TMZ 200 ”Tula” manual.

Photos by Snorre A., Norway, using Sony Ericsson W800i, July 2007

SPECIAL CROSS-COUNTRY
MOTORCYCLE
TM3-5.952

TULAMASHZAVOD

Narijad-Order No._____

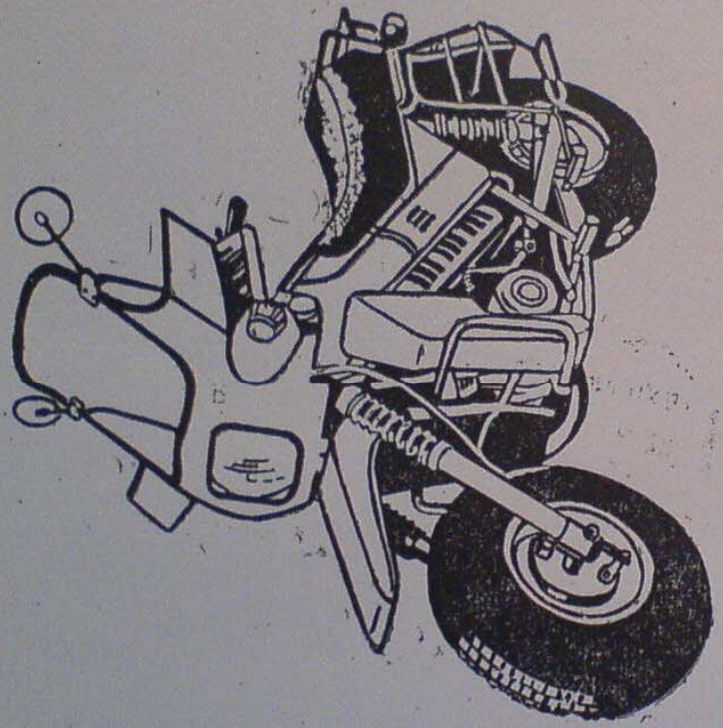
Special Cross-Country Motorcycle ТМЗ-5.952

Service Manual

097 200 000 ИЭ-1

097 200 000 ИЭ-2

TULAMASHZAVOD



Motorcycle TM3-5.952

MOTORCYCLE TM3-5.952

Acceptance certificate

Motorcycle is manufactured in accordance with the drawings and specifications, tested, preserved and accepted by Quality Control Department of the Plant.

Motorcycle No. 084715

Engine No. 95830

Frame No. В 17467

Date of production 26. 07

Speedometer readings 10 km

Date of preservation «26» 07 1994

Represervative of Quality Control Department

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Stamp place

ТЕХНИЧЕСКИЙ КОНТРОЛЬ ЦЕХ № 26

I. PURPOSE AND SPECIFICATIONS

Special cross-country motorcycle with piston displacement of 200 cu cm is intended for busyness and tourist trips, for carrying one passenger and luggage of 20 kg weight, max.

It has high technical parameters, low fuel consumption, riding comfort and operational reliability.

Motorcycle is intended for operation in different climatic conditions over the rough terrain and roads with covering and road service provided.

General Data

Wheel base, mm, not more than	1330
Road clearance, mm, not less than	125
Overall dimensions, mm, not more than:	
length	2000
width	950
height	1250
Dry mass, kg, not more than	128
Maximum load (driver included), kg	170
Maximum speed, km per hr, not less than	90
Braking distance at speed:	
40 km/hr, m, not more than	12.0
60 km/hr, m, not more than	24
Control fuel consumption per 100 km, l, not more than	3.5

Engine

Type	two-stroke with carburettor
Cylinder number	1
Piston displacement, cu cm	199
Cylinder bore, mm	62
Piston stroke, mm	66
Compression ratio	85±0.3
Maximum power output, kW (h. p.), not less than, at 5000±400 rpm	9.6 (13.0)
Maximum torsion moment at 4900±400 Nm (kgfm)	16 (1.6)
Engine lubrication system	fuel
Starting system	electric — by dynastarter, or mechanical — by kickstarter
Carburettor	K-65
Fuel	mixture of petrol A-76 and oil ESSO-2T, SHELL-2T, SAE 30/40W in ratio of 33:1

Cooling system	air, forced with fan
Air cleaner	with two paper filter elements ЭФВ-3.2

