 345-333-3 for pressing off the connecting rod small end bush;
- Reamer 055-127-3, 21 mm diameter., for reaming the hole in the connecting rod small end bush;
- Drill, 3 mm in diameter.

Prior to inspection and measurements, clean the crankshaft oil catches of dirt and wash all the parts. By visual inspection check the general condition of the parts, especially the mated surfaces, in particular, those of the journals on which the main bearings are fitted.

To determine the condition and fitness of the crankshaft for further service measure the following:

- Wear of the connecting rod small end bushes;
- Radial play in the connecting rod big ends;
- Axial play in the connecting rod big ends;
- Run-out of crankshaft main journals relative to each other;
- Turning of the crankpins;
- Alignment of the connecting rod small ends relative to the crankshaft axis.

Use the inside caliper with and indicator head for measuring the wear of the connecting rod small end bush. The wear should not exceed the values given in Table 5.

If, however, the wear exceeds the tolerated limits:

- Press off the worn-out bush with the help of mandrel 345-333-3 using a hand press, and press in a new bush;
- Drill two 3 mm dia. holes in the bush for lubricating the piston pin through oil holes provided in the connecting rod small end, roll the bush into the slots of the small end and ream the bush with the help of reamer 055-127-3;
- Measure the actual size of the hole, mark it as indicated in Table 3, and select a piston pin of respective color. Within a given color group, an expert mechanic should select an appropriate piston pin by feel.

Table 3

Color Marking of the Piston Pin, the Connecting Rod Small End and the Holes in the Piston Bosses

Color index	Piston pin diameter, mm	Diameter of holes in connecting rod small end, mm	Diameter of holes in piston bosses, mm
White	21.0000 - 20.9975mm	21.0095 - 21.0070mm	21,0065 - 21,0040mm
Black	20.9975 - 20.9950mm	21,0070 - 21.0045mm	21,0040 - 21,0015mm
Red	20.9950 - 20.9925mm	21.0045 - 21.0020mm	21,0015 - 20,9990mm
Green	20.9925 - 20.9900mm	21.0020 - 20.9995mm	20,9990 - 20.9965mm

Table 4

Rated Sizes, Positive and Negative Allowances Between the Principal Mating Members of the Engine and Clutch, mm

Part No. and name (shaft)	Rated size and tolerance	No. and name of mating member (hole)	Rated size and allowance	Tolerated limits				Remarks
				positive allowance		negative allowance		
				min.	max.	min.	max.	
IMZ-8.128-01237-30 Piston(skirt diameter)	? 78 -0.060 - 0.090	IMZ-8.108-01031 Cylinder assy	? 78+0.030					Out-of-round and taper dia. ? 78+0,030 within 0.015
	Size groups							
	C		C	0.080	0.100			
	77.930-77.940		78.020-78.030					
	B		B	0.080	0.100			Group index is stamped on piston head and on top end face of cylinder
	77.920-77.930		78.010-78.020					
	A		A	0.080	0.100			
	77.910-77.920		78.000-78.010					
66-01238-01 Piston pin (outer diameter)	21-0.010	66-01237 Piston (hole in boss)	21+0.065 -0.0035					Out-of-round and taper of pin within 0.0025
	White 21.0000-20.9975		White 20.9930-20.9905	0.0040	0.0090			Color index of group is marked on bore of one of pin end faces and on one of bosses inside the piston
	Black 20.9975-20.9950		Black 20.9905-20.9880	0.0040	0.0090			
	Red 20.9950-20.9925		Red 20.9880-20.9855	0.0040	0.0090			
	Green 20.9925-20.9900		Green 20.9855-20.9830	0.0040	0.0090			

Part No. and name (shaft)	Rated size and tolerance	No. and name of mating member (hole)	Rated size and allowance	Tolerated limits				Remarks
				positive allowance		negative allowance		
				min	max.	min.	max.	
66-01238-01 Piston pin (outer diameter)	21-0.010	IMZ-8.106-01027 Connecting rod assy (hole in connecting rod small end	21+0.0095 -0.0005					Out-of-round and taper in connecting rod small end within 0.003
	White 21.0000-20.9975		White 21.0095-21.0070	0.007	0.012			
	Black 20.9975-20.9950		Black 21.0070-21.0045	0.007	0.012			Color indexes are marked on bore of one of pin end faces and on connecting rod stem at small end
	Red 20.9950-20.9925		Red 21.0045-21.0020	0.007	0.012			
	Green 20.9925-20.9900		Green 21.0020-20.9995	0.007	0.012			
Hastings Compression ring (ring height)	1.5-0.03	IIMZ-8.128-01237-30 Piston (groove width)	1.5-0.02	0.01	0.07			
Hastins Oil control piston ring	4-0.03 -0.07	IMZ-8.128-01237-30 Piston(groove width)	4-0.02	0.01	0.07			
72-01234-A Connecting rod small end bushing	23.5+0.145 +0.100	66-01233 Connecting rod	23.5+0.023			0.077	0.145	

Part No. and name (shaft)	Rated size and tolerance	No. and name of mating member (hole)	Rated size and allowance	Tolerated limits				Remarks
				positive allowance		negative allowance		
				min.	max.	min.	max.	
IMZ-8.106-01201/211 Crankshaft journal	40+0.010 -0.006	IMZ-8.106-01202 Cranshaft web	40-0.90 -0.120			0.84	0.130	
IMZ-8.106-01233 Connecting rod (Big end width)	17.2-0.043	IMZ-8.106-01026 Crankshaft assembly, dimension between journal and web	17.4+0.104 -0.05	0.15	0.35			
66-01208 Cage (width)	17-0.17	IMZ-8.106-01233 Connecting rod (width of big end)	17.2-0.035	0.165	0.370			
6601207 Cage	49.7-0.100	IMZ-8.106-01027 Connecting rod, assembly	50+0.018	0.300	0.418			
IMZ-8.106-01201/211 Crank journal	40+0.010 —0.006	6601208 Cage	42+0.17	1.990	2.176		0.028	
IMZ-8.106-01201 Crank front journal	40+0.02 +0.003	5208 Ball bearing	40-0.008				0.003	
IMZ-8.106-01211 Crank journal	40+0.02 +0.003	5208 Ball bearing	40-0.008				0.028 0.003	Out-of-round and taper within 0.01
IMZ-8.106-01201 Crank front journal	30+0.039 +0.025	IMZ-8.106-01229	30+0.023			0.002	0.039	
IMZ-8.106-01136 Front bearing housing	88+0.045 +0.023	IMZ-8.106-01008 Engine crankcase	88+0.033		0.010		0.045	

Part No. and name (shaft)	Rated size and tolerance	No. and name of mating member (hole)	Rated size and allowance	positive allowance		negative allowance		Remarks
				min.	max.	min.	max.	
IMZ-8.106-01141 Rear bearing housing	150±0.014	ИМЗ-8.101-01008 Engine crankcase	150+0.041 - 0.022		0.055		0.036	
5208 Ball bearing	80-0.009	IMZ-8.106-0141 Rear bearing housing	80-0.0012 -0.026			0.003	0.028	
5208 Ball bearing	80-0.009	IMZ-8.106-01136 Front bearing housing	80-0.005 -0.024		0.004		0.024	
IMZ-8.123-01401 Camshaft	22+0.062 +0.039	62-01424 Oil pump drive camshaft gear	22+0.023			0.016	0.062	
IMZ-8.123-01401-01 Camshaft	22+0.062 +0.039	72-01406-01 Camshaft gear	22+0.023			0.016	0.062	
IMZ-8.123-01401-01 Camshaft	22-0.014	72-01107 Camshaft bushing	22+0.105 +0.080	0.080	0.119			
72-01107 Camshaft bushing	26+0.100 +0.55	ИМЗ-8.101-01008 Engine crankcase	26+0.023			0.032	0.100	
IMZ-8.101-01046-01 Tappet	11-0.016 -0.034	6201409-01 Rappet guide	11+0.018	0.016	0.052			

Part No. and *name* (shaft)	Rated size and tolerance	No. and name of mating member (hole)'	Rated size and allowance	Tolerated limits				Remarks
				positive allowance		positive allowance		
				min.	max.	min.	max.	
ИМЗ-8.101-01437 Rock shaft	15-0.032 -0.059	Tappet guide ИМЗ-8.101-01057 Left-hand rocking arm	15+0.027	0.032	0.086			
ИМЗ-8.101-01437 Rock shaft	15-0.032 -0.059	ИМЗ-8.101-01058 Right-hand rocking arm	15+0.027	0.032	0.086			
IMZ-8.106-01507 Valve seat	38.2+0.119 +0.080	ИМЗ-8.101-01502/503 Cylinder head	38+0.050			0.230	0.319	
IMZ-8.106-01524 Intake valve seat	44.2+0.119 +0.080	ИМЗ-8.101-01502/503 Cylinder head	44+0.050			0.230	0.319	
62-01505 Valve guide	14+0.080 +0.063	ИМЗ-8.101-01502/503 Cylinder head	14+0.035	.-		0.028	0.080	
IMZ-8.106-01050 Exhaust valve	8-0.028 -0.050	62-01505 Valve guide	8+0.030	0.028	0.080			
IMZ-8.106-01416 Intake valve	8-0.028 -0.050	62-01505 Valve guide	8+0.030	0.028	0.080			

Table 5

Maximum Tolerated Limits of Wear and Clearances Between Principal Mating Members of the Engine, mm

Name of parts and mated pairs of parts	Maximum tolerances				Measuring point and method
	wear on diameter	out-of-round and taper	diameter clearance	axial clearance	
Crankpin to rollers to connecting rod big end			0.100		
Crankpin	0.050				
Connecting- rod big end	0.050				
Cylinder (face)	0.150	Out-of-round 0.070			In five points (refer to "Repairing the Crank Mechanism" of subsection 2)
Cylinder to piston	—	—	0.200		Measure piston in plane, square to pin axis at point 5 mm from the piston lower edge
Piston pin	0.015				
Hole in piston to fit pin	0.020				
Piston to piston pin			0.010		
Connecting rod small end bush	0.025				
Piston pin to connecting rod small end bush			0.030		
Compression ring (height)	0/050				
Piston groove to piston ring				0.150 (by depth)	
'Piston groove to oil control ring				0.150 (by depth)	
Valve stem	0.120				
Valve guiding bush	0.150				
Valve stem to			0.250		
Guiding bush	0.150				
Rockshaft	0.070				
Rocking arm	0.070				
(aperture)					
Rockshaft to rocking arm			0.120		
Tappet	0.050				
Tappet guide	0.050				
Tappet to tappet			0.100		
guide					

Measure the radial play in the connecting rod big end with the help of indicator by resting the feeler pin on the big end in the centers (Fig. 35).
The radial play should be within 0.10 mm. If otherwise, change the crankshaft. Measure the axial play between the crankshaft cheeks and the connecting rod big end using the feeler; the play should be within 0.20 to 0.34 mm (Fig. 36).
Measure the run-out of crankcase main journals relative to each other in centers using an indicator. The run-out shall be within 0.05 mm (Fig. 37). Should the actual run-out exceed this value; the crankshaft has to be straightened out.
The pointers of both indicators should deviate in the same sense, i. e. positive or negative (Fig. 37, *2* and *3).* If the indicator pointers read different values (Fig. 37, *1*) change the crankshaft.
If the pointers of indicators read the same negative deviation, which exceeds the tolerated value, change the crankshaft.

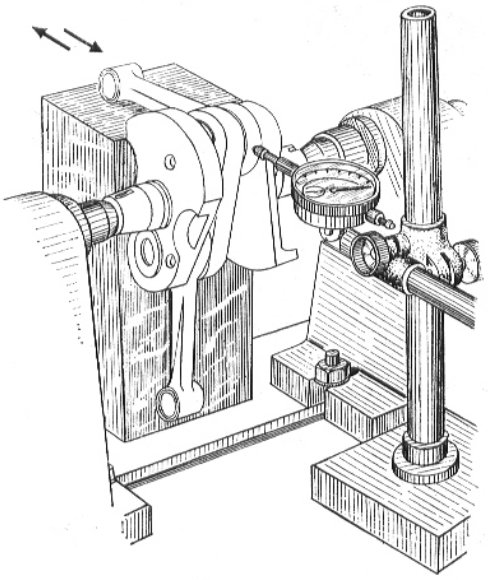

Fig. 35
Measuring the radial play of the connecting rod

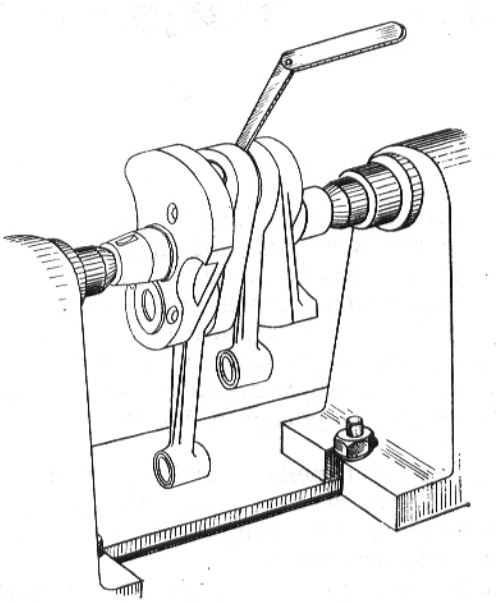

Fig. 36
Measuring the runout of the connecting rod

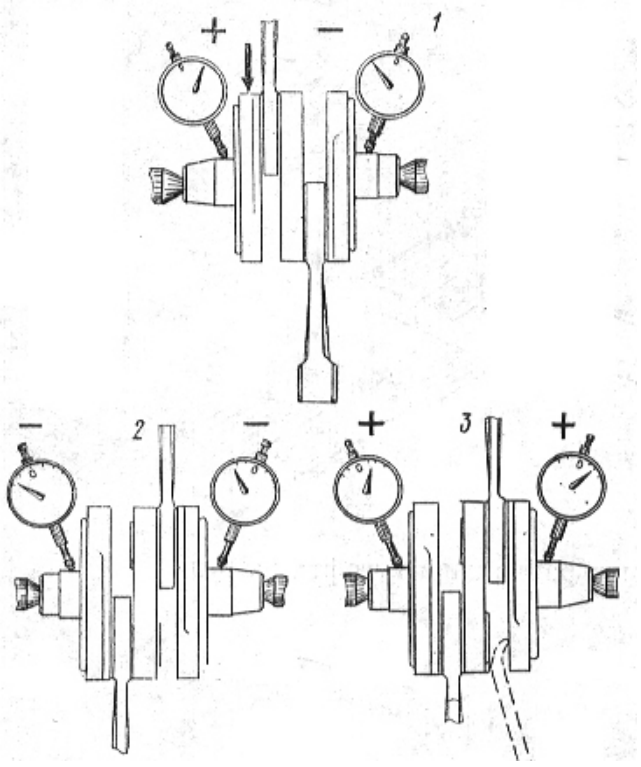

Fig. 37
Measuring the runout of crankshaft necks

Measure the turning of the crankpin in the centers using the indicator. Insert mandrel 457-034 into the connecting rod small ends. Choose the mandrel color to match that of the small end holes. Measurements should be taken in two positions of the crankshaft (Fig 38-39*).* The difference in measurements should not exceed 0.5 mm. If otherwise, the crankshaft should be changed.

Check the connecting rod small ends for proper alignment with the crankshaft axis with simultaneous measuring check of the turning. If the alignment is wrong the mandrel will not enter both holes.

Do not attempt to straighten out the connecting rods, once the crankshaft is assembled.

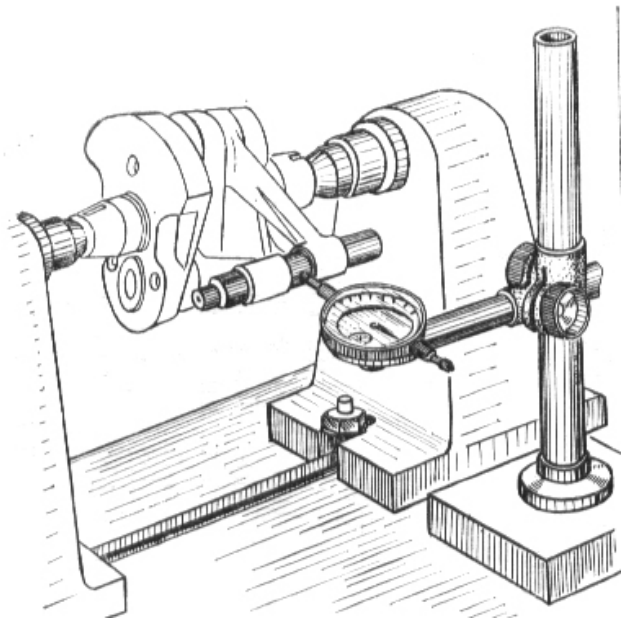

Fig. 38

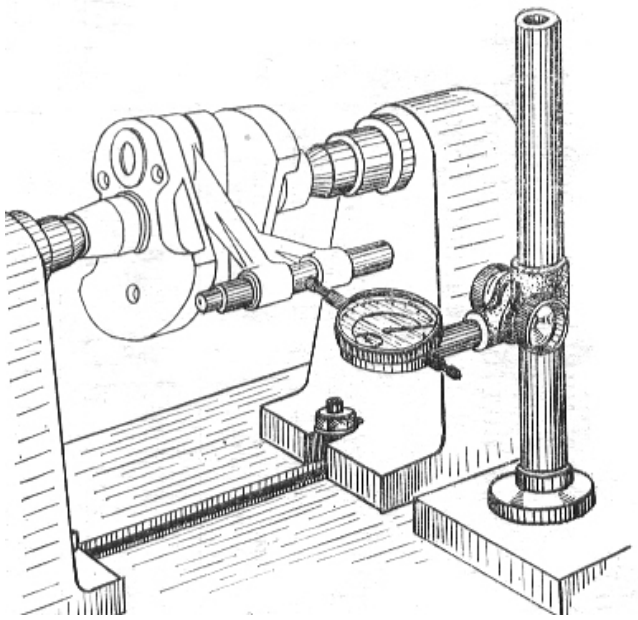

Fig. 39.

Checking the turning of the crankshaft.

Cylinder. The required gauge is:

- Inside caliper with indicator head with the measuring range of 55 to 100 mm and division value 0.01 mm.

Before inspecting and measuring, remove the deposits from the cylinder (top portion) and wash it. Check, whether any cracks are evident (neck and flange), also for tight fit of oil draining tube and the tappet push rod tubes; check, whether any scores are seen on the cylinder face Measure the cylinder bore with the help of the inside caliper in five different sections (points) spaced 9, 16, 64, 74 and 84 mm from the cylinder top plane. Take measurements in two different planes: in the plane of connecting rod travel and in the plane square to the former.

If the cylinder face is out-of-round in excess of 0.07 mm while the taper or wear exceeds 0.15 mm, the cylinder must be replaced. The damaged push rod tubes and the cylinder head fastening studs should be replaced.

If leaks from the oil drain tube are revealed, caulk it to ensure tightness.

Piston rings. Required tools are:

- Micrometer with a spherical pin;
- Feeler gauge.

The normal service life of the piston rings usually exceeds 10,000 km of run, provided that the motorcycle is attended with care. Untimely replacement of piston rings brings about wear of the rings and cylinder walls and will increase formation of carbon in the piston grooves, resulting in an increase of oil consumption due to burning of- oil. The combustion chamber walls get fouled with carbon, the engine loses power while the consumption of fuel rises.

Should oil consumption rise to 250 g per 100 km, check:

- Wear of the cylinder;
- Play of the piston rings in the piston grooves;
- Deposit of carbon and sticky residue in the piston, grooves,. in the slots of oil rings and oil holes in the piston grooves.

Before checking remove deposits thoroughly and wash the piston rings.

Replace the piston rings, if the following faults are diagnosed**:**
Large sections of surfaces not properly embedded to the cylinder, cracks or peeling; lack of resilience of the piston rings proper.
Measure the piston rings:
- In five or six points by their height;
- In the most worn-out points on the ring circumference (radial thickness).

Change the piston ring if its mean height is found to be 0.05 mm less than the minimum size given in Table 4; also in case its radial thickness is over 2.7 mm, or the clearance in the lock, when the piston ring is fitted into the cylinder is more than 1.0 mm.
Prior to fitting the rings of the piston, check clearances between the respective rings belts (piston grooves and rings).
For new compression piston rings and oil rings the clearances should be 0.04 ... 0.08 mm and 0.025-0.065 mm, respectively. If the actual clearance exceeds the top limit given above by 0.03 mm, replace the piston ring.
In the event of removing the cylinder, should only slight wear of its face be obvious, while the total run of the motorcycle amounts to 20,000 km or more, it is advisable to change the rings.
The choice of rings is dependent on the clearance measured in the ends of the new ring fitted into the cylinder wherein the ring will remain for future operation. The normal clearance should not exceed 0.50 mm.

Piston. Before inspecting and measuring,; clean the piston of carbon (especially its head and grooves), then' wash it. Check for scratches, cracks on the piston skirt, the wear or damage of circlips grooves in the hole for fitting the piston pin.
The tolerated wear of the hole should not exceed 0.02 mm. If otherwise, or in case of wear in the piston pinhole, in piston ring grooves, as well as in case of scratches on the piston skirt, replace the piston.
When changing the piston for the first time, and when the cylinder is but highly worn-out and does not require reboring or refacing, select the piston of the normal size to match the actual size of the cylinder (refer to Table 4).
In selecting the size of the piston consider its mass as well, for it will influence the proper balancing of the engine. The difference in the mass of engine pistons should not exceed 4 g.
Weigh the piston together with rings and pin.
The color marking of chosen pistons (on the holes for fitting the piston pin) should be the same as that of the connecting rod small end. The color marking is provided on the bottom surface of one of the piston bosses and on the rod-small end.

This is very important for correct selection of the piston pin.

Piston pin. Inspect the outside surface of the piston pin to reveal scratches, dents, metal (bronze) flashes, and wear in general. Measure the pin on the edges and in the center; the wear should not exceed 0.015 mm of the minimum size of the color-marking group (refer to Table 3).
When changing the crankshaft, the connecting rod small end bush, the piston or its pin, select a new piston pin of respective color marking (on the inside surface of the pin, at one end) to match the marking of the holes of the piston bosses and the connecting rod small end bushing.
To ensure a necessary clearance within one color group, an expert mechanic to the touch usually does the selection of the piston pin to match the hole in the connecting rod small end.
Proper selection of the piston pin is of utmost importance. Selection of new piston pins and connecting rods from adjacent size groups is permissible only in exceptional cases. Select the piston pins to match the connecting rods at an ambient temperature of (20±5) *C.*

Repairing the Valve Timing Mechanism

The following troubles of the engine require repairs of the timing mechanism:
- Loss of compression in the cylinder due to leaky valves, followed by a drop in engine power, increase in the gasoline consumption, and difficulties in starting the engine;
- Increased performance noises of the timing mechanism;
- When dismantling the engine, if any defects in the timing mechanism part are revealed.

Cylinder head. Required tools and fixtures are:
- Tool 345-553 for removing valve springs;
- Indicator with stand;
- Inside caliper with 8 mm indicator head**;**
- Micrometer from 0 to 25 mm;
- Mandrel 345-047-3 for pressing in and out the valve guide bushing;
- Reamer 055-150-3, 8 mm dia., for reaming the valve guide bushing;
- Gauge 403-747 for checking straightness of hole in valve guide bushing;
- Puller with set of tools 345-326-3, 345-570-3 and 061-100-3 for forcing out the valve seat;
- Mandrel for pressing-in the valve seat;
- Tool 345-332-3 to rotate the valve while grinding;
- Set of cutters with mandrel 345-558, 032-106-6, 032-132 for machining the valve seats chamfer.

Inspect all the accessible points in the cylinder head, make sure that there are no damage, cracks, burns in the valves, stripped threads; also check, whether the surfaces of the head-to-cylinder fastening and that of the carburetor are level. In order to inspect the condition of valves, valve guide springs, valve seats and to take the necessary measurements to determine wear, remove the valves.

To remove the valves:
- Fasten the cylinder head on the tool 345-553, fit the lever on the stud securing the cylinder head cover and secure the lever;
- Turning the lever, compress the valve springs and remove the slide blocks (Fig. 40);
- Turn the lever round the stud and remove the side blocks from the other valve;
- Remove the top valve spring retainers, the springs and the valve spring seats;
- Free the cylinder head from the tool and remove the valves.

Clean thoroughly the removed parts of carbon, tar, etc., wash them and inspect.

While inspecting the valves, check:
- The clearance between the valve stem and the guide;
- Wear of the valve stem
- Condition of the valve head seating chamfer.

While inspecting the cylinder head, check:
- Wear of the guide bushing;
- Wear of the valve seat.

Check also resilience of the spring and its height in free state-Measure the side play between the valve stem and the guide-bushing with the help of an indicator, the feeler pin of which should rest against the valve stem end (Fig. 41) moved 4 mm out of the seat.

The clearance) should not exceed 0.25 mm (the indicator reads 0.32 mm). In case the clearance exceeds the tolerated value, replace the valve (or both parts). For this purpose measure the diameter of the valve stem and the guide bushing at a distance of 5 mm from the upper and lower edges of working surfaces. If the wear of the valve stem exceeds 0.12 mm, replace the valve if the wear of the guide bushing exceeds 0.15 mm.

Fig. 40.
Removing the valve springs

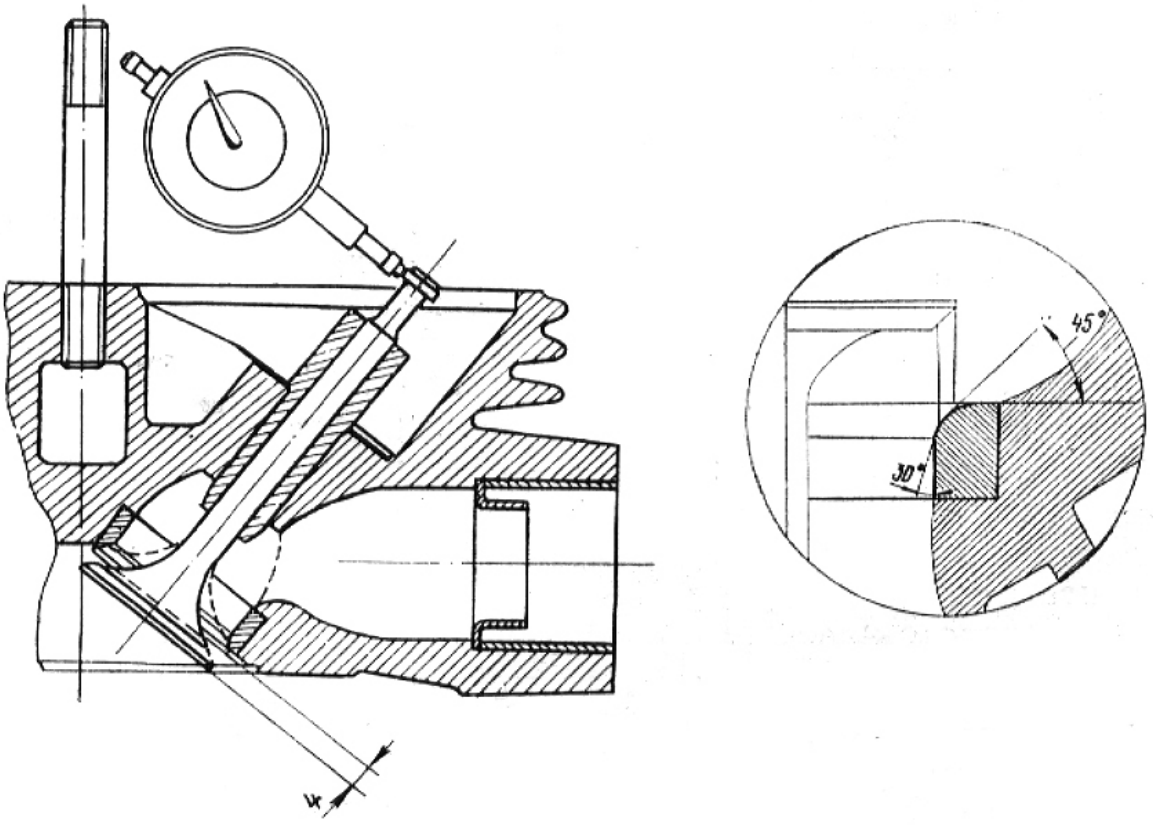

Fig. 41.
Measuring the side play between the valve and bush guide

Substitute the bushing proceeding as follows:
- Remove the deposits from the guide bushing (including the shaft);
- Fasten the cylinder head in the vice, insert mandrel 345-047-3 and press off the valve guide bushing;
- Check the condition of the hole in which the guide bushing is to be fitted, heat the head to 200 °C and having fitted the guide bushing on the mandrel 345-047-3, press the bushing in place, provide a clearance of 20 mm from the thrust plane of the spring bottom washer to the bushing edge;
- ream the hole in the guide bushing with the help of reamer 055-150-3 to 8.00-8.03 mm dia. and check the hole for straight-ness using dia. 7.98 mm gauge 403-747.

Having repaired the guide bushing, **be sure** to check the valve seat chamfer concentricity, and, if need be, to grind or machine the valve seat chamfer with the help of a cutter.
Remember that the compression, power, and fuel consumption of the engine depends to a great extent on the condition of valve head chamfers and valve seats.
If the seats and heads of the valve have a lot of deposits, but their wear is insignificant, while the seating of valve is around the entire surface and the seating fillet is within 1.5 to 1.8 mm, proceed only with cleaning and grinding the working chamfers of the valve and the seat.
If, however, various defects of the working surfaces of the valves and their seats are detected (friction marks, pitting, burns or other damage), remove them by grinding the chamfers on the seat and the valve head.
Use a special-type lathe with a centering chuck to fit the valve stem for the purpose. In grinding take off as little metal as required to remedy black spots, pits and other defects on the valve head chamfer. The cylindrical bead on the valve head should be at least 1 mm thick; In case of considerable deformation or cracks on the valve head, replace the valve. Use a set of cutters 032-106-6 or 032-132 with mandrel 345-558 for grinding the valve seats. When cutting take off the minimum amount of metal necessary for removing all the defects on the valve seat chamfer.
With misalignment of the seat chamfer, check the width and layout of the latter relative to the valve head chamfer surface. To this end, coat the valve seat chamfer with a thin layer of paint (Berlin blue) and fit a respective valve, turning it so as to press the valve head against the seat. The valve fit is considered normal, when the paint fillet thus formed on the valve head is positioned in the center of the chamfer and its width is within 1.5 to 1.8 mm. If otherwise, correct the seat chamfer using a grinding stone or cutters fitted at an angle of 30 and 45° (Fig. 41).
If the valve seat is worn out, or has other defects, which cannot be corrected by grinding, change the valve seat as follows:
- Using the set of tools 345-326-3, 345-570-3 and 061-100-3 thread the valve seat bore, heat the cylinder head to 200 °C, screw in the puller and press out the valve seat (Fig. 42);
- Heat the cylinder head again and use the mandrel to press in a new valve seat.

Finally machine the valve seat as prescribed above. After grinding the cylinder head and the valve seat, grind their working chamfers. Grind in the valve to cylinder head seat as follows:
- fit a spring on the valve stem (the spring size should ensure raising of the valve head 3-6 mm over the seat);
- coat the valve head chamfer with a thin film of grinding compound, insert the valve with a hold-off spring into the guide bushing, and fit tool 345-332-3 for turning the valve on the valve stem end;
- rotate the valve with the help of this tool in both directions in order to ensure rotation of the valve in either direction. While turning the valve, press it from time to time to the seat.

Grind in the valve to the seat accurately, taking off a minimum amount of metal from the working chamfers to prolong the service life of the valve. Towards the end of grinding process reduce gradually the amount of grinding compound and at the end perform grinding using clean oil only.

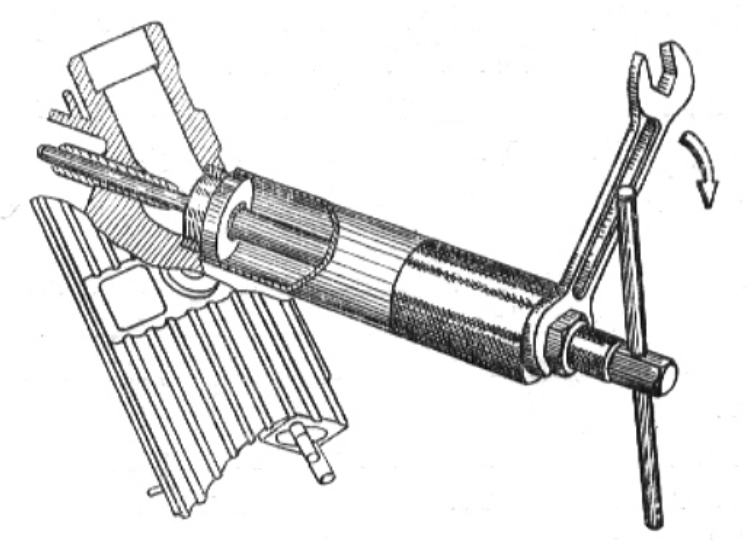

Fig. 42.
Pressing the valve seat out

Once a uniform dull-gray color (with no black spots) is obtained on the working surfaces of the valve and the seat, the grinding is considered satisfactory.
After the grinding-in, wash the valves, the seats, the guide bushings, the neck and the cylinder head combustion chamber to remove all the traces of the grinding compound, then wipe dry.
Check for tight bit of the valves by reinstalling them and pressing the valve heads to the seats, pour kerosene alternately into the intake and the exhaust ducts of the cylinder head. There should be no seepage of kerosene for at least one minute. If otherwise, proceed with a more thorough grinding-in.
Check the valve springs for squareness of their supporting surfaces and resilience, also their length in free state in accordance with the data given in Table 6.

Having completed the checks, measurements and repair, reinstall the valves by reversing the sequence of operations; use graphite grease to lubricate the valve stems prior to fitting them in place.

Valve drive rocking arms.

Required tools are:
- Micrometer up to 25 mm;
- Inside caliper with indicator (measuring range 10-18 mm and 0.01 mm scale division).

Mark the rocking arms, the rockshafts and the brackets, prior to removing them off the cylinder head, so as to reinstall them in proper places. To dismantle, press the rockshaft off the brackets.
Having disassembled the valve; rocking arms, wash parts, inspect, and take necessary measurements.

Table 6

Sizes of Valve Springs

Part No.	Part name	Diameter of wire, mm	Length of spring in free state, mm	Resilience of spring
62-01419-01	Valve spring, outer	4	43	When compressed to 34 mm P=45... 168 N When compressed to 25.75 mm P=296 ... 343 N
62-01420-01	Valve spring, inner	3	39	When compressed to 30.5 mm P=96.5... 111 N When compressed to 22 mm P=207...253 N

Fig. 43.
Left hand and right hand rocking arms assemblies

Check the rockshaft and the rocking armhole for cracks, dents, scores, check wear of the rockshaft and the bores of the rocking arms. If the wear of shafts or bores in the rocking arms exceeds 0.07 mm, replace the defective parts.
If the wear of bushings exceeds the rated values, replace the bushings and having pressed the new ones in, ream them to the size of 15.000-15.027 mm.
Reassemble the right-hand arm as follows:
- Dip the arm shaft into the oil so that the oil covers the distance to the flat.
- Insert the RH bracket with its hole of 13.1 mm down
- Insert the arm into the RH bracket the way that the bigger shoulder of it is closer to the hole of 13.1 mm
- Fit the spring washer between the bracket and the upper face of the arm.
- Fit the mandrel between into the hole of RH arm and spring washer.
- Having matched the shaft recess of the shaft with the hole in the bracket fit the shaft onto the chamfer of the RH bracket and press it in.
- Oil the screw with Locktite and screw it into the bracket.

Reassemble the left-hand rocking arm in the same manner as described above, but position the brackets as indicated in Fig. 43.
If the adjusting bolt has been turned out of the rocking arm, reinstall it and drive in to the limit, then fit a lock nut.
Push rods. Remove the push rods, inspect, and check its ends to reveal wear, possible damage; see whether the rod is straight. If the ends are worn-out substitute the push rod.
In exceptional cases, if the rod is bent but slightly, straighten it out on a check plate by striking lightly with a hammer against the push rod stem through a mandrel made of some soft metal. Use a 0.2 mm feeler to check; it should be nipped between the push rod and the check plate.

Tappets. Wash and inspect the removed tappets and their guides. Change tappets with such defects as scores on the tappet end faces, which contact the cams (camshaft), pitting on the surface due to wear, cracks in the points where the tips are pressed-in Also replace tappet tips, if the inner spherical surface which contacts the sphere of the push rod is worn-out.
The clearance between the tappet end and its guide should be within 0.10 mm. In case of excessive clearance, change the tappet or its guide depending on the wear of the respective part.

Timing drive gears. The required tool is puller 345-659-3 for removing and forcing in the timing gear on the camshaft.
Remember that abnormal noises of the timing drive gearing are usually due to wear of the teeth and, subsequently, an increased backlash or irregular lubrication of gears.
Check the backlash when dismantling the engine or when replacing the gears. Refer to Section "Removing and Reinstalling the Camshaft" for the method of measuring the backlash.
The backlash in a new engine should be within 0.01 to 0.12 mm. Clearance variation in a pair of gears should not exceed 0.05 mm as measured at every tooth.
The maximum clearance in service should not exceed 0.30 mm. In case of an increased clearance, replace the gears. Run-out and end play of the gears should be within 0.04 mm.
Replacement of a single gear is not allowed. Replace both gears at a time, as a gear couple is teamed (by the sound of their running) at the Manufacturing Works. To obtain correct backlash of the gears, they should be selected to center distance between the crankshaft and the camshaft according to Table 7.

Table 7

Gear Set Selection

crank case group	0	1	2	3	4	5
Gear set	13 - 18	12 - 17	11 - 16	10 - 15	9 - 14	8 - 13

Note: Crank case group index is stamped on the upper crank case surface to the right of the generator, while set indices are traced on the gear faces electrographically.

When inspecting the gears, both used and new ones, pay special attention to the condition of their teeth faces, as even slight burrs and dents on a tooth will lead to noisy performance of the gearing. Remedy by filing the burrs and dents properly.
Information for removing the crankshaft gear is given in the Removing and Reinstalling the Crankshaft. To remove the camshaft driven gear in order to replace it, use the gear puller 345-659-3.
Camshaft. The required tools are micrometers graduated from 0 to 25 mm and from 25 to 50 mm. Wash the camshaft, wipe it dry, and inspect. Replace the camshaft, if scores, pitting or wear of its cams are revealed. The permissible wear of the rear journal should not exceed 0.04 mm.
Check the condition of the ball bearing and the camshaft front end; if any defects are revealed, change the bearing.

Repairing the Lubrication System

Check and repair, if necessary, the lubrication system, when overhauling the engine and when the engine lubrication is insufficient.
Oil pump. Wash thoroughly the oil pump removed from the engine crankcase by submerging the oil pump casing into kerosene and rotating the oil pump driving gear shank. In a properly washed pump the gearing should rotate easily without seizing.
Having washed the pump, check its performance. In case of seizing, dismantle the pump and inspect it. Replace all the defective parts and reassemble the pump.
Check the pump assembled after the inspection and repair (refer to Removing and Reinstalling the Oil Pump)

Oil lines. In the course of total of partial dismantling of the engine, especially when reassembling, pay attention to correct mating of the oil ducts and clean them properly. Also see that the gaskets in the joint planes do not overlap the holes, the joints are tight with no leaks of oil.

In the event of total dismantling of the engine, check to reveal porous spots and pitting in the oil line of the engine crankcase, and to this end:

- Close with rubber plugs the holes through which oil is fed to the left-hand cylinder, to the housings of front and rear bearings, and to the hole in the duct on the pump fastening plane; use a hose to feed water under a pressure of 1 m w. g.;
- Inspect all the oil lines, checking them for leaks of water;
- If leakage is revealed, remedy by caulking the leaky points. Having completed the tightness check, remove the plugs; water should flow out of the holes easily, thus pointing to the cleanliness of ducts.

Inspect the oil filter. In case of damage, heavy contamination or the expiry of service life, change the filter.

Repairing the Engine Crankcase and Covers

In the course of an overhaul or partial dismantling of the engine, check the condition of the crankcase and the engine covers. When inspecting pay attention to:

- Cracks or other damages;
- Dents, burrs, etc. from the gaskets formerly installed, grit on the planes of joints;
- Worn-out spots on fitting planes (especially in the points where the bearing is fitted);
- Loose studs, stripped thread;
- Untightness of flaring or pressing-in of pipes;
- Wear of the camshaft rear bearing (bushing);
- Scores of the oil pump drive bushing;
- Wear and scores in the holes for the breather on the gearbox cover.

Eliminate the detected troubles if possible or change the defective parts. Also check the condition of removed bearings and change them, if worn-out.

Repairing the Clutch Mechanism

The required tools and fixtures are blades for checking the balancing of the flywheel.

Having dismantled the clutch, wash its parts and check:

- Condition; of the working surfaces of the clutch plates (scores, dents);
- Condition of splines in the hub of the driven plates;
- Riveting of clutch driven disk hubs;
- Wear of parts of the clutch;
- Resilience of springs.
- Condition of toothed crown of the flywheel. When cracks or broken teeth, or excessive wear-out are found replace the crown.

If scores or dents on the driven plates, or excessive wear-out are evident, change the clutch plates. If riveting shows loosed jump the week point.

The unloaded clutch springs are 43 mm long. The clutch springs should be of the same color marking. The springs are marked out, at the Manufacturing Works. When compressed up to 21 mm, the color marking on the spring ends should correspond to the following loads, N:

Gray ……..170...186

Black……..157...170

3. ADJUSTMENT AND RUNNING-IN OF THE ENGINE AFTER REPAIRS

After repairs and reassembly, adjust and run in the engine in order to check the quality, of repair work and assembly and ensure the embedding of its friction parts. A special test stand with forced air cooling should be employed for running-in.
Prior to installing the engine on the stand, adjust the gaps in:
- Ignition system;
- Spark plugs;
- Valve timing mechanism.