Transmission

Clutch	damping, adjustable, multiplate, running in oil bath
Gearbox	gear type, four-speed
Gearshift	foot
Gear ratio from engine to gearbox	2.353
Gear from engine to clutch	chain, type ПВ-9.525--1300 (50 links)
Gear from gearbox to rear wheel	chain, type ПР-12.7--1820-2 (116 links)
Gear ratio	2.533
General gear ration of gearbox (four-speed):	
first gear	3.000
second gear	1.644
third gear	1.235
fourth gear	0.900
General gear ratios from engine to rear wheel:	
first gear	18.824
second gear	10.316
third gear	7.749
fourth gear	5.647

Recommended Speeds, kms/hr

Table 1

Gear	New motorcycle	Run-in motorcycle
1	5—15	5—20
2	15—25	15—35
3	25—35	30—60
4	35—60	50—85

Running Gear

Frame	tubular with punched elements
Front wheel fork	telescopic with spring hydraulic shock absorbers

Shock absorber travel, mm, not less than	155—25
Rear wheel suspension	lever-type with spring-hydraulic shock absorbers
Shock absorber travel, mm, not less than	90±10
Wheels	disk-type, dismountable with aluminum cast hub
Brakes	shoe-type, dia. 150 mm
Tyre size inch:	
of front wheel	6.70—10
of rear wheel	6.70—10

Tyre pressure kgf/cu cm:	without passenger	with passenger
front wheel	1.0	1.2
rear wheel	1.5	2.0

Electrical Equipment

Electric power source	storage battery БМТС-9 (two batteries)
Ignition coil	Б-51
Dynastarter	ДС1Б. 87.5W
Generator regulator	PP-121 or PP-121A
Ignition switch	ВК 330 Б
Direction indicator switch	1803.3709

N O T E. While motorcycle operation over muddy all-terrain it is recommended to reduce tyre pressure to 0.8 kgf/cu cm in front wheel and to 1.0 kgf/cu cm in rear wheel.

Headlight beam switch with horn button	1703.3709
Light switch	ВК26-А2
Horn	С205Б or С205Б-02
Headlight (sealed beam)	ФГ 137Б or ФГ 140-200Б
Capacitor	К42-18-9
Speedometer	СП-131 or 18.3802
Spark plug	А17В
Tail lamp with stop light	bulbs А12-21+6
Portable lamp	А12-1
Direction indicator relay	РС57-В or РС491

Pilot Lamps

Signal lamps	1933.3803 (red) 1953.3803 (green) 1973.3803 (orange) 1943.3803 (blue)

Filling Capacities

Fuel tank, l, not less than	11
Reserve, l	0.5
Gearbox crankcase, l	0.7, oil SAE 40-50
Oil volume in spring-hydraulic shock absorbers:	
front fork, cu cm, into every bracket	200, SAE 20
rear swing arm, cu cm, into every shock absorber	55, SAE 20

Main Data for Control and Adjustment

Gap between breaker contacts, mm	0.4—0.7
Gap between spark plug electrodes, mm	0.5—0.6
Clutch lever play, mm	5—10 at lever end
Hand brake control lever play, mm	5—20 at lever end
Foot brake pedal play, mm	10—25
Ignition advance prior U. D. C., mm	2.8—3.6
Rear wheel drive chain sag, mm	15—20

II. CONTROL MEMBERS AND INSTRUMENTS

(see Fig. 1)

Handlebar is connected with the front wheel fork by means of the brackets. It may be set into position as to comfort the driver.

Clutch control levers, fuel valve control lever, hand brake control lever as well as headlight beam and direction indicator switches, carburettor throttle control lever and rear view mirror are mounted on the handlebar.

Clutch control lever is arranged on the handlebar left side, connected with the lever in the change-speed gearbox by means of the cable and intended for the clutch control. When pressing the lever the clutch releases and the engine crankshaft disengages from the change-speed gearbox.

Hand brake control lever is arranged on the handlebar right side and connected with the front wheel brake by means of the cable. While pressing the lever, the front wheel brake is put into action; in this case the stop lamp starts on. One should use the hand brake together with the foot one for effective and safe braking.

Emergency ignition cut out. By moving the red lever along the pointer (upward) ignition cutting out is performed.