To check the gap in the spark plugs undo them from the cylinder heads. The gap must be in the range of 0.9-1.0 mm. When required bend the side electrode to have the right gap.
To check and adjust the clearances in the valve timing mechanism:
- Remove the cylinder head covers and check head torque;
- Turn the crankshaft by means of the kick-starter. By the beginning of the intake valve closing, adjust clearance of the exhaust valve and by the beginning of the exhaust valve opening, adjust clearance of the intake valve. Check the clearance between the big end of the rocking arm and the valve stem. If it is more or less than 0.1-0.15 mm, loosen the locknut and by screwing in or out the adjusting bolt, set the required clearance checking it with a feeler.

After that, lock the adjusting bolt by means of the lock nut. Adjust clearances in the valve timing mechanism of the other cylinder in| the similar order. After the adjustment, lubricate the rockshafts through the central holes and close the heads with covers. In order to run in the engine, reinstall the gearbox; set the engine on the stand and perform all the necessary connections (header pipes, gasoline feeding pipes, ignition wiring, etc.).
Prime the engine and the gearbox before running in.

Table 8

Running-in Schedule

Schedule	Rotational speed. Min^{-1}	Running time, min	Gear engaged	Load, kg
Cold running (from an external prime mover)	850	15	IV	
Hot running	600... 750 2500	5 25	— IV	Idle running 3,.5

After the cold running-in, drain oil out of the sump, flush the engine with clean oil and refill. Replace the oil filter as well.
When starting the engine idle, adjust the carburetors as follows.
Start and warm-up the engine, as the adjustment performed on a cold engine will be disturbed, once the engine gets warm.
Adjustment of idle run at low speed is of great importance, as idle run system functions both under low and high loads of the engine.
Check the carburetor operation for the same speed of rotation at idle run when one of the cylinders is working.
Do it in the following manner.
Start up the warm engine with carburetor prior adjusted using a vacuum meter. When difference in rotational speed is shown adjust carburetor additionally by screwing in or out the throttle adjustment screw. Get the proper rotational speed of the engine.
Check if sharp opening and shutting of the throttles select the rotational speed of idle run correctly. If the engine at sharp opening of the throttle cuts out or accelerates slowly, enrich the mixture by insignificant screwing of the idle run screw. If the engine cuts out at sharp shutting of the throttle, the mixture should be leaned by unscrewing of the idle run screw.

Adjust the carburetors for in-step operation of engine cylinders as follows:
- Start the engine and set a speed of 1,500 to 1,800 min;
- By cutting off alternately each cylinder determine by ear whether both cylinders ensure the same speed. Adjust the engine speed to be the same to each cylinder.

Turning in or off the cable sheath guides altering the throttle valves lift performs the adjustment of carburetors.

After completing the adjustment, lock the control cable sheath guides.

With the throttle valves fully lowered there should be a clearance within 2-3 mm between the cable sheaths and the sheath guides, almost; the same for the right- and left-hand carburetors.

Having adjusted the carburetors for in-step operation, lock the guides in place.

Adjustment of the mixture composition under partial load duties is performed by shifting of the throttle-metering needle in relation to the lath and is described in detail in the motorcycle service Manual.

In the course of running-in, check to reveal:
- Oil leaks in the joints;
- Abnormal noises;
- Local heating of parts.
- The engine performance at different speeds and loads.

Remedy all the detected troubles at once.

V
REPAIRING THE GEARBOX

1. DISMANTLING AND REASSEMBLING THE GEARBOX

Removing and Reinstalling the Clutch Release Mechanism
(with the gearbox removed from the motorcycle)
To remove the clutch release mechanism (Fig. 44):
- Remove the clutch release arm (Fig.44, Pos.1);
- By pressing on the front end] of the clutch release rod (Fig.44, Pos.2), remove the clutch release slider, the thrust ball bearing, the rod tip and finally the clutch release rod.
Wash, the disassembled parts and inspect them, change faulty parts, if necessary.
Reinstall the clutch release mechanism in the following sequence:
- Fit the clutch release rod into its tip, and then insert the rod into the hollow in the clutch shaft;
- Smear the thrust ball bearing with grease and fit it in place;
- Fit home the clutch release slider exercising care not to damage the slider rubber ring against the edge of the gear case;
- Fit the clutch release arm and lock it with a cotter pin.

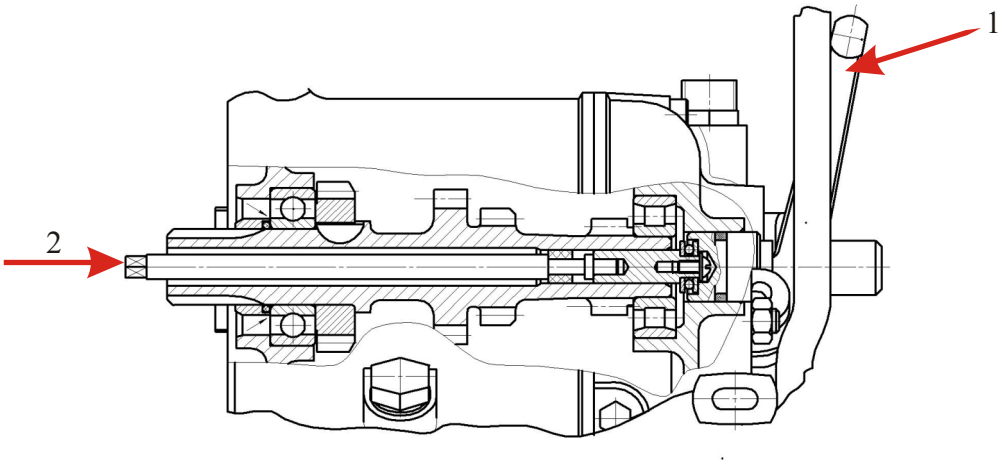

Fig. 44 Removing the Clutch Release Mechanism

Removing and Reinstalling the Speedometer Drive
Remove the speedometer drive as follows:
- Undo the bolt of the drive bushing and remove the thrust bushing (Fig.45, Pos.1);
- Rotating the main shaft counter-clockwise (as viewed from the flexible coupling flange end), remove the driven gear of the speedometer drive (Fig.45, Pos.2);
- Uncotter the castellated nut of the main shaft, undo the nut and remove the washer and driving flange of the propeller shaft flexible coupling using tool 346-710 (Fig. 47).
Wash and inspect the removed parts. Should any of the teeth show wear, replace the gearing.
Reassemble the speedometer drive in reverse sequence. Before reinstalling the driven gear, lubricate its face and teeth with grease LITOL –24.

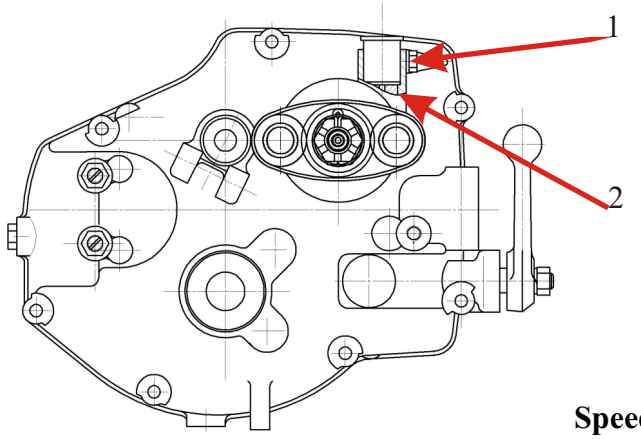

Fig. 45
Speedometer drive

Removing the Gear Shift Mechanism

The gearshift mechanism consists of the following assembly units and parts:

- Gear change foot pedal mechanism;
- Switch quadrant with a shaft;
- Reverse gear engagement mechanism with lever;
- Gearshift forks;
- Bracket with an intermediate gear.

Tool required are the crank handle 346-403 for turning the clutch shaft and 346-710 to remove the flexible coupling plate.

To remove the gear shift mechanism:

- Unscrew the drain plug and drain oil out of the gear case;
- Remove the clutch release mechanism;
- Undo the nut of the kick-starter lever wedge, knock out the wedge with an aluminum hammer, and remove the lever (Fig.46, Pos. 1);
- Remove the flexible coupling plate (Fig.47);
- Turn off seven bolts fastening the gear case cover (Fig.46, Pos.2);
- Hammer slightly the clutch shaft end and the cover projections to force the shafts together with the cover out of the gear case;
- Having unbent the lock washer undo the bolt fastening the reverse gear shift fork, remove the fork;
- Take the axle and bracket with an intermediate gear out of the cover;
- Take the kick-starter shaft together with the gear out of the cover;
- Remove the forks shaft shafts.
- Press out the clutch and main shafts from the gear case cover by hammering slightly against their end faces;

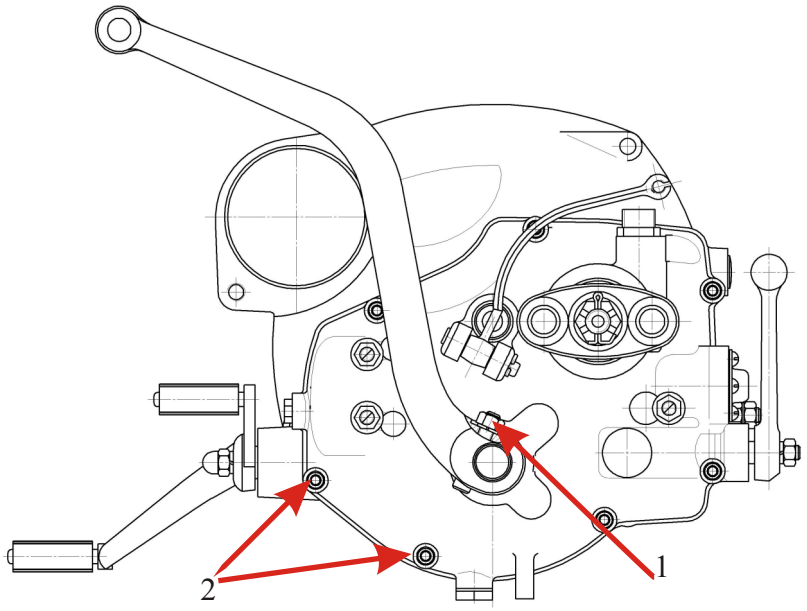

Fig.46

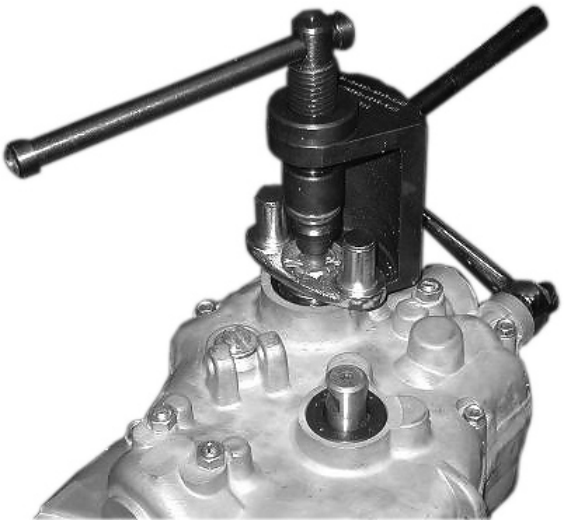

Fig. 47.
Removing the flexible coupling plate

- Undo the bolts of right hand cover and force out the right-hand cover with the seal;
- Turn off the adjusting screws of the gear shift mechanism;
- Remove the lock ring of the quadrant shaft, shim and intermediate bushing.
- Remove the stop of the return spring;
- Remove the quadrant shaft and gear shift mechanism;
- Undo the nut and remove the reverse gear engagement lever from the axle;
- Remove the reverse gear engagement quadrant with a shaft and spring.

The mechanism thus removed should be washed and examined. If any damage or defects are revealed, disassemble it, repair and reassemble.

Reassembly of the Gear Case Cover

To reassemble the gear shift mechanism:

- Place home the gear case cover with the split joint upwards (Fig.48);
- Set the return spring of the gear shift mechanism by driving the spring ends behind the stop;
- Set the quadrant shaft with its short end into the hole in the right hand cover.
- Put intermediate bushing, and locking ring onto the shaft. Set shims between the quadrant and the bushing to provide required clearance. The clearance should be 0.1-0.4 mm.
- Fasten the ratchet bracket with bolts and lock them with wires.
- Screw in the return spring stop, the cylindrical end of the stop should locate between spring ends.
- Screw in the adjusting screws.
- Set the spring onto the reverse gear quadrant.
- Insert the quadrant shaft into the gear case cover hole.
- Set the reverse gear shift lever onto the shaft splines and fix it.

Fig. 48.
Gear case cover.

To reinstall the gearbox shafts:

- Set the clutch shaft and main shaft into the cover bringing their teeth in mesh (Fig. 49);
- Put bearing 304 onto the main shaft (Fig. 50)
- Mount the shift forks, bring the fork lugs into the coupling slots, set the forks in neutral position and insert their pins onto the quadrant slots (Fig. 51, Pos.1);
- Mount the fork shaft (Fig.51, Pos. 2).

Fig. 49.
Shafts mounting

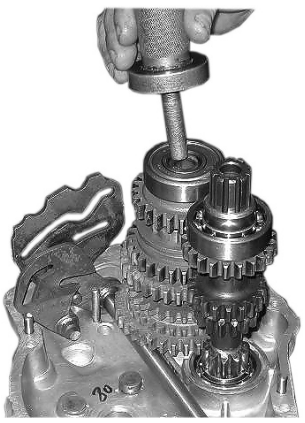

Fig. 50.
Installing bearing 304

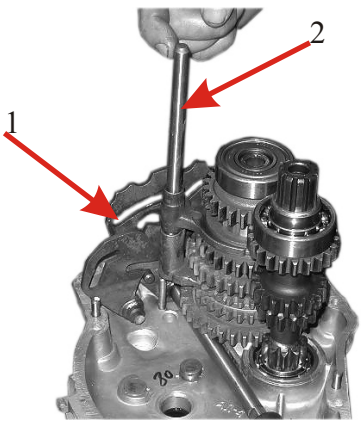

Fig. 51.
Setting the shift forks.

- Fit the kick-starter shaft with gears into the cover bringing the gears in mesh (Fig. 52);
- Set the bracket with intermediate gear;
- Having the reverse gear quadrant pressed out insert the bracket shaft into the cover hole (Fig. 53)
- Set the reverse gear shift fork and insert its lugs into coupling slots of the coupling gear, bolt it and lock with the tab washer.
- Insert the spring of the kick-starter shaft (Fig. 54)

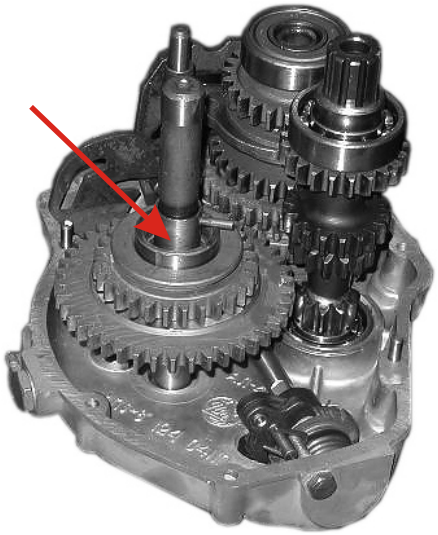

Fig. 52
Mounting the kick-starter shaft

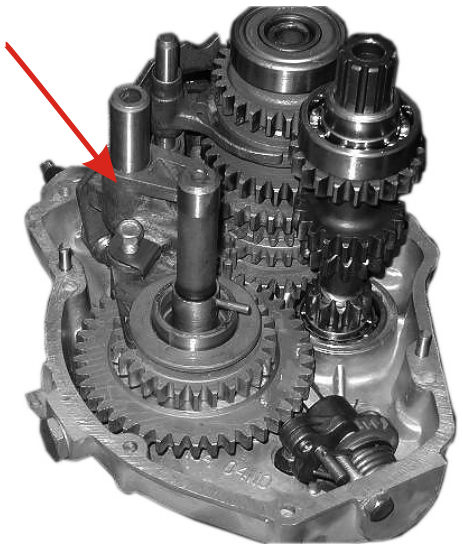

Fig. 53
Mounting the intermediate gear

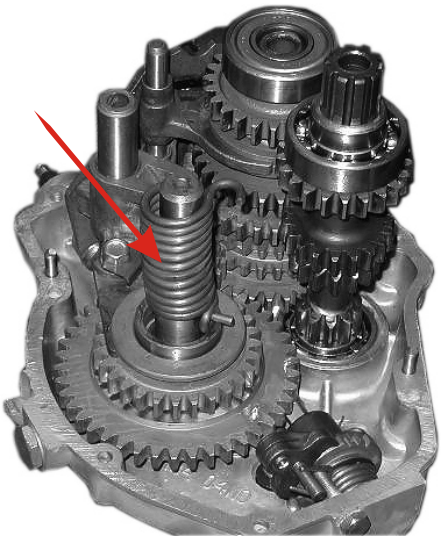

Fig. 54
Mounting the kick-starter gear.

Reassembly of Cover with Gear Case

The tools required for reassembly are: mandrel 346-298 for pressing the gear case on the cover with shafts, and spanner 36X41.

For reassembly:

- Install the cover with shafts, with the joint face upwards;
- Coat the joint faces with Locktite
- Set the shims into the blind hole in the crankcase and grease them (Fig. 55);
- Set the pin of mandrel 346-298 in the clutch shaft seal;
- Place the gear case on the clutch shaft bearing, the main shaft on the fork shaft and bracket shaft aligning the cylindrical pin with a bracket slot;
- Align the slot of the gear change foot pedal with the crank pin; by striking slightly with an aluminum hammer fit the gear case on the bearings, then press the gear case on the press making use of mandrel 346-298;

Fig. 55
Setting the shims

Fig. 56
Setting the gear case

- Set and tighten up seven bolts fastening the gear case cover, the tightening torque being 6.4-7.8 Nm
- Having turned the shaft for about 120 degrees anticlockwise by a wrench and sunk it in axial direction to 8 mm minimum cock spring of the kick-starter and free the shaft. The shaft should get out of the cover and lock (Fig.57).
- Set the gearshift sleeves in the neutral position by turning the reverse gear shift lever backwards and check the shafts for ease of rotation;
- Fails the clutch shaft rotate easily, jump it into the hole for the slider, same with the main shaft on the flexible coupling plate using mandrels (Fig.58 and 59).
- Check operation of starter mechanism and its spring.

The tolerable axial movement of the starter shaft is 1.0 mm.

- Press the plate onto the splines using device 345-943, fasten and splint (Fig. 60).
- Set the kick-starter lever, put distance washer onto the starter shaft, insert fastening wedge knocking it with a aluminum hammer and tighten. The torque is 15.7-19.6 Nm.

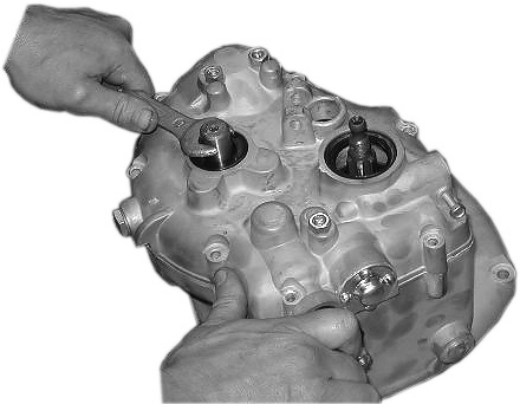

Fig.57

Fig.58

Fig.59

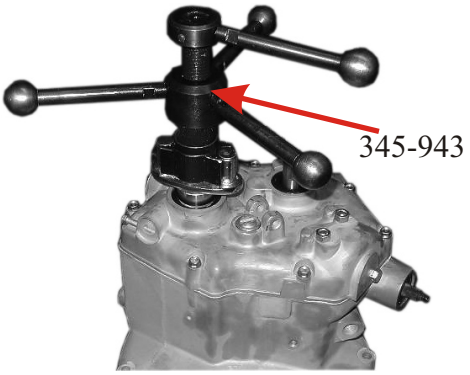

Fig.60

For reassembly of the speedometer drive and clutch release mechanism refer to relevant sections of this manual.

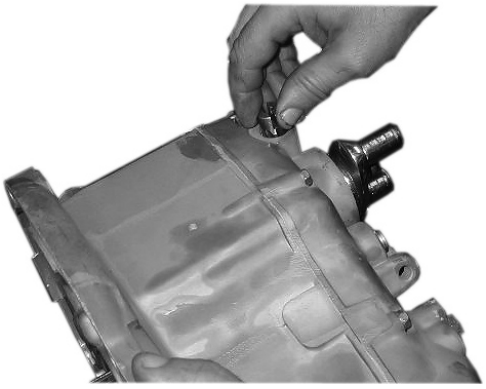

Fig. 61.
Mounting the driven gear of the speedometer drive

Fig. 62.
Setting the thrust bushing.