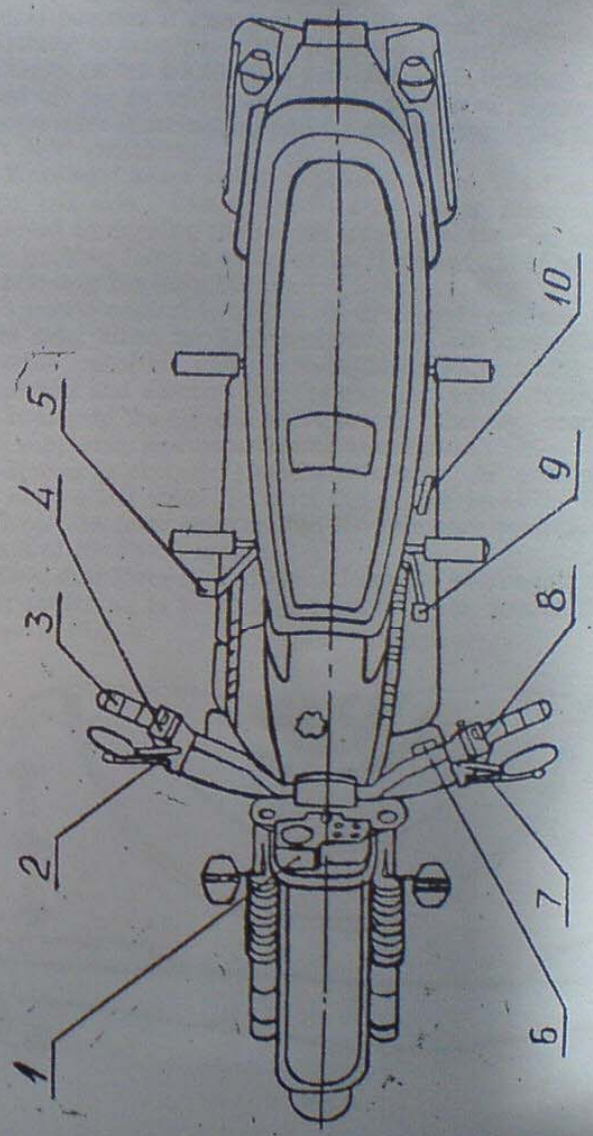

Fig. 1. Control members of motorcycle:
1—instrument board; 2—front-wheel hand brake control lever; 3—carburettor throttle control twistgrip; 4—emergency ignition cut out with light switch; 5—foot brake pedal; 6—fuel valve control lever; 7—clutch lever; 8—headlight beam and direction indicator switch with horn button; 9—gearshift lever; 10—kickstarter handle

Fuel valve control lever is arranged on the handlebar left side. While rotating the lever clockwise the fuel valve opens thereby enriching the working mixture; to close the fuel valve—turn the lever counterclockwise.

Ignition switch (Fig. 2) is provided to switch on and off the circuits of ignition, starter and lighting. The switch is intended for four positions. In the central position the ignition key is freely inserted and removed out of the switch. In this case no switching in the electric circuits is achieved. When turning the key into position II through 37° the voltage is supplied to terminal «КЗ» (ignition) and «ПР» (lighting). The engine being non-operated, do not keep the key in this position for a long time (because it may lead to ignition coil overheating). While further rotation the key clockwise up to the rest, terminal «СТ» (starter) switches in, terminal «КЗ» (ignition) being switched in as well. This position is not fixed and after engine starting by dynastarter (the key being released) the key returns into the fixed position automatically.

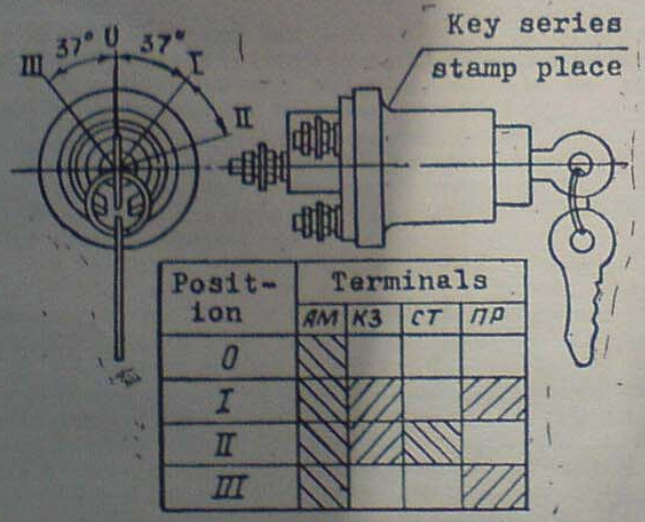

Fig. 2. Position of ignition key

When turning the key through 37° to the left from the central position it also gets into its fixed position, thereby switching in terminal «ПР» (lighting circuit).

Light switch ВК26-А2 is provided (with terminal «ПР» switched in) for switching in overall dimension lights, buld for speedometer illuminating and for current supplying to distance-dim light switching.

Headlight beam switch with horn button is set on the handlebar left side. Dimmer-to-distance light changing over is achieved by turning the switch lever. In the neutral position only parking lamp is switched in. Horn switching is carried out by pressing the horn button.