After full disassembly of the gearbox or repair of the gearshift mechanism, adjust the latter by turning the clutch shaft with a special crank handle 346-403 (Fig. 63).

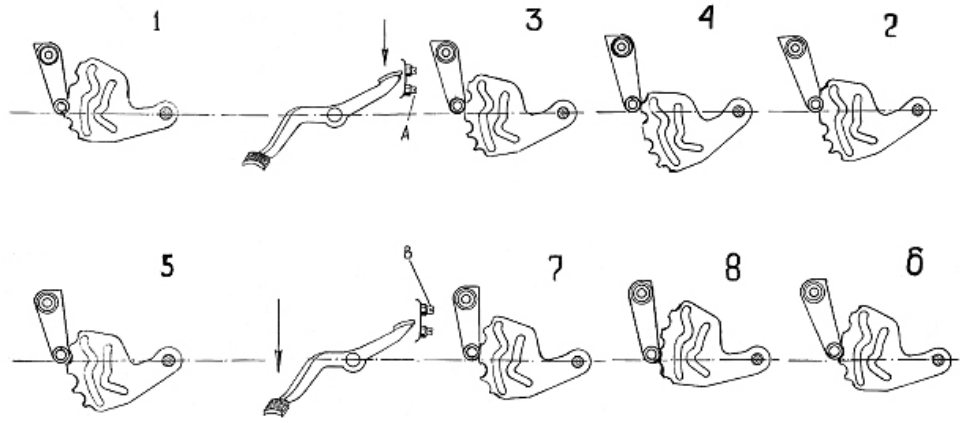

Fig.63

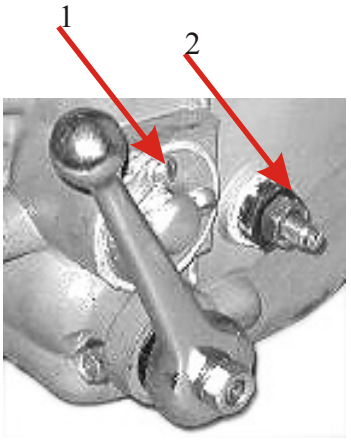

Fig.64

To adjust proceed as follows (Fig. 63):
- Undo four screws Mx5 and remove the right hand cover of the gearbox, covering the shaft of the quadrant.
- Screw in one of the M5 screws with flat washer to fix the bushing of quadrant shaft.

To adjust the lower stop "A" limiting the turn of the quadrant when up-shifting (acceleration), proceed as follows (see Fig. 63):

- Depressing the upper arm of the pedal, engage the quadrant in the position of II gear, the retaining roller should fully get into the flute on the quadrant and lock it in the Pos. 1 (Fig. 63) by means of the spring(Fig.63).
- Depressing the pedal once again, engages the III gear.
- When the lower stop is adjusted correctly the quadrant turns to required angle and locks again in Pos.2 (Fig. 63)

When the stop is maladjusted the roller after turn would not get into flute, Pos. 3 and 4 (Fig. 63). It can be easily found by turning the projecting end of the quadrant this or that way using 10-mm wrench.

To adjust the upper stop "B" limiting the turn of the quadrant when down-shifting (deceleration), proceed as follows:

- Depressing the lower arm of the pedal, shift the quadrant from III gear to II gear, Pos. 5 (Fig.63)
- Check the quadrant shaft for soundness of locking of the roller in the flute of the quadrant, using 10-mm wrench. When it is not locked properly, the stop is maladjusted, Pos. 7 and 8 (Fig. 63)

Note: The gearshift mechanism is factory-adjusted. This operation requires skills and should be proceeded only when major repair or replacements of parts of gear shift mechanism. Should a gear disengage spontaneously the stops should not be readjusted, as in such a case that very pinion of the main shaft calls for replacement, whose gear is involved in spontaneous disengagement.

Adjustment of the position of the neutral gear pick-up.

During operation of the gearbox the position of neutral gear pick-up may be disturbed. Do the following:

- Shift the gear shift mechanism to neutral position
- Slacken the wire terminal fastening nut and pick-up screw-locking nut (Fig.64, Pos.2).
- Switch the ignition on, and turning the pick-up screw in or out, make the green tell-tale on the dash board go on, having checked the circuit of the tell-tale before.

Lock the screw and with the nut and secure the pick-up lead terminal.

2. REPAIRING THE GEARBOX ASSEMBLY UNITS AND PARTS

When repairing the assembly units and parts of the gearbox, pay special attention to providing the clearances (positive and negative allowances), keeping in line with values set by the Manufacturing Works and stipulated in Table 9.

Table 10 gives the tolerated limits of clearances due to wear in the principal mated parts, which will help to evaluate fitness of separate parts for further service.

Table 9

Nominal Sizes, Positive and Negative Allowances Between the Principal Mating Members of the Gearbox, mm

Part No. and name (shaft)	Nominal size and tolerance	No. and name of mating member (hole)	Nominal size and tolerance	Tolerated limits			
				positive allowance		negative allowance	
				min.	max.	min.	max.
IMZ-8.103-04201-10 Clutch shaft	25+0.017 +0.002	205 Ball bearing	25+0.003 -0.013		0.001		0.030
62-04201 Clutch shaft	20-0.017 -0.002	12204 Roller bearing	20+0.003 -0.013	0.007		0.036	
ИМЗ-8.103-04326 Main shaft (front bearing)	20+0.017 +0.002	304 Ball bearing	20+0.003 -0.013		0.001		0.030
ИМЗ-8.103-04326 Main shaft (rear bearing)	20- 0.007 - 0.020	304 Ball bearing	20+0.003 -0.013		0.023		0.006
205 Ball bearing	52+0.004 -0.017	ИМЗ-8.103-04101 Gear case	52+0.008 -0.023		0.025		0.027
304 Ball bearing	52+0.004 -0.017	ИМЗ-8.103-04101 Gear case	52+0.008 -0.023		0.025		0.027
12204 Roller bearing	47+0.003 -0.014	ИМЗ-8.103-04110 Gear case cover	47-0.020 -0.047			0.006	0.050
IMZ-8.103-04201-10 Clutch shaft	25+0.017 +0.002	7204208-01 Clutch shaft sleeve	25- 0.016 -0.039			0.018	0.056
IMZ-8.103-04201-10 Clutch shaft	25+0.017 +0.002	ИМЗ-8.101-04202 Clutch shaft IV gear	25-0.016 -0.030			0.008	0.047
ИМЗ-8.101-04307 Gear shift fork shaft	10+0.025 +0.010	ИМЗ-8.103-04304/6204306 Gear shift forks	10+0.150 +0.050	0.025	0.140		

Part No. and name (shaft)	Nominal size and tolerance	No. and name of mating member (hole)	Nominal size and tolerance	Tolerated limits			
				positive allowance		negative allowance	
IMZ-8.101-04307 Gear shift fork shaft	10+0.025 -0.010	IMZ-8.103-04101 Gear case	10+0.025 +0.010	0.000	0.129		
IMZ-8.101-04307 Gear shift fork shaft	10+0.025 -0.010	IMZ-8.103-04110 Gear case cover	10+0.150 -0.050	0.025	0.140		
IMZ-8.103-04236-10 Main shaft	26-0.040 -0.070	62-04211, 62-04212, 62-04213 Main shaft gears	26+0.033	0.040	0.106		
6204306 Gear shift fork	6 -0.160 -0.240	IMZ-8.103-04222 Gear engaging sleeve	6+0.160	0.160	0.400		
6204306 Gear shift fork	8-0.100 -0.200	IMZ-8.103-04301 Gear shift quadrant	8+0.200	0.100	0.400		
IMZ-8.103-04401 Kick-starter shaft	18-0 .016 -0.033	IMZ-8.103-04042-10 Kick-starter gear	18+0.060 +0.30	0.046	0.093		
IMZ-8.103-04401 Kick-starter shaft	18-0.016 -0.033	IMZ-8.103-04119-10 Kick-starter shaft front bushing	18+0.035	0.016	0.068		
IMZ-8.103-04401 Kick-starter shaft	20-0.041	IMZ-8.103-04110 Gear case cover	20+0.085 +0.025	0.045	0.126		
IMZ-8.103-04 236-10 Main shaft	23,4 -0.040 -0.070	IMZ-8.103-04062 Gear 1 assy	23.4+0.033	0.040	0.103		
IMZ-8.103-04304 I and II gear shift fork	5-0.160 -0.240	IMZ-8.103-04221 I and II gear shift sleeve	5+0.160	0.160	0.400		
IMZ-8.103-04304 I and II gear shift fork	8-0.100 -0.200	IMZ-8.103-04301 Gear shift quadrant	8+0.200	0.100	0.400		
IMZ-8.103-04305-20 Intermediate gear bracket	18-0.020 -0.070	IMZ-8.103-04061-30 Intermediate gear assy	18+0.027	0.020	0.097		
IMZ-8.103-04248 Bracket pin	18-0.020 -0.070	IMZ-8.103-04305 Intermediate gear bracket	18+0.070	0.020	0.140		
IMZ-8.103-04248 Bracket pin	18-0.020 -0.070	IMZ-8.103-04101 Gear case	18+0.070	0.020	0.140		
IMZ-8.103-04248 Bracket pin	18-0.020 -0.070	IMZ-8.103-04110 Gear case cover	18+0.035	0.020	0.105		

Table 10

Maximum Tolerated Limits of Clearances and Wear Between the Principal Mating Members of Gearbox, mm

Parts and mating members	Tolerated limits		
	wear on diameter	diameter clearance	axial clearance
Main shaft to main shaft gearing		0.25	
Gear shift fork shaft to shift forks		0.25	
Gear shift forks to gear engaging sleeve (width)			1.00
Gear shift fork (width)	0.40		
Gear shift fork pin to quadrant slot			0.80
Gear shift fork pin	0.20		

Repairing the Clutch Release Mechanism

Proceed with repairs of the clutch release mechanism, when;
- Dismantling the gearbox in general;
- Any troubles connected with the clutch release become evident;
- Oil leaks through the central hole in the clutch shaft are noticed.

The repair of Clutch Release Mechanism is just replacing of the defective parts.
When inspecting, check:
- The condition of the slider rubber ring;
- Whether the thrust surface (case-hardened) of the slider, also that of the rod tip fitted into the thrust bearing are bent in;
- Whether there is any lamination of the clutch release rod end which is fitted into the rod tip;
- Condition of the seal of clutch release rod.
- Condition of square end of the clutch release rod and thrust surface

Replace defective parts.

Repairing the Speedometer Drive

Proceed with repairs, when wear of teeth becomes obvious (the speedometer fails to operate though the flexible shaft is intact) or in case of dismantling the gearbox in general.
When repairing, change worn-out parts, paying attention to ease of rotation of the gearing and proper backlash in the toothing (with the flexible coupling flange stopped in any position, the driven gear should display a slight side play in the gearing).

Repairing the Gear Shift Mechanism

Proceed with repairs when there are troubles in shifting the gears.
Prior to inspection, wash the mechanism. Check the general condition of the parts, paying particular attention to the condition of) the ratchet teeth and excessive play in the joints, also to any possible defects. Should any troubles be revealed, dismantle the mechanism observing the following sequence of operations:
- Undo four bolts and remove the cover enclosing the right hand end of the gearshift quadrant shaft;
- Remove the lock rings and shims from the right hand end of the shaft
- Moving the shaft to the right push the bushing out of the gearbox and remove the bushing from the quadrant shaft.
- Undo the splines of two bolts fastening the bracket of the flywheel and undo the bolts.
- Keeping the return spring by hand lift the bracket and remove it from the quadrant shaft and remove the ratchet and the crank assembly.

- Remove the return spring and ratchet crank from the shifting mechanism.
- Moving the quadrant shaft to the left take out the shaft from the gearbox cover;
- Remove the plate from the quadrant shaft and take the splint out of the quadrant.

Wash the dismantled parts and inspect thoroughly, paying attention to accurate fitting of pin, pawl axle and the pawl. Check the ratchet and pawl for possible defects, also condition of the "working edges of the oil seal. Pay special attention to the shift quadrant (check it for wear, cracks, curvatures, etc.). Replace all the defective parts.

The pawl should pivot freely on its axle, but without any excessive play. The crank arm and pin should not display an excessive play either, the permissible clearance between them being 0.6 mm, maximum.

To reassemble the gearshift mechanism, reverse the sequence of operations, lubricate the friction surfaces of parts with motor oil. Pay special attention to correct fitting of the return spring and to proper position of the pawl crank arm on the gear change pedal shaft as well as to safe fastening of the shaft nut. When correctly assembled, the return spring should be able to return the foot pedal into the initial position with ease and should have no play in this position. Installing the lock ring onto the quadrant shaft be sure that the clearance between the lock ring and shims is in the range of 0.1-0.4 mm. Use Locktite mounting the cover enclosing the right hand end of the shaft.

For the sequence of disassembly and reassembly of the mechanism refer to Sections "Removing the Gear Shift Mechanism" and "Reassembly of the Gear Case Cover".

Gearshift forks. Having removed the forks inspect them and replace, if excessive wear is revealed (refer to Table 11).

Repairing the Gearbox Shafts

Clutch shaft. Required tools and fixtures are:

- Puller 345-330-3 for removing the roller bearing cone from the clutch shaft;
- Puller 345-441-3 for pressing-out the clutch roller bearing cup.

Having removed the clutch shaft from the gearbox, wash it and inspect thoroughly. Check condition of bearings, gear teeth (wear, scores, pitting), the tightness of the IV gear fit, and condition of splines.

If any defects are revealed, dismantle the clutch shaft as follows using tools 345-330-3 and 345-659-3:

- Remove the roller bearing cone, using tool 345-659-3
- Use tool 645-659 to press off the gear.

Replace all the defective parts and reassemble in the reverse-order.

When pressing-in the gear, the bearing and the sleeve, make-sure that the gear is fitted with its flat end towards the shaft shoulder. Lay a rubber ring between the bearing and the sleeve. Press in the sleeve with its larger chamfer facing out.

When replacing the roller bearing race, make sure to change the race as well which is pressed into the clutch shaft rear bearing housing. Use puller 345-441-3 for pressing-out the race of the roller bearing.

When pressing-in the roller bearing race, make sure that its-end face with the mark of the Manufacturing Works is facing out.

In case the clutch shaft is correctly assembled, the mounting-size measured along the outer faces of both bearings should be within 134 to 133.39 mm.

Main shaft. Having removed the main shaft, dismantle it and wash all the parts properly. Check condition of all the parts, paying special attention to the wear of friction surfaces, condition of teeth of the speed gears, as well as those of the gear engaging sleeves. Replace the defective or excessively worn-out parts.

Lubricate the main shaft splines with motor oil, when reassembling. Fit the oil baffles with the bore facing out.

In case of a properly assembled main shaft, mounting size measured along the outer faces of bushings in the assembled set of gears should be within 106.74 to 106.264 mm, while the mount-

Kick-starter shaft. Remove the kick-starter shaft, wash and inspect it thoroughly paying attention to condition of the pawl working edge and to condition of the gear ratchet teeth. If any defects are revealed, dismantle the kick-starter shaft, as follows:
- Press out the shaft bushing pin by slightly knocking with a hammer against the end of protruding portion, remove the shaft bushing, then the gear;
- Remove the pin and the pawl spring from the shaft;
- Press out the pawl axle and remove the pawl. Wash all the parts of the shaft and replace worn-out ones. The pawl can be used again, if it is reversed, with the other side, which has no wear on its working edge.

To reassemble the shaft, reverse the sequence of the operations given above.
Punch the pawl axle at both sides in two opposite points. Insert the shaft bushing pin with its thin end on the opposite side of the pawl and press it flush with the bushing. Make sure that once the shaft is reassembled, the gear turns freely on the shaft. The pawl tooth should fit tightly with its working edge into the gear ratchet tooth.

Repairing the Gear, Case
Required tools and fixtures are:
- Mandrel 345-336-3 for pressing-out the main shaft bearing from the gearbox cover;
- Tool 139-227 for pressing-in the main shaft bearing into "the gearbox.

Having dismantled the gear case and the gearbox cover, wash it and inspect, paying special attention to the condition of the main shaft ball bearing, working edge of the oil seal, the quadrant lock in the kick-starter pawl release, look for cracks and other defects.
Replace all the defective parts.
Use tool 345-336-3 to press off the main shaft from the cover and tool 139-227 to press it in.

VI.
REPAIRING THE FINAL DRIVE AND THE DRIVESHAFT

1. DISMANTLING AND REASSEMBLING THE FINAL DRIVE AND THE DRIVE SHAFT (WITH THE FINAL DRIVE REMOVED FROM THE MOTORCYCLE)

Removing and Reinstalling the Drive Shaft

To disconnect the drive shaft from the final drive proceed as follows:

- Uncotter the nut of the wedge bolt, unscrew the nut and using a soft mandrel knock the wedge bolt out;
- Remove the splined fork of the shaft from the driving gear shank (by slightly knocking with a rubber or a bronze hammer).

Having disconnected the drive shaft, wash it and inspect. If necessary, dismantle the universal joint. Check and take measurements, replace worn-out parts (refer to Repairing the Drive Shaft).

To reassemble the drive shaft, reverse the sequence of the operations given above, paying special attention to proper joint of the splined fork to the pinion gear shank. The slot in the pinion gear shank is made inclined to its axis for tightening with the wedge bolt. Therefore, when fitting the splined fork on the shank match them in such a way that the boss with the hole on the fork lies on that side of the slot edge which is nearer to the shank end face. Insert the wedge from the side of the boss with the shear facing the shank end. With the nut tightened up, the wedge bolt head should not sink in the boss. This is achieved by using shims of different thickness to be placed between the splined fork end face and the double-row radial-thrust ball bearing. The tightening torque of the wedge bolt should be 6.86-8.82 Nm.

To dismantle the universal joint:

- Remove the lock rings from the drive shaft holes and from the splined fork (for the universal joint cross pins)
- Lay the fork on the hand press and press out one of the needle bearings, until the universal joint cross thrusts against the fork, i. e. by pressing-in one of the needle bearings, press out somewhat the other opposite needle bearing through the cross (Fig. 65);
- Clamp the protruding portion of the bearing in the vice and remove it;
- Turn the drive shaft and press out the second needle bearing out of the fork from the opposite side through the cross;
- Take the holders and rubber sealing collars from the universal joint cross and separate the drive shaft from the universal joint.

In the same manner press out the needle bearings from the drive shaft splined fork, take out the holders and sealing collars, then remove the universal joint cross.

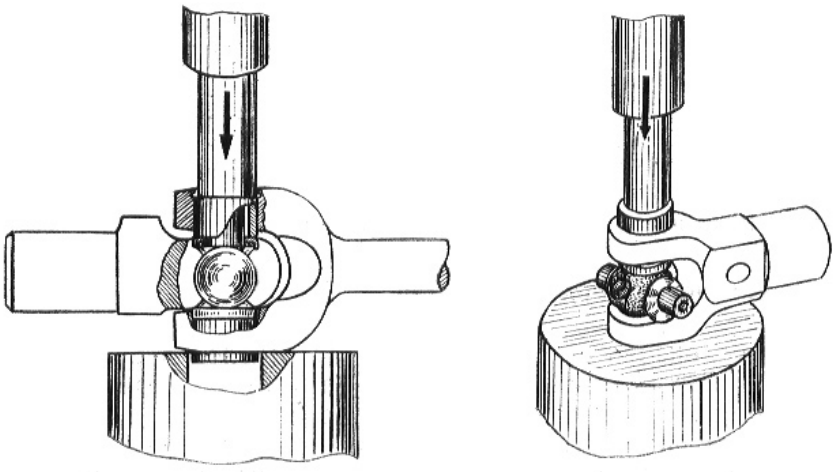

Fig. 65
Removing and Reinstalling the Drive Shaft

Having dismantled, wash, inspect and change the defective parts, if necessary.
Reassemble the universal joint as follows:
- Smear the inner surfaces of the needle bearings with grease Litol-24 and pack the needles into the bearings;
- Fit the rubber sealing collars and holders, with the latter covering the collars, on the inserted pins of the universal joint cross;
- Press in the needle bearings. See to it that the universal joint cross pin enters the bearing without disturbing the needles and that the bearing is fitted not deeper than required for installation of the lock ring, as otherwise the cross will be gripped by the bearings;
- Fit on the circlips;
- Fit the drive shaft on the second pair of the cross pins, fit on the sealing collars and holders in the same sequence, press in the bearings and mount the lock rings.