Throttle control twistgrip is arranged on the handlebar right side. When turning the twistgrip «to yourself» the carburettor throttle valve raises, thereby increasing the fuel supplying and accelerating the engine; while reverse turning the twistgrip the throttle valve lowers thereby decreasing the fuel supplying and decelerating the engine.

Starter (kickstarter) mechanism lever is positioned from the engine left side. To start the engine press the lever pedal by foot. The lever returns into the reference position under the action of the recoil spring.

Gearshift lever is positioned from the engine left side. Gearshift switching is performed according to gearshift diagram, given in Fig. 3.

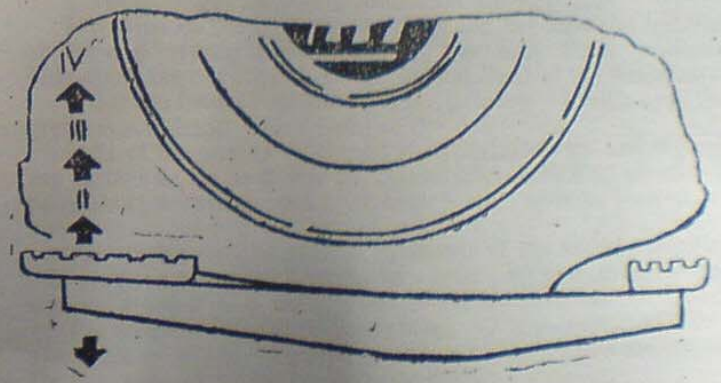

Fig. 3.

Foot brake pedal is arranged from the motorcycle right side. The rear wheel brake is put into operation by pressing the pedal, in this case the stop lamp starts on.

Antijoy ride device is positioned on the steering column right side. Steering fork locking in the extreme left position is carried out by means of this device. It is necessary to turn the steering fork into the extreme left position for its locking, to insert the key into the lock slot and turn it clockwise having pressed the key. This done, remove the key out of the lock slot.

Brake pad wearing-out indicator. To determine the wearing-out degree of the brake pads without disassembly of brakes, the motorcycle has the brake pad wearing-out indicator consisting of the pointer-shaped boss on the brake cover.

One should press the foot brake pedal or hand brake lever against the thrust in order to determine the brake pad wearing-out. The brake cam lever position when its contour reaches the pointer beginning on the brake cover should be considered as maximum wearing-out.

III. PREPARATION OF NEW MOTORCYCLE FOR SERVICE

In spite of the fact that each motorcycle is factory-adjusted, checked and run-in before your first riding it is necessary to.

1. Remove all the outer protective lubricant for slushing with the rags moistened in kerosene and wipe dry.
2. Check the oil level in the gearbox (p. 19).
3. Check the tyre pressure and pump up, if necessary, according to the instructions of the present Manual (p. 7).

Install complete units: storage batteries 3MTP-10, rear view mirrors, direction indicators.

Set the storage batteries having them previously put into the working condition in accordance with the «Operating Instructions for Storage Batteries» and the present Manual. Storage batteries 3MTP-10 should be connected in series (see Fig. 15). Before storage batteries installation it is necessary to remove air cleaner coupling springs, disconnect the black wire «mass» from the motorcycle frame and the red wire «plus» from terminal «Б» of the generator regulator and connect the black wire with the minus terminal but the red one with terminal «plus» of the storage batteries. The storage batteries having been installed, connect the black wire «mass» with the motorcycle frame and the red wire with terminal «Б» of the generator regulator PP-121, return the air cleaner springs.

The rear view mirrors are set into the bracket holes of the clutch levers and the brake and are secured by a nut.

5. Fill in the tank with fuel: mixture of petrol A-76 and oil ESSO-2T, SHELL-2T or SAE 30/40W, in ratio of 20:1 during running-in and that of 33:1 while further operation.
6. Prior to engine first starting it is necessary to drain oil primed into the cylinder for preservation. For this purpose screw out the spark plug, set the change-speed box into neutral position and rotate the crankshaft energetically by means of kickstarter or dynastarter.
7. Check the ignition timing and the gap between the breaker contacts (p. 17).
8. Check the clutch adjustment (p. 18).
9. Check the brake operation.
10. Be sure that lighting and signalling systems are properly operated.

Engine Starting and Motorcycle Driving Rules

For engine starting it is necessary to:

1. Turn on the petrol tap (the lever should be turned into position «O»).
2. Open the fuel valve.
3. Press the carburettor float depressor to fill the float bowl with fuel. To start the warm engine do not follow the above mentioned procedure.
4. Turn the gas twistgrip somewhat «to yourself».
5. Switch in the ignition inserting the key into the ignition switch and turning it clockwise till the first fixed position. This done, the red signal lamp should light at the dashboard.
6. Set the neutral position of the gearbox. In this case the green signal lamp should light at the dashboard.
7. Start the engine by means of dynastarter by turning the key further as far as it will go. Dynastarter switching on should be of short duration, not more than 8 sec, with an interval of 2 min.

The engine may be started by means of the kickstarter. For this purpose press the kickstarter lever by foot abruptly but without a shock with the ignition being switched on.

The cold engine should be warmed up by running at low speed for 4—6 min. **Engine warming at high speed results in the considerable wear out of engine parts.**

During a stop it is desirable to use the brakes of the front

and the rear wheels simultaneously and change the gear shift from fast to slow while deceleration.

Running-in of a New Motorcycle

Proper running-in of motorcycle ensures its reliability during further operation and normal service life. Running-in should be carried out during the first 2000 km.

The running of friction parts and the slacking of threaded and other connections take place during the running-in period. That is why the inspection, lubrication and tightening of the threaded connections should be performed in good time. For the running-in period the carburettor is fitted with a pin to limit the upward movement of the throttle. On no account should this limiting pin be removed until the running-in is completed. The following requirements should be observed during the running-in period:

1. Do not move off until the engine is warmed up during 4—6 min at idle running.
2. The motorcycle running-in should be performed with the limiting pin in the carburettor, in this case the travelling speeds should not exceed the recommended ones given in Table 1.
3. Do not ride over the heavy roads where the engine is likely to be overloaded.
4. Use the mixture of petrol and oil of the specified grade according to the Manual in the ratio of 20:1 during running-in and that of 33:1 while further operation. Mix petrol with oil thoroughly.
5. During the first 1000 km it is advisable to make halts every hour and stop the engine to avoid overheating.
6. Training to ride the motorcycle during running-in period is intolerable.

IV. ENGINE DESIGN

(see Fig. 4)

Engine consists of the piston-cylinder unit including the cylinder, the head the piston with its rings, piston pin and the crankshaft with the connecting rod; the gearbox consisting of crankcase, the engine gear, the clutch, shafts, gears and the gearshift; the cooling system consisting of blast housings

and fan; the electric equipment system consisting of dynastarter ДС-1Б, the breaker, ignition coil Б-51 with condenser, the high voltage wire, the spark plug cap and plug A17B.

Bimetallic cylinder. The cylinder sleeve is manufactured of special iron, the cylinder case is made of aluminium alloy. The cylinder and the cylinder head are secured to the crankcase with the help of four pins. The cylinder working surface (mirror) serves for piston travel direction. The cylinder has inlet, three blow and outlet channels, the branch pipe to connect with a silencer pipe and the flange with two screwed-in pins to connect with a carburettor. There provided the valve-homogenizer in the cylinder outlet channel to fill the engine with the fuel mixture more fully and qualitatively.

Piston is manufactured of special aluminium alloy. Two rings are mounted on it. Wear out of rings takes place during engine operation. Fuel consumption increases due to ring wear out and the oil is coked, i. e. scale is forming while oil gets into the gaps between the ring and the piston groove. The rings should be replaced after running of 9000—11 000 km to keep the engine in good condition.

The piston and the cylinder are classified into three groups 0; 1; 2 according to the diameter size. Piston group index is punched on the piston crown, and cylinder group index is on the upper aluminium portion of the cylinder. The piston should be replaced after running of 18 000—30 000 km depending on operation conditions.

Marking of the piston pins and pistons (according to the hole for the piston pin) is performed by groups: white, black, red. Colour index is applied to the piston boss and the piston pin end face.

Crankshaft is assembled of the right-hand and left-hand trunnions connected by the pawl on the press fit, it is not subject to disassemble. The left-hand trunnion is rotated around two ball bearings and the right-hand one is turned around one roller bearing. Outer rings of the bearings are pressed into the holes of crankcase halves. The rubber glands and labyrinth packing are located between two ball bearings put on the cylindrical journal of the left-hand trunnion. The driving sprocket is put on the semicircular key and secured by a nut at the trunnion journal end. The nut is locked by a special washer. The dinastarter armature is secured on the conic journal of the right-hand trunnion.

Crankpin connecting the crankshaft trunnion and the connecting rod represents cemented and hardened shaft.

The outer surface of the pawl middle cylindrical portion is the working one for the roller bearings of the connecting rod lower head.

Gas Outlet System

It consists of the silencer and the silencer element connected by the branch pipe. While operation it is necessary to perform cleaning of the silencer element from the carbon deposit. The first cleaning is performed every 2000 km of running, the consequent ones are done every 4000 km.