Dismantling and Reassembling the Final Drive
(With the drive shaft dislodged)
To dismantle the final drive (Fig. 66):
- Turn off the drain plug, drain oil, fill kerosene instead and by rotating the drive in both directions wash the inner cavity, then drain kerosene;
- Remove the brake shoes (Fig. 66, Pos. 1);
- Unscrew the nut fastening the brake cam lever and by knocking slightly, drive the cam axle out of the arm*;
- Unscrew the nuts fastening the casing cover, remove the washers and by slightly knocking against the end of the driven gear hub, remove the cover together with gasket and the driven bevel gear in assembly with the hub (Fig. 66, Pos. 2);
- Remove the rollers from the hub groove (45 pieces); (Fig.66, Pos.3)
- Remove the hub with the driven gear from the casing cover, inserting the rear wheel axle into the central hole until the hub rests against the distance bushing and holding the hub by hand, knock slightly against the axle end to press the cover from the bearing (Fig.66, Pos. 4)
- Press the ball bearing from the driven gear hub through the holes in the gear using a drift for the purpose. Unscrew the nut fastening the pinion gear bearing by turning it clockwise (left-hand thread) and remove the sealing ring; Take care to keep the bearing from cocking, when removing (Fig.66, Pos. 5);
- Unscrew the nut fastening the pinion gear bearing by turning it clockwise (left-hand thread) and remove the sealing ring (Fig.66, Pos. 6);
- Insert the wedge into the pinion gear shank slot, remove the pinion gear together with the radial-thrust ball bearing, remove the packing and the shim (Fig.66, Pos.7);
- Take the needles out of the bearing on the pinion shank (Fig. 66, Pos. 8).
Replace defective parts.
Reverse the sequence of the operations, when reassembling the final drive. Prior to mounting the needles into the bearings smear the fitting points with grease Litol-24 and keep the needles from falling out when reinstalling the mating members.
The tightening torque should be: for the casing cover nuts -13.7-17.6 Nm; for the nuts fastening the pinion bearing 68.6-88.2 Nm; reverse gear brake lever 22-28 Nm.

2. REPAIRING THE ASSEMBLY UNITS AND PARTS OF THE FINAL DRIVE
Keep in mind that positive and negative allowances between the mating members must fall in with the values set forth by the Manufacturing Works during repair of assembly units and parts and stipulated in Table 11.
To determine whether separate parts are fit for further service, refer to Table 12 which gives the tolerated limits of clearances due to wear in the principal mating members.
*** Do the above work in case of necessity; in reassembling ensure that angle of the rear brake lever deviation back from the vertical centerline of the final drive is kept true within 33±5° as set during factory assembly.**

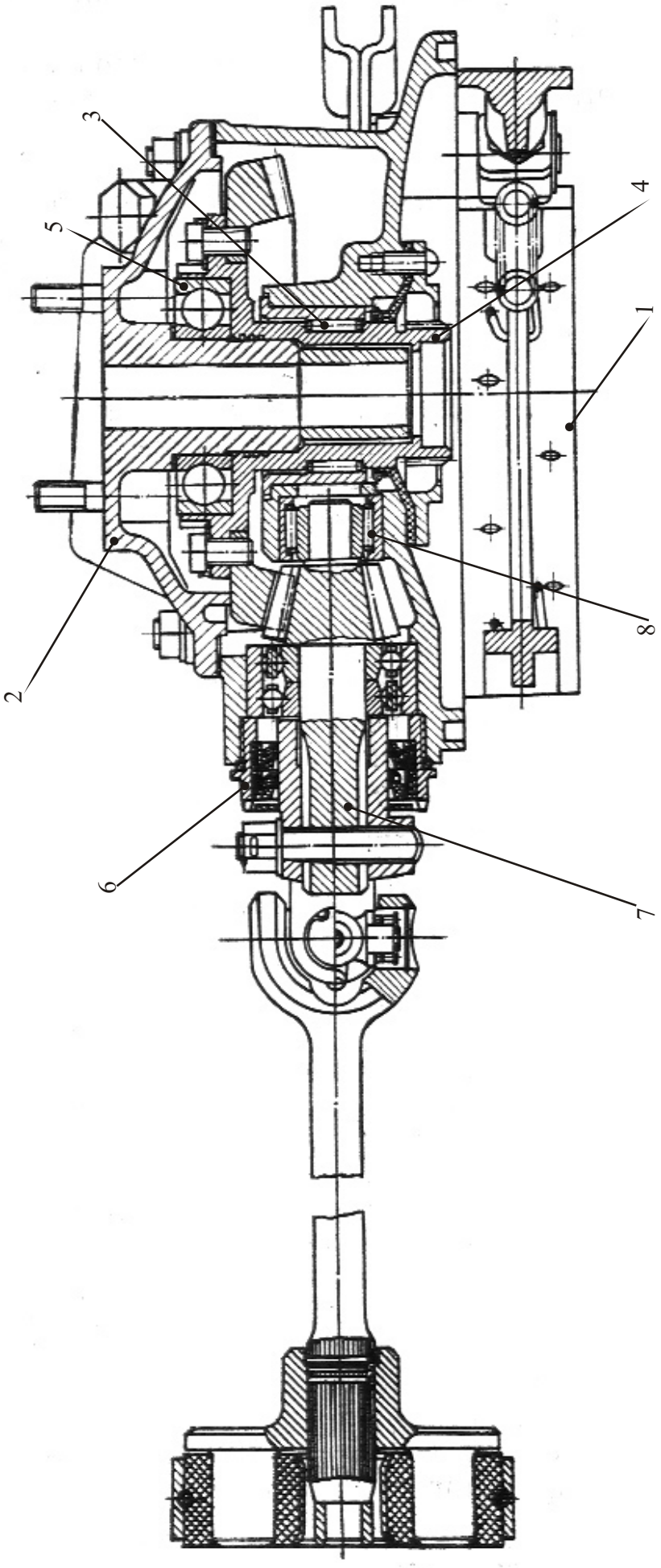

Fig. 66
Final drive

Table 11

Rated Sizes, Positive and Negative Allowances Between the Principal Mating Members of the Final Drive and the Propeller Shaft, mm

Part No. and name (shaft)	Rated size and, tolerance	No. and name of mating member (hole)	Rated size and tolerance	Tolerated limits			
				positive allowance		negative allowance	
				min.	max.	min.	max.
72-052-2 Double-row radial-thrust ball bearing	52-0.013	ИМЗ-8.101-05101 Final drive casing	52+0.030	0.000	0.043		
72-05202-01 Final drive-pinion	20-0.014	72052-2 Double-row radial-thrust	20-0.010		0.014		0.010
72-05202-01 Final drive-pinion	13+0.019 +0.007	72052-1 Needle bearing	13-0.010			0.007	0.029
72051-1 Needle bearing	32-0.011	ИМЗ-8.101-05101 Final drive casing	32-0.007 -0.035		0.004		0.035
72-05104-01 Final drive casing bush	54+0.065 +0.045	ИМЗ-8.101-05101-10 Final drive casing	54+0.030			0.015	0.065
207 Ball bearing	72+0.004 -0.017	IMZ-8.103-05229 Final drive ring gear hub	72-0.008 -0.040		0.009		0.044
ИМЗ-8.101-05121 Final drive casing cover	35+0.015 -0.010	207 Ball bearing	35+0.003 -0.015		0.013		0.030
IMZ-8.103-05229 Final drive .ring gear hub	82- 0.023	72-05227 Final drive gear	82+0.035	0.000	0.058		
N72053 Needle bearing	19- 0.009	ИМЗ-8.101-05301 Propeller shaft	19-0.023		0.009		0.023
72-05211 Universal joint cross	10-0.010	72053-2 Needle bearing	10+0.035 +0.015	0.015	0.045		

Repairing the Drive Shaft

The drive shaft will call for repairs when any major troubles are revealed in the course of operation, i. e. shaft bent, universal joint worn-out, flexible coupling worn-out, etc.

Inspect all the parts carefully, paying special attention to the mated friction surfaces and check the condition of:

- Flexible joint coupling;
- Drive shaft splines;
- Universal joint cross needle bearings;
- U-joint cross pins. The wear-out should not be more than 0.5 mm
- Drive shaft splined fork.

Change worn-out, damaged or otherwise faulty parts.

Table 12

Maximum Tolerated Limits of Clearances and Wear Between the Principal Mating Members of the Final Drive and the Drive Shaft, mm

Name of parts and mating members	Maximum tolerances		Measuring point and method
	wear on diameter	diameter clearance	
Ring gear hub splines	Tooth thickness 0.75		
Drive shaft cross pins (journals)	0.05		On working surfaces of journals
Final drive gears	Tooth thickness 0.15		
Ring gear hub bearing		0.12	

Repairing the Final Drive

Required tools are:

- Tool 345-320-3 for removing the radial ball bearing of the pinion;
- Puller 345-325-3 for removing the needle bearing inner race from the pinion.

Before dismantling the drive for repairs, measure the backlash in the bevel gear pair, which should be within 0.10 to 0.30 mm.

By visual inspection determine the condition of:

- Oil seals;
- Casing bushing that serves as outer race for the roller bearing of the driven gear hub;
- Side surfaces of the distance bushing;
- Race of the roller bearing and the teeth of the driven gear hub meshing with the wheel hub:
- Ball bearings;
- Bevel gearing teeth (wear, pitting, crumbling of the working surfaces of the teeth, etc);
- Threaded joints (for damage to thread, rigidity of the joints).
- Replace all the parts exhibiting excessive wear or other defects, which may influence the motorcycle performance. Replace the bevel gears by pairs, as at the Manufacturing Works they are selected and run-in by pairs to ensure noiseless run.

When replacing the bevel pinion and in order to remove the bearings, make use of remover 345-325-3 for the needle bearing inner race and tool 345-320-3 for the radial thrust ball bearing.

To press out the outer race of the needle bearing from the casing, heat the bearing to a temperature of 75 to 90 °C. Begin by pressing-out the bushing which serves as the outer race of the driven ring gear hub and then knock out the needle bearing outer race through the hole thus opened up.

Having completed the repairs and reassembled the final drive, check the gearing backlash; adjust it, if necessary, with the help of shims inserted between the driven ring gear hub ball bearing and the casing cover wall.

VII
DISASSEMBLY AND REASSEMBLY OF THE FINAL DRIVE AND SIDECAR DRIVE

(With the drive shaft dislodged)

To dismantle the final drive (Fig. 67):

- Turn off the drain plug, drain oil, fill kerosene instead and by rotating the drive in both directions wash the inner cavity, then drain kerosene;
- Provide marks on the brake shoes to avoid installing them in a wrong position whilst reassembling. Remove the brake shoes (Fig. 67, Pos. 1);
- Unscrew the nuts fastening the casing cover, remove the washers and by slightly knocking against the end of the driven gear hub, remove the cover together with gasket and the driven bevel gear in assembly with the hub (Fig. 67, Pos. 2);
- Remove the rollers from the hub groove (45 pieces); (Fig.67, Pos.3);
- Unscrew the nut fastening the pinion gear bearing by turning it clockwise (left-hand thread). (Fig. 67. Pos.4)
- Using the mandrel press off the collar from the nut fastening the pinion gear bearing (Fig 67, Pos.5);
- Insert the wedge into the pinion gear shank slot, remove the pinion gear together with the radial-thrust ball bearing, remove the packing and the shim (Fig.67, Pos.6);
- Using a tool remove the radial thrust bearing 3086304 from the pinion gear shank (Fig. 67. Pos.7)
- Using tool 345-325-3 remove the internal cage of the roller bearing of the pinion. (Fig.67, Pos. 8)
- Take the needles out of the bearing on the pinion shank (Fig. 67, Pos. 9).
- Press off the external cage of the roller bearing of the pinion (Fig.67, Pos.10) using an appropriate tool.
- Press off the collar from the final drive case using a mandrel (Fig.67, Pos. 11)
- Press off the external cage of the roller bearing of the hub using an appropriate tool (Fig.67, Pos.12)
- Remove shims from the final drive cover.
- Remove distance rings and adjustment ring from the final drive hub.
- Using an appropriate tool remove hub in assembly with the driven bevel gear from the bearing 1000822 (Fig.67. Pos. 13)
- Shift the drive engagement lever into the position “disengaged”, make marks on the final drive cover and the shift lever to further install them in the correct position.
- Screw out the drive shift fork stop out of the final drive cover
- Take out the cotter pin from the drive shift fork.
- Holding the drive shift lever by hand remove the shaft from the shift fork and the final drive cover.
- Remove the drive shift sleeve in assembly with the fork from the splined hub (Fig. 67, Pos.14)
- Remove the fork from the shifting sleeve, take out two keys
- Using an appropriate tool remove the lock ring from the splined hub
- Set the cover onto the ring, put the mandrel into the splined hub hole and press off the splined hub form the final drive cover.
- Using an appropriate tool press off bearing 3056204 from the splined hub (Fig.67, Pos.15)
- Using an appropriate tool press off bearing 1000822 from the final drive cover (Fig. 67, Pos. 16)
- Using an appropriate tool press off bearing 7000111 from the final drive cover (Fig. 67, Pos. 17)
- Press out the collar from the final drive cover (Fig. 67, Pos. 18)

Wash thoroughly and inspect all the removed parts of the final drive. Replace the defective parts.

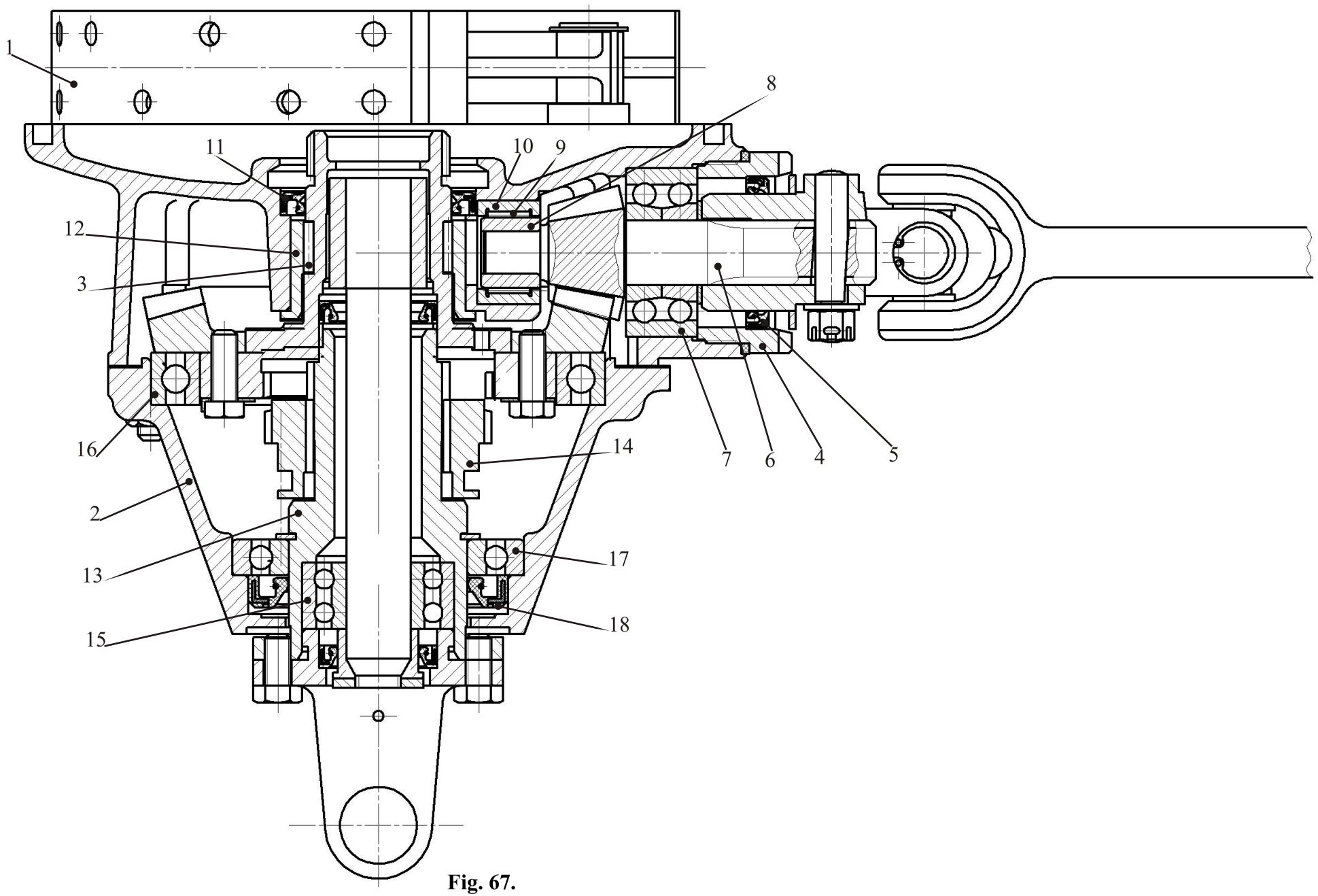

Fig. 67.
Final drive with disengageable sidecar drive

Assembly of the final drive with the sidecar drive
- Press in the external cage of the hub roller bearing into the final drive gear case using the mandrel (Fig. 68)
- Using an appropriate tool press bearing 3086304 onto the driving bevel gear.
- Using an appropriate tool press internal cage of the roller bearing onto the driving bevel gear;
- Apply grease into the internal cavity of the external roller bearing cage and install needles into the cage.
- Set the external cage with needles onto the internal cage, which is located on the driving bevel gear.
- Install distance brace between the face end of the needle bearing external cage and the face of the driving gear crown.
- Oil the seats of radial thrust bearing and roller bearing with transmission oil used in the final drive;
- Using a mandrel press the driving bevel gear with bearings until it stops into the final drive gear case (Fig.69);
- Oil the internal diameter of the nut fastening the bearing of the driving bevel gear and the circumference with the with transmission oil, fill the space between the edges of the collar with grease and press the collar into the nut using a mandrel;
- Put rubber packing ring onto the nut fastening the bearing of the driving bevel gear.

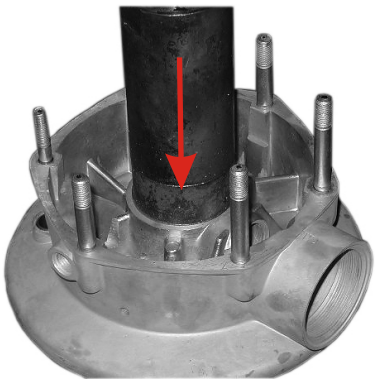

Fig. 68.
Pressing the hub bearing cage

Fig. 69.
Mounting the driving gear

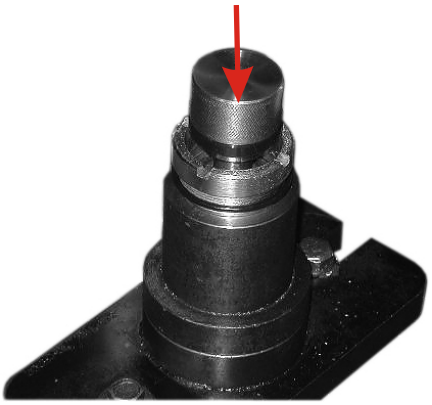

Fig. 70.
Pressing the collar in

- Using a wrench screw the nut fastening the bearing of the driving bevel gear into the final drive turning it anticlockwise until it stops.
- Remove the distance brace.
- Oil the internal diameter of the splined hub with transmission oil.
- Put the splined hub into the stand and press in bearing 3056204 until it stops using a mandrel (Fig. 72).
- Oil seats for collar 55-80-8 and bearing 7000111 with transmission oil.
- Oil circumference of collar 55-80-8 with transmission oil and pack the space between edges of the collar with grease.

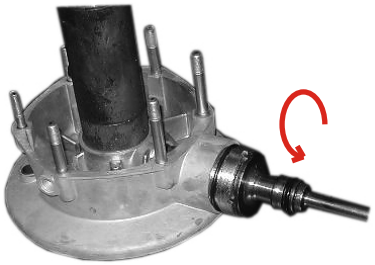

Fig. 71.
Installing the bearing nut

Fig. 72.
Pressing the bearing into the hub

- Put the final drive cover onto the stand
- Using a mandrel press the drive shift shaft collar (Fig. 73)
- Using a mandrel press collar 55-80-8 into the final drive cover (Fig. 74…76)
- Using a mandrel press bearing 7000111 into the final drive cover (Fig. 75…76)
- Put the final drive cover onto a support

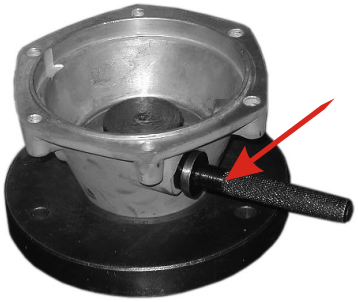

Fig.73

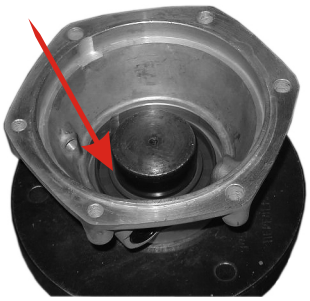

Fig.74

Fig.75

Fig.76

- Oil the circumference of the splined hub with transmission oil and using a mandrel press the hub into bearing 7000111 until the hub stops (Fig. 77).
- Put the final drive cover onto a support
- Use a mandrel to press the lock ring onto the splined hub (Fig.78)
- Remove the mandrel; the lock ring should be located between the groove and bearing 7000111. Remove the final drive cover from the support and hammering the mandrel set into the in the hole of the splined hub jump it until the lock ring gets into the groove.
- With the groove inside the final drive cover, set the drive shift sleeve onto the splined hub.
- Set two keys into the shifting fork, install the fork with the key into the drive shifting sleeve having faced the longer part of the fork to the threaded hole of the lock (Fig. 79)
- Oil the fork shaft with transmission oil;

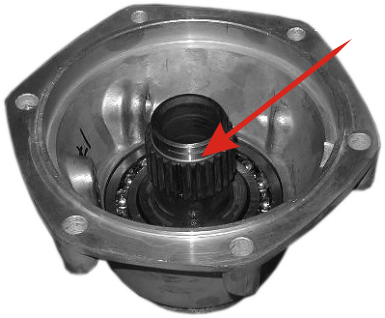

Fig. 77.
Pressing the hub into the bearing

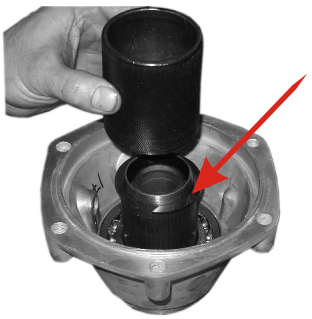

Fig. 78.
Installing the lock ring

Fig. 79.
Installing the shift sleeve

- Move the shift sleeve inside until it stops
- Matching marks made before install the drive shift shaft into the final drive cover and into the shift fork;
- Set the cotter pin into the drive shift shaft
- Regressed the thread of the stop and the threaded hole in final drive cover.
- Apply Locktite onto the thread of the stop, screw the stop into the final drive cover thus providing the reliable fastening of the shift fork to the stop ball (Fig.81).
- Oil seat for bearing 1000822 with transmission oil.
- Put the final drive cover onto the support.
- Press bearing 1000822 into the final drive cover using an appropriate mandrel (Fig. 82).

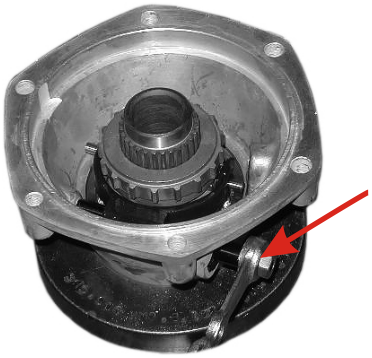

Fig. 80.
Installing the drive shift shaft

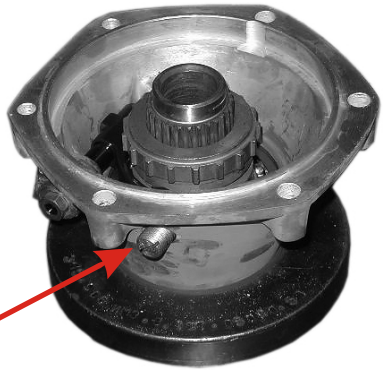

Fig. 81.
Installing the stop

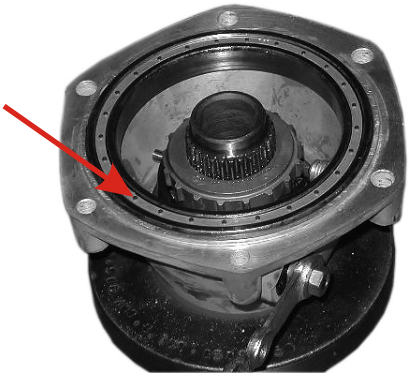

Fig. 82.
Pressing the bearing in

- Degrease eight bolts fastening the hub of the final drive driven gear
- Degrease eight threaded holes in the driven bevel gear
- Set the hub onto the driven gear.
- Apply Locktite onto the bolts, set lock washers and screw the bolts to the torque of 21-24 Nm
- Lock 8 bolts having bent the lock washer over the edge of the bolt head. Be sure not let the lock washer protrude outside the diameter of the hub of the driven gear.
- Oil the internals of the driven gear hub with transmission oil.
- Set the driven gear hub into the support.
- Set the distance bushing into the driven gear hub (Fig. 83)
- Oil the circumferences of seal 24-35-7 with transmission oil, pack the cavity between the collar lips with grease and press the collar into the driven gear hub.
- Oil the seat for bearing 1000822 in the driven gear hub with transmission oil.
- Put the final drive gear onto the support and press the driven gear hub into bearing 1000822 using an appropriate tool (Fig. 85)

Fig. 83.
Setting the distance bushing

Fig. 84.
Setting the collar into the driven gear hub

Fig. 85.
Pressing the hub into the bearing

- Install the adjustment ring onto the driven gear hub, and then install the distance ring (Fig. 86)
- Grease the groove for rollers on the driven gear hub and then set 45 rollers
- Set shims onto the final drive case studs (Fig. 88)
- Set cover into the final drive case (Fig. 89).

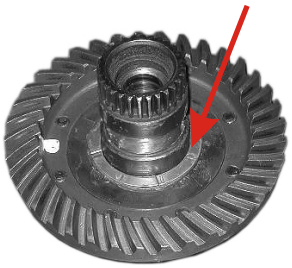

Fig. 86.
Setting the adjustment ring and the distance ring

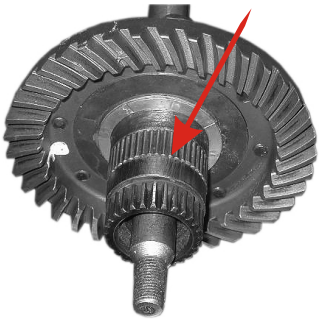

Fig 87.
Setting the rollers

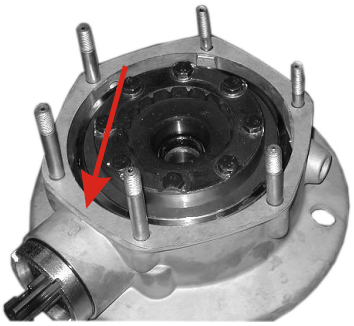

Fig. 88
Setting the shims

Fig. 89
Setting the final drive cover

- Put washers M8 onto studs, screw nuts in, set distance bushings onto the studs M10 and tighten the nuts to 14-18 Nm.
- Check play in the mesh of gears, it should be in the range of 0.01-0.30 mm. The play is adjusted by shims located between the cover and the final gear case as well as with adjustment rings on the driven gear hub.
- Set the mandrel on the splined end of the driven gear.
- Oil the circumference of collar 45-60-8 with transmission oil, pack the cavity between c0llar lips with grease and press the collar into the final drive case using the mandrel (Fig. 90).
- Install brake shoes into the final drive matching marks made before (Fig. 91)
- Install shims onto the splined end of the driving bevel gear, connect the driving shaft, press the wedge in, screw the crown nut in and insert the cotter pin (Fig.92)
- Undo four M10 nuts and remove distance bushings from the studs before mounting the final drive onto the motorcycle.

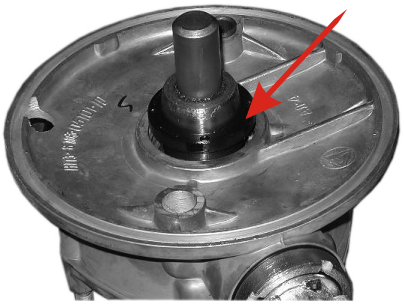

Fig. 90.
Installing the collar onto the case

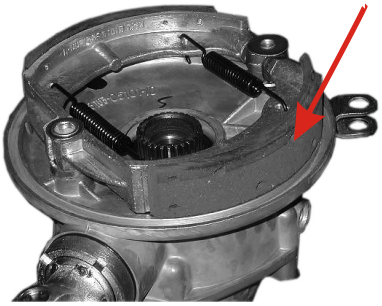

Fig. 91.
Installing the brake shoes.

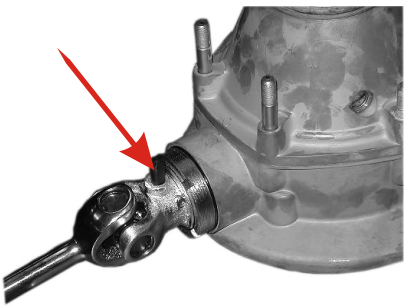

Fig. 92.
Mounting the drive shaft.

Dissembling the sidecar wheel drive shaft
(The drive shaft disconnected from the final drive)

To disassemble the drive shaft proceed as follows:
- Remove the sidecar wheel
- Remove the adjusting nut from the brake tie rod
- Undo three bolts fastening the cover of the brake drum and remove the cover with brake shoes (Fig.93, Pos.1)
- Put the mandrel onto the sidecar wheel axle and remove the sidecar wheel shaft slightly hammering the mandrel. Remove the protective washer from the shaft (Fig. 93, Pos. 2,3).
- Undo two bolts fastening the sidecar wheel shaft to the sidecar chassis.
- Remove the wheel shaft from the sidecar chassis
- Remove the distance ring from the splined bushing
- Remove bearing 180206 from the sidecar wheel shaft (Fig. 93. Pos. 3)
- Take out the distance bushing (Fig. 93, Pos.4)
- Using the mandrel remove the splined bushing in assembly with bearing 180207 from the wheel shaft (Fig. 93. Pos.5)
- Press off the splined bushing from bearing 180207 (Fig.93. Pos.6)
- Remove protective washer from the splined bushing (Fig.93, Pos.7)

Inspect all parts and replace defective ones.
Reverse the sequence of operations to assemble the wheel drive shaft.

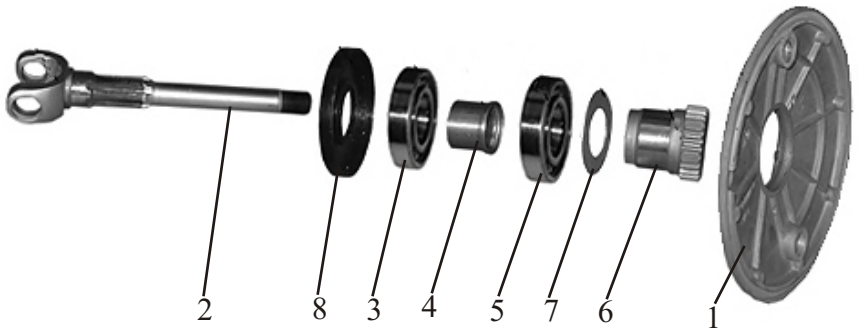

Fig. 93.
Sidecar drive shaft

VIII.
REPAIRING THE WHEELS

Having removed the wheel and prior to repairs, check:
- wear of tires and their possible damage;
- cracks and dents of the wheel rim;
- wear on the brake drum surface;
- wear in the taper roller bearings and spacers;
- radial and side run-out of the rim and tire;
- presence and uniform tightening of all the wheel spokes. Check condition of the bearings in wheel hubs not by rotating and rocking the wheel on the axle, but, on the contrary, by rotating the tightened axle and rocking it in the wheel, because •due to the considerable weight of the wheel the overtightening of the bearings may be unnoticed. The axle should rotate freely, without noticeable run-out, seizing, clicks, etc.

Radial and side run-out in a running wheel may be tolerated within 1.5 mm for the wheel rim and within 3 mm for the tire. Repair the wheels if any defects are revealed.

1. DISMANTLING AND REASSEMBLING THE WHEEL

Demounting and Remounting the Tire

(With the wheel removed)

Required tools and fixtures are:
- Tire irons (2 pieces);
- Hand-operated tire pump;
- Tire gauge for measuring the pressure in tires.

To remove the tire from the wheel:
- Turn off the valve cap, turn off the slide valve, and push the valve inside the tire;
- Lay the wheel with the brake drum down and press off the tire sides so as to separate them from the rim shoulders;
- At a distance of approximately 1/4 on the wheel circumference from the tire valve, press the tire bead into the center of rim well and use tire irons, inserting them from the opposite side of the rim to catch the tire bead and twist it outside through the rim shoulder. Smear the tire iron ends with liquid soap to facilitate inserting;
- By moving both irons along the rim and pressing the tire beads into the rim well from the opposite, side, gradually remove the whole tire bead. When removing, make sure that the irons do not pinch the inner tube. Do not exert too much force as otherwise the bead wire may be damaged; see that the tire bead on the opposite side (not yet removed) lies in the center of the rim well and the inner tube is not seized;
- Once one side of the tire bead is freed, pull it off preferably near the tire valve and take the inner tube out.

To remove the tire off the wheel rim, holding the wheel in the vertical position, insert the tire iron from the side of the tire bead not yet removed, catch the tire bead with the iron end and twist it outside (see that the opposite side of the not-removed tire bead also enters the rim well). By moving the irons along the wheel rim remove the tire from the rim.

After demounting, inspect the tire and inner tube and check for punctures, other possible damage, sharp or foreign matters on the inner surface of the tire. If necessary, repair the tire and the inner tube, or replace them.

To remount the tire and the inner tube, proceed as follows:
- Powder the inside of the tire casing with talcum;
- Fit on the rim flap, matching its hole for nipple with those in the rim well. Make sure that the flap covers entirely all the nipple heads, while no spokes are protruding from the nipple heads;

- insert a portion of the tire bead into the rim well and use the tire irons to slip the hole bead inside, moving it towards the rim shoulder;
- insert the inner tube valve into the hole in the rim, insert the slide valve into the tube valve, inflate the tube slightly and insert it into the tire casing, making sure that it is spread uniformly without any wrinkles;
- fit on the second tire bead, beginning from the side opposite to the valve. Make sure that the first tire bead is settled in the rim well properly. Usually about two thirds of the bead are fitted in with hands, while the rest, with the help of tire irons.

When using irons, take care not to pinch and injure the inner tube; to facilitate mounting smear the tire bead with liquid soap.

Having mounted the tire bead, make the valve sink into the tire casing, inflate the inner tube and tap with a rubber hammer along the tire circumference until the tire is set uniformly in the rim well.

Inflate the tube to the required pressure, turn on the valve and screw on the valve cap.

Tires pressure, Mpa :

Front wheel and side-car wheel 35psi

Rear wheel and spare wheel ....….... 40psi

Check the proper arrangement of the tire on the rim (the check strips should be equidistant from the rim along the entire periphery of the tire).

Dismantling and Reassembling the Wheel Hub
(with the wheel removed)

The required tool is mandrel 345-324-3 for removing the roller bearing cup.

To dismantle the wheel hub:

- Loosen locknut, undo the seal nut and remove the left-hand distance bushing;
- Insert the mandrel or the wheel axle on the side of the hub splined portion and press the end roller bearing, the intermediate bushing, the cone of the second roller bearing and the right-hand distance bushing out of the wheel hub;
- Using mandrel 345-324-3 presses out the thrust washer and the roller bearing cup.

Wash and inspect the dismantled parts. Change all the defective parts. Reassemble the wheel hub as follows:

- Fit the thrust washer and the right-hand distance bushing into the hub inserting the shoulder of the latter into the thrust washer groove;
- Press in the roller bearing, having packed it first with grease Litol-24 so that the wider side of the cup faces the thrust washer, with the bearing pressing against the washer;
- Insert the intermediate bushing;
- Press in the second roller bearing (also packed with grease Litol-24 so that the wider side of the cup faces the oil seal nut (outside):
- Press the rubber collar into the oil seal nut arranging it so that the oil catching edge and the spring are inside the nut;
- Insert the left-hand bushing into the seal nut from the side facing the bearing, turn in the nut to the limit, thus tightening the bearings properly;
- Turn off the nut by 1/6 to 1/8 of a revolution and lock with a locknut. The tightening torque should be 14.7-17.6 Nm.

After reassembling, check the bearings for proper tightening and adjust, if necessary. To perform this check:

- Insert the rear wheel axle into the reassembled wheel hub, and tighten up all the cones and cups on the axle with the help of the nut with a set of bushings;
- By turning and rocking the wheel axle, make sure that it

Turns freely, with neither noticeable play nor squeaks in the bearings. Unscrew the locknut and adjust it for proper tightening, if necessary.

Remember that overtightening of bearings or excessive play are harmful as they lead to premature wear of bearings.

With a properly assembled hub, the left-hand distance bushing should protrude from the rubber collar within 1.0-2.0 mm. If otherwise, change the faulty bushing.

2. REPAIRING THE WHEEL ASSEMBLY UNITS AND PARTS

Repairing the Tire (with the tire removed)

Inspect the tire removed. If tire tread wear, tire side damage, deterioration of the cord or breakage of the bead wire are evident, change the tire.
.If deterioration of cord is insignificant, send the tire to a specialized repair shop.
When inspecting the tire, pay special attention to the tire casing and make sure there are no sharp objects stuck therein, as they may cause puncture of the tube.

Repairing the Wheel Hub

Repair the wheel hub when:
- The brake drum working surface is worn-out;
- The hub splines are worn-out;
- The taper roller bearings and spacers are worn-out;
- Other signs of damage are evident which make the wheel service impossible.

In case of wear of the brake drum working surface, wear of bearings and other damages, change the faulty parts for new ones.

Repairing the wheel brake disc

Repair the wheel brake hub when:
- Wear-out of the brake disc is obvious
- The disc shows face runout
- Damages are in place, which prevent the disc from further use

Replace disc when the disc is thicker than 4.5 mm or the runout is more than 0.2 mm

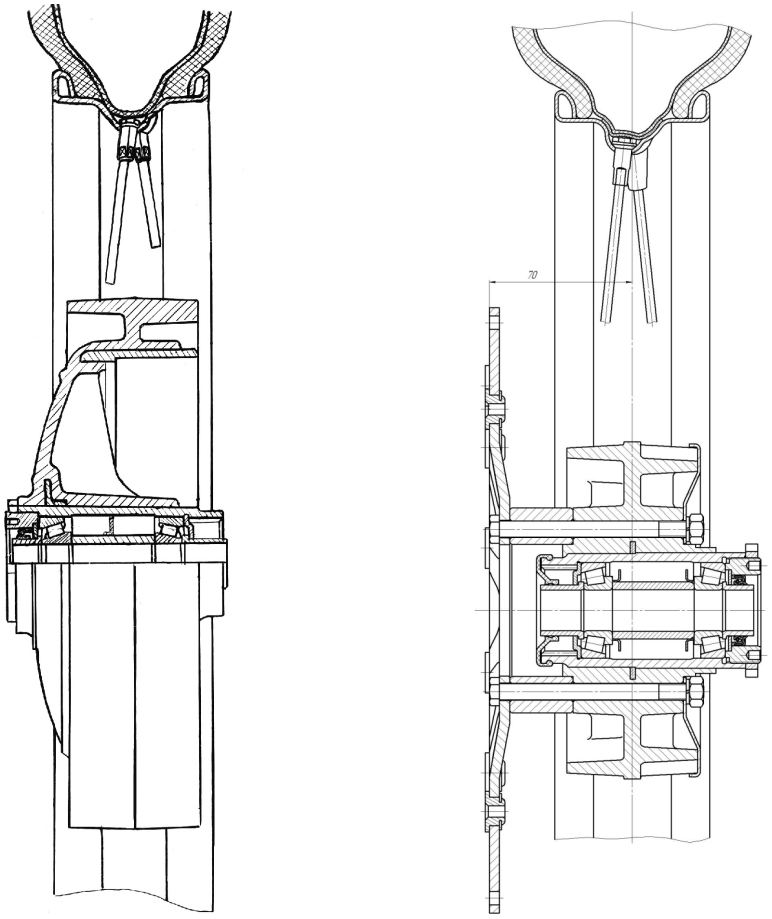

Fig. 94
Wheel general view.

Repairing the Wheel Rim and Changing the Spokes

The required tool is the wrench for driving in spoke nipples. If cracks or dents on the rim are evident, replace it. Proceed in the following order:

- Using the wrench, turn all the nipples from the spokes, take the spokes out, and inspect them. Replace defective spokes and nipples;
- Insert 20 short spokes into the drum rim, put the hub on the workbench with the drum facing down. Arrange the spokes towards the axes of holes in such a way that the spokes intersect at approximately one half of their length;
- Lay the wheel rim on the workbench with the hub in the center of the rim; see that the holes for nipples, which are relatively more declined from the axis of symmetry, are facing down. Arrange the rim so that the holes for the short spoke nipples coincide with the direction of the spoke axes (between the intersecting short spokes there should be one hole for the long spoke, directed to the right);
- Insert the nipples into the rim holes and drive them on the spokes for about 3/4 of the thread length;
- Drive the nipples on ten long spokes (three or four turns of the thread) and insert them into the rim holes arranged between the nipples of intersecting short spokes, slide the spoke heads into the holes on the hub smaller flange from the outside (the head of installed spoke should lie on the inside of the flange facing the drum) and drive the nipples to about 3/4 of the thread length;
- Drive the nipples on the ten remaining long spokes, inserting them into the unoccupied holes and sliding the spoke heads into the holes in the hub flange from the inside (the heads of installed spokes should lie on the outside hub). For general layout of spokes refer to Fig. 35.

Having installed the spokes, turn on all the nipples uniformly and tension the spokes. Check the reinstalled rim for radial and side run-out, also its proper position relative to the wheel hub. Tolerated radial and side run-out of the wheel rim should be within 1.5 mm. The outer side surface of the rim should be positioned at a distance of 5.5-7.5 mm from the wheel hub end face with splines for joining to the final drive.