For silencer element cleaning it is necessary to extract the cover from the element body having unscrewed the screw. Clean the holes of the silencer pipe and the partitions from the carbon deposit, after that insert the cover into the body and fasten it by the screw.

Engine Maintenance

The outside surface of the engine should be always clean. Dirt and dust on the cylinder surface and its head have a detrimental affect on cooling and may cause engine overheating, excessive wear of parts and mechanisms and emergency stoppages.

To avoid fire hazards it is necessary to remove the remnants of fuel and oil off the engine surface.

Particular attention should be given to engine lubrication, **operation of motorcycle filled with petrol only is intolerable.** It leads to heavy wear of the friction parts, breakage of the connecting rod bearing and to failure of the engine finally.

While operating with the enricher mixture, loss of power and carbon formation is observed.

Heavy carbon formation on the piston crown, the cylinder head and the spark plug may cause knocks and overheating.

The carbon is removed by the metal plate with the subsequent scavenging by heavy air jet.

The carbon is removel out of the cylinder outlet channel with the help of steel scraper or scrape only after the outlet pipe and the cylinder head have been removed. The piston is installed into the lower dead centre and scavenge windows are plug with the clean rag so as the carbon fails to get into the

crankcase through the scavenge windows. The carbon having been removed, turn the crankshaft through some revolutions without putting the outlet pipe in order to avoid the removed carbon remnant getting into the silencer.

The carbon in the combustion zone (on the cylinder upper edge, on the piston crown etc.) is removed after the cylinder head had been removed. The piston in this case should be in the upper position.

It is necessary to clean the silencer outlet pipe periodically.

It is necessary to check the condition of the valve plate every 5000 km in engines with the valve at inlet after running of 15 000 km. The outer symptom of plate failure is a sharp decline of motorcycle speeding up dinamics and unstable operation of the engine while slow running.

Ignition Timing

For ignition timing it is necessary to:

1. Screw out the spark plug. Insert the measuring instrument into the hole.
2. Turn the crankshaft (by the fan impeller) counterclockwise until reaching the upper dead centre (U. D. C.) in the cylinder.
3. Mark the notch on the measuring instrument in this piston position, above it mark the second notch at a distance of 2.8—3.6 mm.
4. Adjust the gap between the breaker contacts: unscrew the screw intended for support securing and set the gap or 0.7 mm by the feeler using eccentric the screw in and check the gap again.

Due to wear of the lever pads the gap may drop to 0.4 mm.

5. Connect the portable lamp between «mass» and breaker ware and switch on the ignition (the lamp should light).
6. Rotate the crankshaft (by the fan impeller) clockwise till the contacts are locked (the portable lamp goes out) and further turn through 30—45°. The rotate the crankshaft carefully counterclockwise untill the contacts are disengaged (the portable lamp burns). At this moment the piston should be in the upper dead centre at a distance of 3.6—2.8 mm (corresponds to the second notch).
7. The contacts having been disengaged earlier or later, the ignition timing is wrong. So, release the screws securing the base and turn the latter to the right or left to the required value.

With the ignition timing properly adjusted tighten the screws.

V. POWER TRANSMISSION

Clutch

The clutch is designed for releasing and smooth engaging of the engine with motorcycle power transmission; it is important when starting, gearshifting, halting and braking with the operating engine.

The main parts of the clutch are two drums, a set of disks, springs, pawls and adjusting nuts

Large driving drum has grooves for driving disk projections. There is a sprocket of the primary drive chain for torque moment transition to the clutch driving drum through the damping rubber sleeves.

Small (driven) drum has evolvent teeth on the outer surface for setting of driven disks.

Driving and driven disks alternate and both are compressed by spring force through the pressure disk to create the friction force for torque moment transition.

The motorcycle clutch is switched permanently. In this position the driving drum rotation through the connected disks is transmitted to the driven drum and through in to the primary shaft rigidly connected with the drum with the help of slit connection.

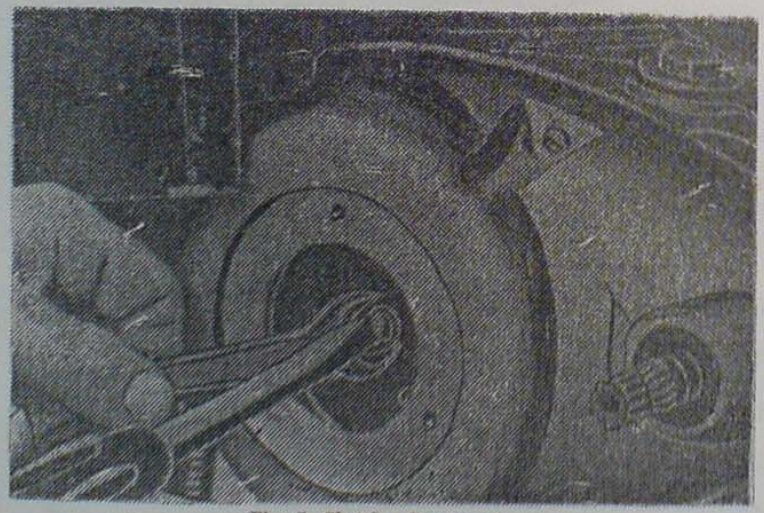

Fig. 5. Clutch adjustment

For proper clutch adjustment it is necessary to:

— put the motorcycle on the central support;

— screw home the adjusting connecting pipe of cable jacket on the engine;

— remove the inspection hole cover;

— screw out the locknut and screw the adjusting screw out;

— screw in the adjusting screw upon the rest in the rods stretching the cable so that the clutch pressure lever on the engine thrusts against the carburettor boss;

— screw in the adjusting screw through 1.5—2 of turn and holding it with a screwdriver lock by means of a locknut;

— adjust the free travel of clutch lever on the handlebar 5—10 mm by means of rotation of cable jacket adjusting pipe connection of the engine.

The clutch adjustment being performed (projection of the pin threaded end beyond the adjusting nut being 0,5—1 mm) but slipping not excluded, it is necessary to screw in adjusting nuts through 0.5—1 turn. In so doing pay attention the pressure disk should travel without skewness while pressing the clutch lever.

The clutch springs are manufactured in sets: of red (force of 40—44 kg), white (force of 44—48 kg) marking. The springs of one marking are installed into the clutch mechanism.

While motorcycle operation due to disks wear the clutch slipping may occur that is eliminated by means of screwing of three adjusting nuts through 0.5—1 turn.

Gearbox

With the help of gearbox (Fig. 6) the ratio of revolutions of engine crankshaft to those of driving wheel, i. e. power transmission ratio, changes.

The gearbox is four-speed, two-stroke with straight teeth cylinder gears.

The gearbox consists of two shafts, four pairs of gears and gearshift mechanism.

Gearbox maintenance is intended to observe the availability of oil, to replenish and change it in due time. The lever is considered to be normal when oil gets the inspection hole lower edge of clutch control.

Oil change should be made while the engine is hot, moreover immediately upon completion of the run in the following manner:

a) unscrew the drain plug in the lower portion of the crankcase left cover and drain the used oil;

b) screw in the plug and fill in the crankcase with 1 l of oil. Warm the engine during 3—5 min at idle running, the gearbox being engaged;

c) drain oil and fill in the new portion. Fill oil through the inspection hole in the crankcase cover.

It is recommended to repair the engine and the units of the running gear at a service station of the firm where your motorcycle is sold.

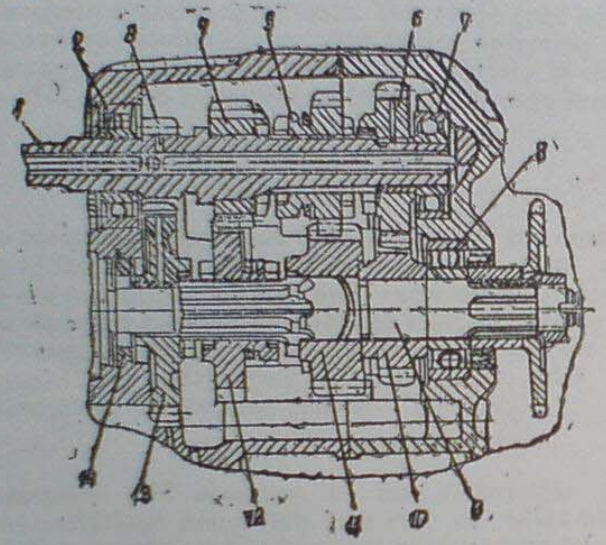

Fig. 6. Speed-change box:

1—primary shaft; 2—bearing No. 203; 3—first speed gear (as a unit with shaft 1); 4—second speed gear; 5—third speed gear; 6—fourth speed gear; 7—bearing No. 202; 8—bearing No. 204; 9—secondary shaft; 10—fourth speed gear; 11—third speed gear; 12—second speed gear; 13—first speed gear; 14—bearing No. 202

VI. MAIN GEAR

Mechanical connection of the gearbox output shaft and the rear wheel is the main gear.

The main gear is a chain one and consist of chain ПР-12.7-1820-2 (116 links) and two sprockets.