Having tensioned the spokes and centered the wheels, file all the protruding spoke ends flush with the nipple heads.

The centering of wheels has to be checked also when only separate broken or bent spokes have been replaced, making sure that the tension of the replaced spokes is the same as that of the rest of them. Tighten up other loose spokes revealed.

IX .
REPAIRING THE FRONT FORKS

1. DISMANTLING AND REASSEMBLING THE FRONT FORK

It is possible to partially dismantle or repair the front fork without taking the entire assembly off the motorcycle.

Removing and reinstalling the front fork leg
(With the front wheel removed, the front fork remaining on the motorcycle)

To dismantle the front fork leg:
- Remove the front feneder when it is fastened to the fork leg tips;
- Unscrew the coupling nut tightening the fork leg tube to the cross-piece (Fig. 95)
- Remove the spring of the front fork (Fig. 96-97). Remove the distance bushing and the spring when it concerns single bikes.
- Loosen the coupling bolt fastening the legs to the front fork bridge
- Remove the fork leg. For easier operation do the nut into the front fork tube for 4-5 turns hammer out the tube from the crosspiece cone using a rubber hammer.
- Reverse the sequence of operations to reassemble the front fork. Whilst tightening the nut to provide the tight sit of the cone in the fork crosspiece, loosen the nut of the coupling bolt first and tighten it after the tightening of the clamp nut.

Fig.95

Fig.96

Fig.97

Dismantling and Reassembling the Fork Leg
- Drain oil
- Remove the through bolt of the wheel (Fig. 98)
- Remove the screw fastening the shock absorber (Fig. 99)
- Remove the shock absorber (Fig. 102 and 103)
- Remove the front fork leg tip (Fig. 100)
- Remove the outer seal (Fig. 101)
- Remove the lock ring (Fig. 104)
- Remove the inner seal (Fig. 104)

Wash and inspect all the removed assembly units and parts, replace defective ones, if necessary.
To reassemble the fork leg, reverse the sequence of the operations.
The priming capacity of the fork leg is 180 cc (SAE 10).

Fig.98

Fig.99

Fig.100

Fig.101

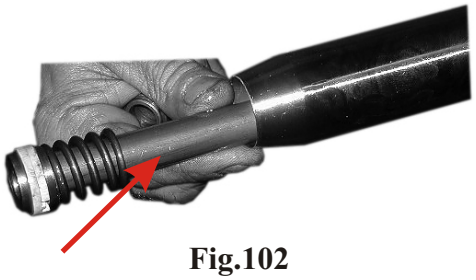

Fig.102

Fig.103

Fig.105

X.
REPAIRING THE MOTORCYCLE FRAME

Check condition of the motorcycle frame, having first washed it to remove dirt, oil and dust.
Repair the motorcycle frame, when external damage, cracks or other defects rendering further operation impossible are revealed.
In case of serious breakage, cracks or damage, replace the frame or its separate parts. If insignificant cracks or other damages are revealed, weld up the cracks and straighten out the damaged spots, reinforcing them with plates. Clean the repaired spots and apply a coat of paint.

XI
REPAIRING THE SUSPENSION
DISASSEMBLY AND REASSEMBLY OF THE MOTORCYCLE REAR SUSPENSION AND THE SIDE-CAR WHEEL SUSPENSION

Dismantling and reassembling the motorcycle rear suspension and the sidecar wheel suspension are described in Section III "Dismantling and Reassembly". Check the removed parts, if there are any troubles. Pay special attention to rubber of silent-blocks, wear of pins and distance bushings of silent-blocks.
Replace defective parts. When pressing-in the shock absorber
silent blocks into the swinging fork and the axle lever, make use of mounting mandrel 346-197-3 and mandrel 346-198-3.

Dismantling and Reassembling the Shock Absorber
(With the shock absorber removed)
Required tools are:
- Mandrel 345-337-3 for mounting the seal on the shock absorber rod;
- Jaws 366-144-3 for gripping the shock absorber rod.

Make sure that the working place, tools and fixtures are clean, as otherwise dirt trapped inside may cause damage to shock absorber parts.

To dismantle the shock absorber:
- Set the shock absorber in tool 345-435-3;
- By screwing in the tool screw, compress the suspension spring by 5-10 mm and remove the retainers;
- Remove the upper cap
- Remove tool 345-435-3
- Remove the spring, the check ring and the sliding cam.

To reassemble the shock absorber, reverse the sequence of operations.
When dismantling or repairing the shock absorbers, check the condition and proper fastening of the silent blocks and bushings and, if deterioration of rubber is revealed, replace them.
When reinstalling the shock absorbers, tighten up the silent blocks with the swinging arm in the central position.

XII
HANDLEBARS AND CONTROL CABLES

1. DISMANTLING AND REASSEMBLING THE THROTTLE COTROL TWIST-GRIP

To dismantle the twist-grip:

- Undo the screws and remove the carburetor covers together with the throttles;
- Compress the throttle springs **and remove the cable tips;**
- Undo the extreme screws fastening the halves of the switch body and remove the upper part;
- Turn to yourself the throttle control twist-grip and remove the cable tips out of the slider;
- Unlock the adjusting screw and turn it off a little;
- Slacken off the screw fastening the switch body and remove the throttle control twist-grip with a chain and a slider.

Wash and inspect the dismantled parts. Replace defective parts.

Reassemble the twist-grip in the following order;

- Set the throttle control twist-grip on the handlebar and hi the lower half of the body, having preliminarily lubricated the twist-grip tube rotation;
- Set the cable tips into the twist-grip slider and lubricate the points of the twist-grip tube rotation;
- Set and screw up the upper half of the body;
- Tighten to the limit the screw fastening the switch body;
- Set the cable tips into the twist-grip slider, reinstall the throttles and secure the covers;
- Adjust the twist-grip rotation with an adjusting screw and lock it with a nut.

2. REPAIRING THE CLUTCH AND BRAKE CONTROL LEVERS AND CABLES

Check the condition of control cables at every repair of the motorcycle. Even if a single wire is found broken, or the cable sheath is damaged (seizing, extension, etc.) replace the cable. If the joint of the control cable and its tip is disturbed (the tip slips off the cable), solder a new tip on, spreading the cable end wires apart prior to soldering to ensure proper tightness of the Joint. The handlebar control levers should be screwed on to the seats (clips) so as to ensure their free pivoting around their axes and preclude, at the same time, any play of the levers in the clips. When inspecting the handlebar, pay special attention to the brackets, which fasten it to the fork crosspiece and check the bracket end for cracks. Replace the brackets, if defects are revealed. To remove the brackets from the tube, unscrew the nut of the bolt fastening the handlebar tube to the brackets, insert a wedge plate into the bracket slot and by knocking it in, spread the bracket slot so as to permit taking the bracket from the tube. Reverse the sequence of the operations, when fitting the brackets on.

XIII.
FUEL SYSTEM

The fuel system comprises the gas tank, the vacuum valve, gasoline hoses and carburetors. Dismantle, inspect and repair the above assembly units and parts when dismantling the motorcycle, partially or totally, or when such troubles are revealed which render further operation of the motorcycle impossible.

Service and repair of carburetors and vacuum valve is only possible in shops having specialized equipment.

Repairing the Fuel Tank

Inspect the fuel tank for cracks, dents, peeling of paint, etc, Test the fuel tank for tightness by submerging it in water and creating a pressure of 39 kPa.

Prior to welding up the revealed cracks in the fuel tank, flush it in soda solution. Clean the spots with peeled off paint and renew the coat.

Check fuel lines for cracks and swelling. Replace if required.

XIV.
REPAIRING THE INTAKE AND THE EXHAUST SYSTEMS

Repair the intake and the exhaust systems (the air cleaner, "the air corrector, intake branch pipes, exhaust pipes and silencers) whenever necessary; inspect them in the course of partial or total dismantling of the motorcycle and proceed with repairs when the troubles revealed render further operation of the motorcycle impossible.

XV
REPAIRING THE SIDE-CAR

Proceed with repairing the sidecar when wear of the joints or damage of separate parts and assemblies are evident.

1. DISMANTLING AND REASSEMBLING THE SIDE-CAR

To detach the side-car body:

- Open the luggage compartment cover and unscrew the top 'fastening nuts of the rubber members;
- Take the floor carpet out, unscrew the front bolt nuts, which fasten the sidecar body to the frame, then remove the suspension clips and cushions;
- Remove the sidecar body from the frame;
- Unscrew the bolts of the pressing flange fastening the rubber members and remove the members (if necessary),

After the required repairs, reassemble the sidecar in the reverse order.

2. REPAIRING THE SIDE-CAR

Repairing the sidecar body. Repair the side-car body if there are cracks or mechanical damage. Straighten out all the dented spots, weld up the cracks and dress out the surface. For reinforcement, some straps may be welded on the inside of the cracked spots. After welding, straightening out and trimming, touch up the damaged spots with a coat of paint or repaint the whole body.

Originally grade МЛ-12 enamel is used at the Manufacturing Works for painting, followed by hot drying.

Repairing the sidecar frame. Repair the sidecar frame at the time when the motorcycle is dismantled for repainting, or in case of any defects noticed in service. If after disassembly wear is found, change broken and/or worn-out parts for new ones.

In case of cracks or damage to the frame proper, weld up the cracks and reinforce the spots with the aid of stiffeners or cover plates.

XVI
ELECTRICAL EQUIPMENT

1. Wiring and fuses

The electrical equipment of the motorcycle is of the so-called single-wire type, where the negatives of the sources and users are connected to the “ground” which functions as another wire. Refer to Table on page 98 for electric diagram. The entire circuit is switched on with the same ignition lock.

Almost all the circuits are protected through the fuses located under the dashboard on the left hand motorcycle side. Before replacing the blown fuse, check the reason and fix the fault. Refer to Table 13 for circuits protected by a specific fuse.

Disconnect the wire from the negative terminal of the battery before repairing the motorcycle and electric equipment. Never use fuses incompatible with the design and parameters of the electric system.

Table 13

# of the fuse (See Fig. 119)	Circuit description
1 (16 A)	Marking lights, high beam
2 (8A)	Parking lights
3 (16 A)	Horn, brake lights
4 (8 A)	Ignition
5 (8 A)	Blinker relay

2. STORAGE BATTERY

The motorcycle is equipped with a dry storage battery with capacity of 18-32 A.

Specifications

Type	6CT-18-32 a
Rated voltage, V	12
Discharge current, A	0.9…1.0
Capacity at 20-hour discharge, A-h	16-32

The above ratings are given for storage battery with density of electrolyte at the beginning of discharge being (1.28± 0.01) g/cm^3 reduced to 25 °C. To check the storage battery, wipe its exterior with a cloth moistened in a 10 % ammonia spirit or baking soda solution.

Checking the Storage Battery Condition

The following tools and fixtures are required for purpose:
- A densimeter with a scale of 1.10 to 1.32 and division value of 0.01;
- Thermometer with a scale calibrated from -30 to +65 °C.

To ascertain the storage battery good condition, check it for:
- Possible electrolyte leaks;
- Battery discharge by evaluating the electrolyte density;
- Electrolyte level, by visual evaluation against the top and' bottom level marks traced on the storage battery side.

Examine the battery for damage, cracks in the cells, dependable connection of the battery terminals to binding posts and possible electrolyte leaks.

Estimate the battery discharge by measuring the density of electrolyte provided that initial density of the fully charged battery is known and no electrolyte was added in service guiding by Table 14.

Table 14

Battery Discharge, Estimation by Density

Density of electrolyte		
Fully charged battery	**25 % discharge**	**50 % discharge**
1.28	1.24	1.20

Measure density at the temperature of 25 °C. In case the measurements are taken at a temperature other than specified, then apply a correction (either positive or negative) to the acidometer reading as specified in Table 15.

The density fluctuation in the cells should not exceed +0.01 g/cm^3.

Table 15

Correction to Densimeter Readings

Electrolyte temperature when measuring density, C	Correction to densimeter reading, g/cm2
-40 ... -26	-0.04
-25...-11	-0.03
-10... +4	-0.02
+5...+19	-0.01
+20... +30	0.00
+31 ...+45	+0.01

To ensure full charging of the battery:
- Top up the cells with distilled water or acidic solution with .a density of 1.40 depending on the electrolyte density;
- Charge with 1.5-2.0 A current until abundant degassing is evident in all the cells and specific gravity of electrolyte and voltage in all the cells are stable for the period of 2 h.
The detailed manual for battery 6CT 18-32 A is enclosed to the motorcycle.

3. ALTERNATOR
The motorcycle is fitted with a. c. DENSO alternator .
Specifications
Type .....…… 100211-1680
Rated voltage, V 14
Rated output, W 500

Testing the Alternator Performance
Test the alternator performance on a special bench at no-load and under load.
In all tests where voltage is applied, strictly observe polarity of connections, i. e., connect the positive wire to a positive terminal only.

Testing the Alternator on the Motorcycle
If no test bench is available, check the ratings of the alternator with the engine running.
- Connect the voltmeter to positive and negative terminals of the storage battery
- Start the engine. Whilst starting the voltage should drop to 9,5 V
- Engine speed of 3500-4000 rpm should produce voltage of 13.5-15.5 VDC
When so, the alternator and voltage regulator are intact.

Precautions:
To prevent the alternator from damage all required precautions should be followed**. Disassemble and repair the alternator only with shops having specialized equipment.**
- In the event that an extra battery is connected (for example, for better start) observe polarity connecting the batteries to each other.
- Strictly observe polarity connecting the battery to the charger.
-Never run the engine with battery disconnected.
-Never short-circuit the terminals of the battery and voltage regulator
-Strictly observe polarity connecting the alternator to circuits

Changing the brush holder:
In the event that brushes are worn out and protrude for less than 5 mm from the holder replace the holder in assembly with the brushes.
To replace:
- Undo three screws on the rear cover of the alternator (Fig. 105, Pos. 1)
- Loosen contact stud nut and remove the cover (Fig. 105, Pos. 2)
- Undo two bolts of the brush holder and take it out (Fig. 106)
Proceed in reverse sequence to assemble the alternator.

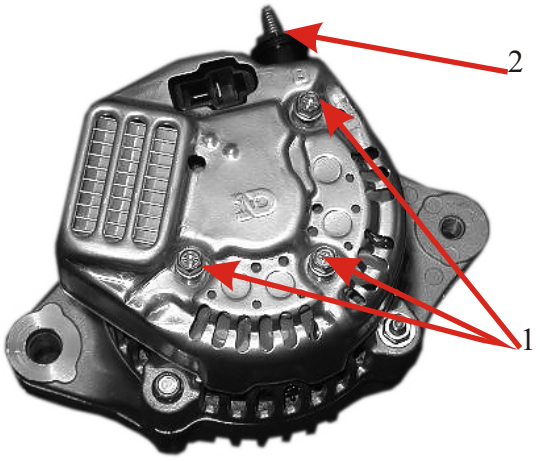

Fig.105

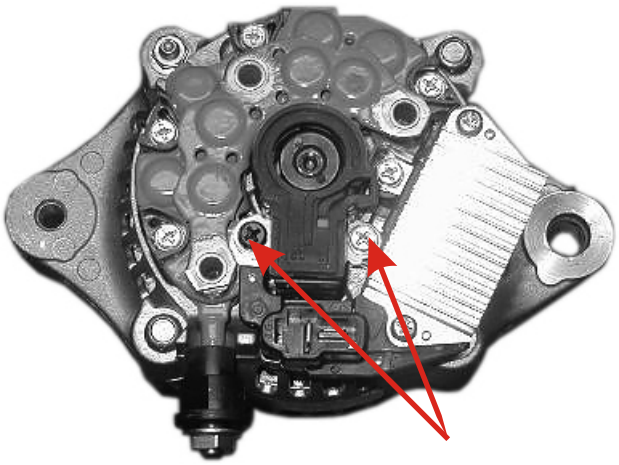

Fig.106

Disassembly and Assembly of the alternator drive

To disassemble the alternator:
- Fix the alternator gear with the drive
- Remove the cotter pin from the alternator nut and undo it.
- Press off the alternator gear from the shaft using and appropriate tool
- Remove the key from the alternator shaft
- Undo four nuts fastening the alternator to the drive and separate them
- Remove the packing ring form the casing
- Using a mandrel remove the drive shaft
- Undo three screws fastening the drive flange
- Using a mandrel press of the bearings and distance ring from the drive casing
- Remove the drive seal
- Remove the rubber damper from the casing
- Making use of wrench 346-709 undo the damper casing from the alternator shaft
- Remove the distance bushing from the alternator

Replace worn out or damaged parts preventing the alternator from further use.

Fig. 107.
Alternator with drive, general view

Fig. 108.
Removing the alternator gear

To assemble the alternator:
- Press bearings and distance ring into the alternator using the mandrel (Fig. 109)
- Set the packing ring on the drive housing (Fig. 100, Pos. 2)
- Set the flange and fasten it with three screws using a sealing stuff (Fig. 110, Pos. 2)
- Having packed the seal with an appropriate grease (ZIATIM 221 type) press it the seal in using the mandrel (Fig. 111)

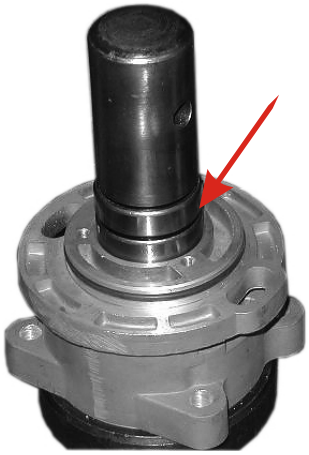

Fig. 109.
Pressing the bearings in

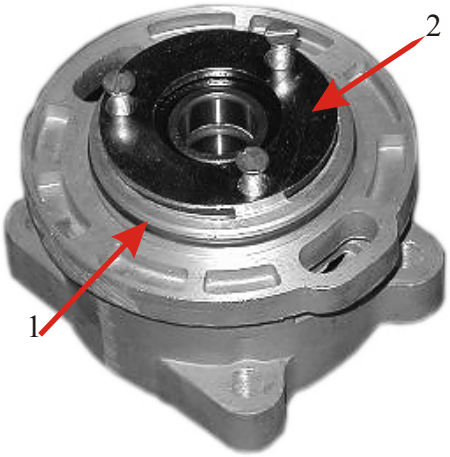

Fig. 110.
Installing the flange

Fig. 111.
Installing the seal

- Using the mandrel press the drive shaft in until it stops (Fig. 112)
- Press the key in the drive shaft (Fig. 113)
- Having matched the key recess and alternator gear heated to 200 deg. C press the gear in (Fig. 114)
- Having matched the slot in the nut with the hole for the cotter pin on the drive shaft do the nut to the torque of 50-60 N-m. Splint the nut.

Fig. 112.
Pressing the drive shaft in

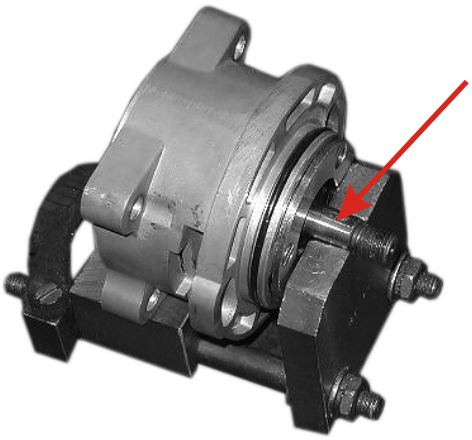

Fig. 113.
Pressing the key in

Fig. 114.
Pressing the gear on

- Set the distance bushing onto the drive shaft
- Do the damper housing to the torque of 30-50 N-m using wrench 346-709 (Fig. 115, Pos. 1)
- Install three rubber dampers into the damper housing (Fig. 115, Pos.2)
- Match the holes with the alternator studs the way that the lobe of the external circumference faces the nearest alternator bracket (Fig. 116)
- Set the washers and do the nuts to the torque of 14-15 N-m

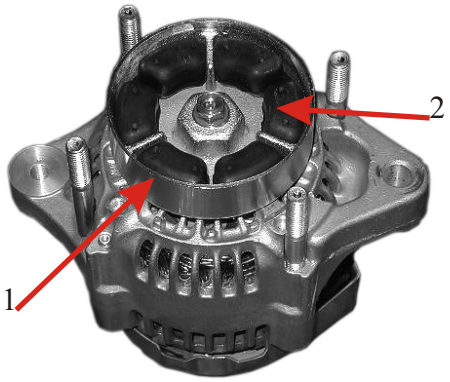

Fig. 115.
Installing the damper housing

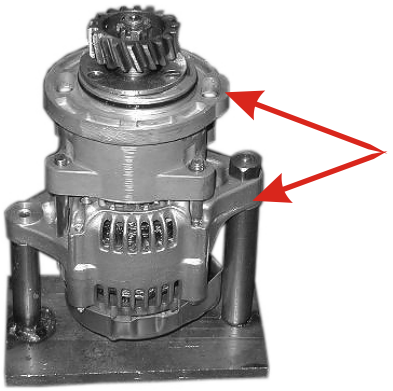

Fig. 116.
Installing the drive

4. STARTER

To start the engine up a little electric motor is required, i.e. starter. The starter must provide about 300 rpm to start the engine. It is possible only when the starter operates perfectly and the battery is sufficiently charged.
The starter consists of a drive housing, poles and a collector. The pole and the collector housings comprise armature and the collector itself as well as brush holder. The brush holder has coal brushes that tend to wear out rather slowly but consistently. Having the worn-out brushes the starter is not able to operate.
The front of the starter has a gear drive. When the starter is supplied with voltage from the push button the starter relay located on the starter housing moves the gear that meshes with the toothed crown of the flywheel. When the gear reaches the limit it is positively connected to the flywheel. The starter speeds up the engine to required speed. Once the starts the gear is rotated by the engine and overruns the engine within a short period of time. The connection to the engine discontinues and the starter does not interfere the engine operation.
The starting requires huge current, thus be sure to clean the electrical connections every time when maintaining. Clean the dirty connections and apply die-electric grease on them.

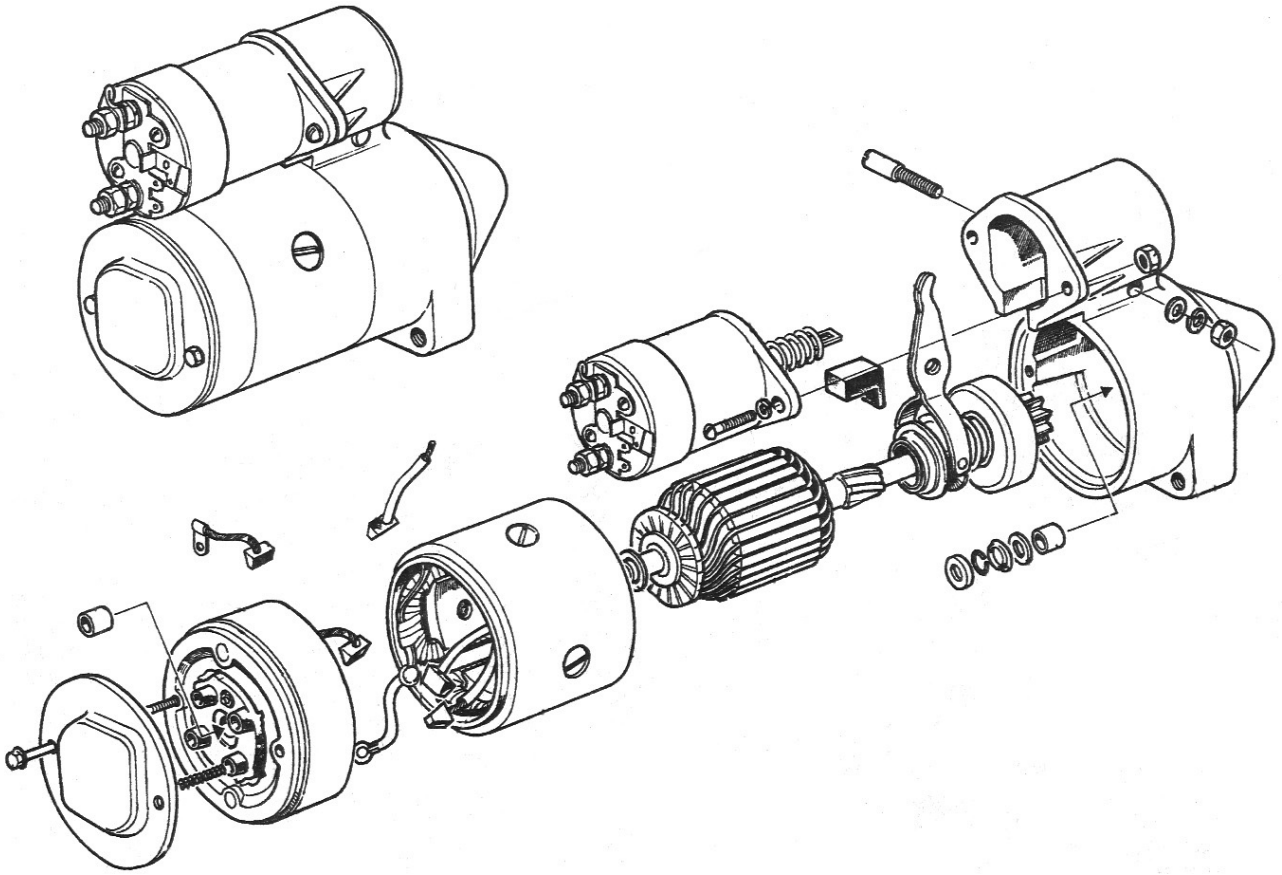

Fig. 117.
Starter General View

Faults, diagnostics and remedy

Fault	Remedy
When switched on the starter does not rotate, the starting relay does not operate	
1. The battery wrong or totally exhausted	1. Charge or replace the battery
2. The battery terminals are badly corrupted, wire ends dirty or loosen	2. Clean the terminals and wire ends, tighten the ends and apply protective stuff on.
3. Short circuit in winding, to ground cut in the starting relay winding	3. Replace the starting relay
4. The starting relay faulty	4. Replace the starting relay or clean its contacts
5. The circuit supplying the winding of starting relay broken	5. Check wires and their connections in the circuit
6. Faulty contacts of the ignition switch	6. Replace the contacts of the ignition switch
7. Wires powering the starting relay broken	6. Check the wires and their connections in the circuits: battery to the starting relay and to the starting relay connector
8. Armature of the starting relay seized	8. Remove the relay and provide easy move of the armature
When the starter on the armature does not rotate or rotates too slowly	
1. The battery wrong or totally exhausted	1. Charge or replace the battery
2. The battery terminals are badly corrupted, wire ends dirty or loosen	2.Clean the terminals and wire ends, tighten the ends and apply protective stuff on.
3. Loosen ends of wires connecting the power train with ground	3.Tighten connections
4. Contact studs of the starting relay loosen or nuts fastening the wires loosen	4. Clean and tighten the contacts
5. Collector burnt, brushes seized or worn out	5. Clean the collector, replace the brushes
6. Cut or short circuit in stator or armature windings	6. Remove the stator or armature
When the starter on the starting relay repeatedly operates and then switches off	
1. The battery exhausted	1. Charge the battery
2. Cut or short circuit in the restraining coil of the starting relay	2. Replace the starting relay
3. Voltage drop in the circuit powering the starting relay because of wire ends badly corrupted	Check wiring and the connections from the battery to the starter connector
When the starter on the armature rotates but the flywheel does not	
1. Idle run coupling slips	1. Check the starter on the test bench, replace the coupling
2. Coupling lever broken or jumped out	2. Replace the lever or set its shaft to the proper location
3. Drive ring broken	2. Replace the coupling
Strange noise from with armature rotating	
1. Bearing bushings or webs of armature shaft badly worn out.	1. Replace the starter or clutch housing
2. Loosen fastening of the starter or cover on the drive side broken	2. Tighten fastening nuts or repair the starter.
3. The starter is skewed	3. Check the starter fastening
4. Loosen fastening of the starter armature (the armature touches the pole)	4.Tighten the fastening screw
5. Gear teeth or flywheel teeth are broken	Replace the drive or the flywheel
6. The gear won't disconnect from the flywheel - The drive lever jammed - The sleeve on the splined shaft of the armature seized - Broken or week springs of starter relay or of coupling - The lock ring off from the coupling hub - Armature of starting relay seized	6. Make one the following operations - Replace the lever - Clean the splines and oil them with engine oil - Replace the coupling or starting relay - Replace damaged parts - Replace or fix the starter relay

The damages and faults are fixed by replacing the parts.

The rebuilding of the starter must only be performed in a specialized shop.

Replacing the starter brushes

-Undo two bolts fastening the stator

-Remove the cap protecting the gasket and brushes' springs

Undo two nuts in the rear fastening the brush holder terminals and remove the brushes along with the holder**.**

5. IGNITION SYSTEM DEVICES

The ignition system comprises the following devices:
- Microprocessor unit
- Double-terminal ignition coil
- Spark plugs
- Interference suppression resistor

Double-terminal ignition coil

Type……...KMSZ 3705060
Rated voltage on terminals of primary winding …….12 V
Gap between discharges and high voltage terminals, mm……...5.5
Camshaft maximum speed of uninterrupted sparking, rpm …..100

Spark plug

Type ……..NGK BP7H
Gap between electrodes, mm…….0.9-1.0
Threaded portion thread type …….SP 14 x 1.25

Mounting of the system onto engine

To mount the engine onto the system proceed as follows:

- Mount the ignition coil and fasten it with two M5X20 screws
- Mount the adaptor bushing onto the distribution cover of the engine and fasten it with three M5x16 screws
- Mount the rotor on the engine camshaft and fasten it with bolt M6x12
- Mount the microprocessor unit on the adaptor bushing the way that its leads face the ignition coil and fasten the unti with two M5x10 screws
- Connect leads K3 and "+" (black and red correspondingly) of the microprocessor unit to terminals of ignition coil (see Wiring Diagram).
- Connect wire "+12" connecting the ignition lock and ignition coil terminal (see Wiring Diagram).

Ignition timing
- Set the crankshaft of the engine into position corresponding the initial advance angle in accordance with the Owner Manual
- Slacken off the screws fastening the unit to the adaptor bushing and turn it clockwise until it stops.
-Power the ignition system having switched the ignition lock on.
- Turn slowly the microprocessor unit clockwise controlling the LED
- Turning the LED first results in LED on and then off.
- Stop turning the unit when the LED is off.
- Tighten screws fastening the unit
- Switch the ignition off.

Note: Finally adjust the advance when the engine is warmed up.
When required the initial advance angle of the microprocessor unit can be adjusted by turning it clockwise (increase) or counter-clockwise (decrease) taking in account the marks on the adaptor bushing. The divisions on the plate is 5 degrees.

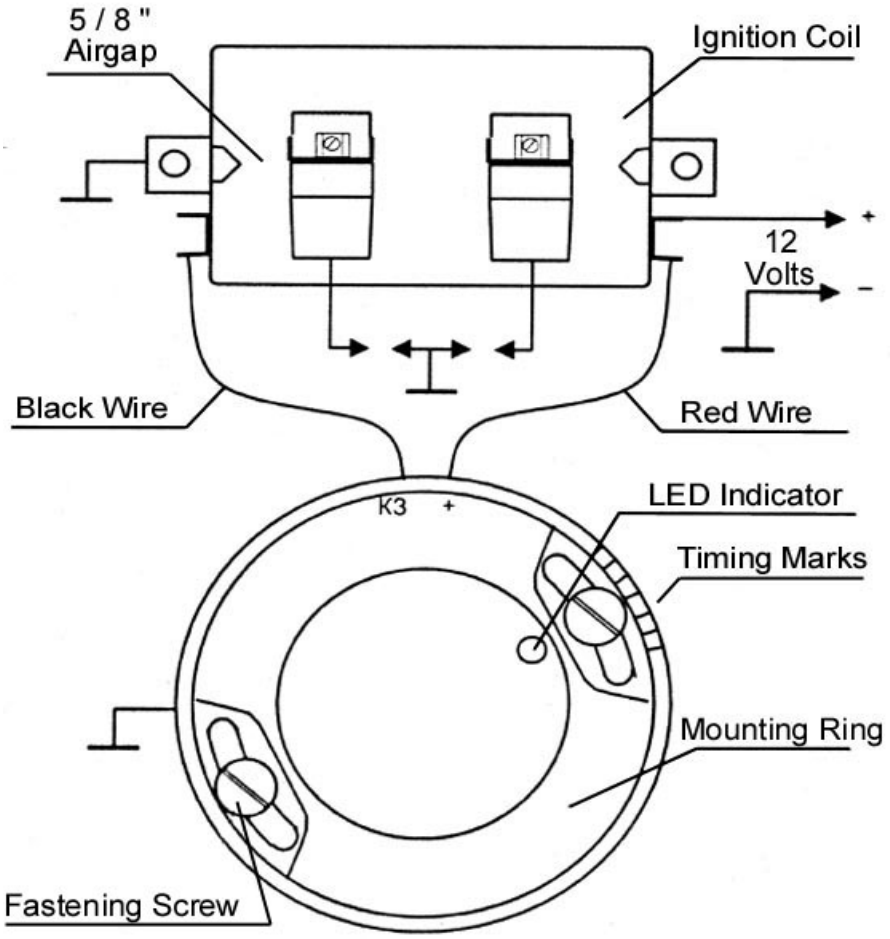

Fig. 118.
Ignition timing

Table 16

List of Lighting and Light-Signal Equipment

Equipment	Type	Purpose of lamp	Type of lamp bulb	Lamp power, W
Headlamp	ФГ137В	High-low beam	H4 12V60/55W	60/55
		Parking light	A12-4	4,0
Speedometer	СП158	Lighting of speedometer	A12-1	2.1
Pilot lamp	2202.3803-07	Direction indicator pilot lamp	A12-1	2.1
Same	2202.3803-47	Generator per formance pilot lamp	A12-1	2.1
»	2202.3803-28	High beam	A12-1	2.1
»	2202-3803-57	Gearbox neutral indication	A12-1	2.1
Side-car front light	0033.003712	Front side lamp, right-hand	A 12-8	8.2
		Front right-hand indicator	A12-21-3	25.0
Side-car tail light	0065.003716	Rear side lamp, right hand, filament 6 W and stop-light on side-car, filament 25 W	A12-21+5	25+6
		Rear direction indicator right hand	A12-21-3	25.0
Motorcycle tail light	0064.003716	Stop-light lamp on motorcycle	A12-21-3	25.0
		Illumination of license plate	A12-5	5.1
Turn indicator		Turn indicator		
front	0036.103726		A12-21-3	25.0
rear	0036.003726		A12-21-3	25.0

6. HORN

Type……..trumpetless, 20.3721000-01
Sound pressure at the distance of 20 meters at 12V, dB…….. 105-125
Voltage, V……..11-15
Current drain at 12 V. A ……..…….less than 3
Frequency at 12 V, Hz …….……..350-450

Mostly the failure of the horn is caused by dirt on the horn diaphragm or by defective push button. Replace if defective.
The sound level is adjusted by the
adjusting screw located on the rear of the horn housing.

7. WIRING

The motorcycle uses low-voltage wires having the cross section of 1 square mm of PGVA type. The high voltage wires are of PVL type.
See color coding on the diagram (Fig. 119).

BEARINGS USED ON MOTORCYCLE

Part #	Description	Location	Qty
205	Single-row radial ball bearing	Gearbox clutch shaft, camshaft	1/1
208	Same	On crankshaft journal	2
208	Same	In hub of final drive driven ring gear	1
304	Same	Gearbox main shaft	1
180206	Same	Sidecar drive	1
180207	Same	Sidecar drive	1
3056204	Double-row radial ball bearing	Sidecar drive	1
7000111	Single-row radial ball bearing	Sidecar drive	1
1000822	Single-row radial ball bearing	Sidecar drive	1
7204	Taper roller bearing	Wheel hub	8
12204	Roller radial	Gearbox clutch shaft	1
778707K	Radial thrust ball bearing	Steering column	2
864708ДМ	Roller radial Cage Rollers	Connecting rod big end	2
874901	Needle bearing	Final drive pinion	1
904700	Needle bearing	Drive shaft U-joint	4
904902	Needle bearing	Sidecar drive U-joint	8
948066	Ringless radial ball bearing	Clutch release mechanism	1
3086304L	Radial thrust ball bearing	Final drive pinion	1

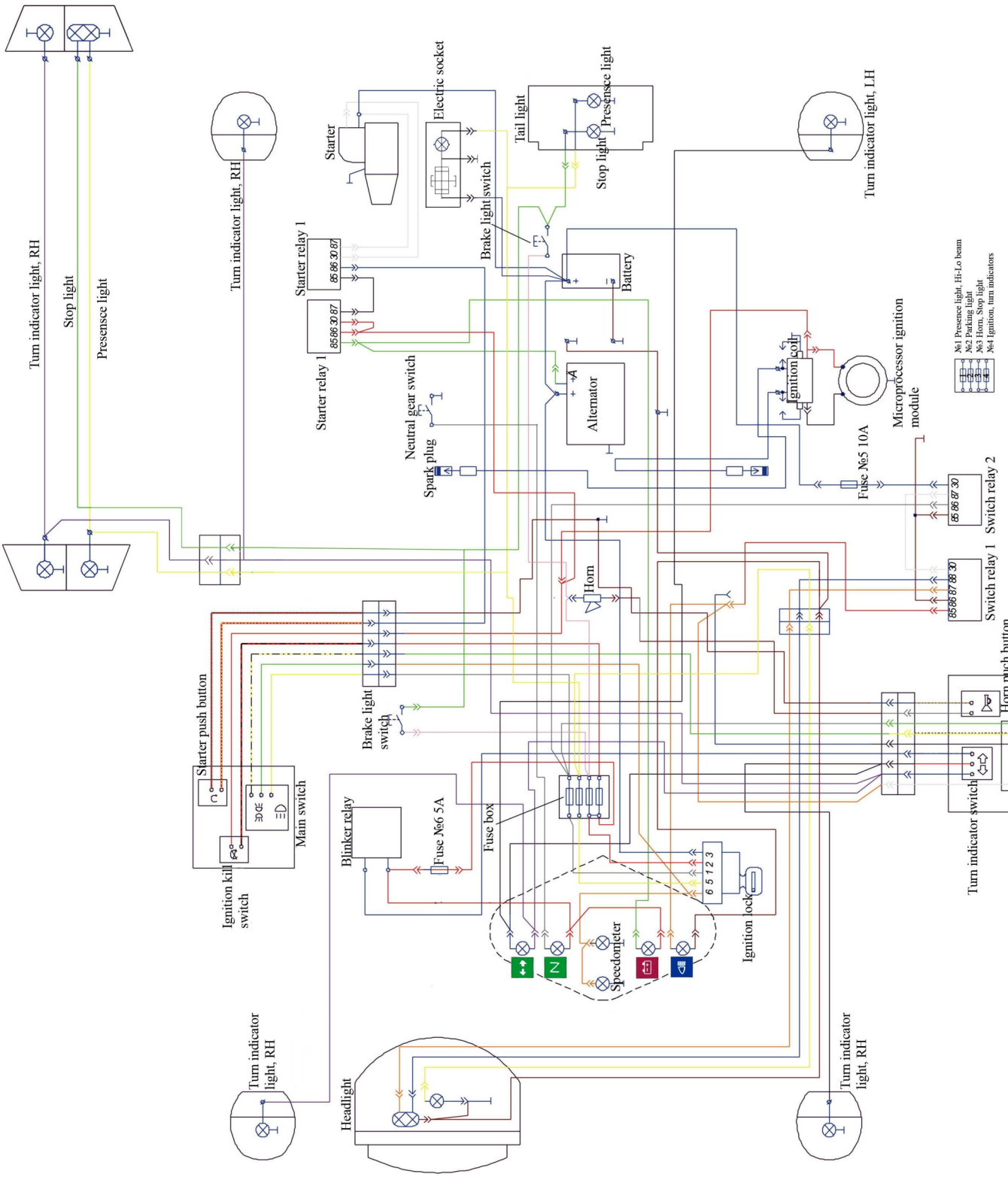

Fig. 119 Wiring Diagram

Seals and rings used with URAL motorcycle
Dimensions D-d-H

Used before 2005	Used since 2005
Cam shaft seal, 30.1-15-7 (621124-01)	RUBENA 30-16-8 (IMZ-8.103-01083)
Crankshaft seal, VITON 80-55-10 (IMZ-8.108-01081)	RUBENA 80-55-10 (IMZ-8.108-01081)
Seal of right hand cover of gearbox case 25.1-12.3-7 (62-04017)	RUBENA 25-12-7(IMZ-8.103-04017)
Clutch shaft seal 45-32-8 (62-04010)	RUBENA 45-32-8 (IMZ-8.103-04010)
Main shaft seal 48-36-7 (IMZ-8.103-04015-01)	RUBENA 47-36-7 (IMZ-8.103-04015-10)
Drive shaft fork seal 49,4-33-8 (IMZ-8.101-05033)	RUBENA 47-36-7 (IMZ-8.103—04015-10)
Gear shift pedal seal 32-15-7 (IMZ-8.103-04050)	RUBENA 32-15-7 (IMZ-8.103-04050-01)
Kick-starter shaft seal 40-20-10 (IMZ-8.101-04048-01)	RUBENA 40-20-10 (IMZ-8.103-04048
Wheel seal 36,5-25-8 (6206006-10)	RUBENA 35-25-7 (IMZ-8.103-06006)
Final drive case seal 59-45-7 (IMZ-8.101-05039)	RUBENA 60-45-8 7 (IMZ-8.103-05039)
Sidecar drive seal VITON 80-55-10 (IMZ-8.108-01081)	RUBENA 80-55-8 (IMZ-8.108-01081-10)
Clutch release slider ring 20.5-17-3.5 (7203207-A)	Clutch release slider ring 20.5-17-3.5 (7203207-A)
Clutch release rod 11.4-4.4-8 (7203213-20)	Clutch release rod 11.4-4.4-8 (7203213-20)