The driving sprocket with tooth number Z=15 is attached on the secondary shaft of the gearbox with the help of a nut.

The sprocket is locked on the shaft by slit connection to avoid pulling.

The driven sprocket with the tooth number Z=38 is connected by the rivets with the bearing body which is connected with the wheel hub by its evolvent slits.

To increase the chain service life it should be periodically removed, washed carefully and lubricated. The washer chain should be lubricated.

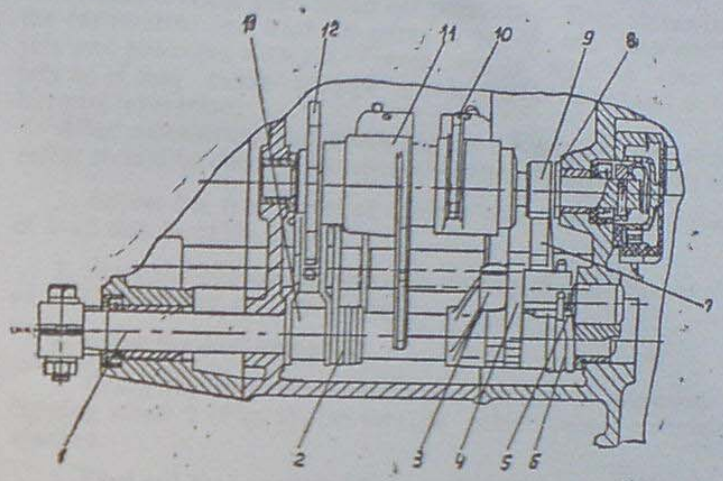

Fig. 7. Gearshift mechanism:

1—gearshift shaft; 2—lock spring; 3—crank; 4—crank pawl; 5—gearshift pawl stop; 6—retracting spring; 7—toothed segment; 8—rest bushing; 9—gearshift drum; 10 and 11—gearshift forks; 12—fixing disk; 13—lock

To remove the main drive chain proceed as follows:

1. Remove the rear wheel (Fig. 8).
2. Unscrew the semi-axle nut (left-hand thread).
3. Remove the semi-axle from the rear pendulum groove.
4. Knock out the rods to the wheel side out of bushes tightening the housings and extract the bushes.
5. Displace the rubber cases, remove the right chain housing.
6. Disengage the chain lock and take the chain out, having previously connected a new one to it.

When assembling observe the reverse sequence of operations.

The unloaded motorcycle standing on the main support, check the chain tension.

Chain sagging should be 15—20 mm in the centre of unloaded chain portion.

Take into account that a new chain is stretched intensively. Therefore check the chain tension during motorcycle running-in.

Motorcycle operation with weakly tensioned chain may lead to the failure of its parts, the chain vibrates hard, it may run against the sprocket tooth and break. The chain being heavily tensioned there appeared hard overloads of separate parts and units and primarily the chain it self which very quickly gets out of order.

Engine chain operates in oil bath. This chain does not require adjustment and maintenance. But during operation it stretches, thus sagging is increased, so it is necessary to check the condition of the chain from time to time and change it if necessary.

VII. FUEL SYSTEM

Air Cleaner

While motorcycle operation it is necessary to observe the condition of the filter elements. The signs of filter element clogging are mixture enriching and increasing of fuel consumption. It is permissible to blast the element inside periodically by compressed air with light knocking of the intake flange against any metal object or to clean the outer surface of the element by the vacuum cleaner.

Carburettor K-65

Disassembly and cleaning of the carburettor (Fig. 9) should be performed every 7000 kms run or when necessary (if some dirt or water get in it). Fuel mixture may be changed due to the position of the bevel needle relative to the throttle. For this purpose the needle is provided with several grooves which make it possible to control the mixture quality within the limit of 3/4 of throttle lift. Needle lowering causes the leaning of the mixture and its lifting provides enriching. The mixture quality control in idling conditions is performed by quality screw 3 which changes the air inlet into the idling system. Screwing in enriches the fuel mixture and screwing out causes its leaning. Idle stroke revolutions are controlled by screw 2. Its screwing in is intended for engine deceleration and screwing out — for engine acceleration.

There is float depressor 1 provided on the left of the mixing chamber body.

The carburettor has a fuel valve with its drive lever on the handlebar. With the lever turned by more than 50% of its travel there is provided the enrichment of the mixture; the necessity of this occurs sometimes when the engine operates at maximum power setting.

To clean the carburettor remove it from the engine, the air cleaner having been taken off previously. Then disassemble the carburettor and wash all parts in petrol and blow out the jets and passages with air. Never use a wire to clean the jets as it may cause change in jet section and fault of carburettor operation.

After assembling and mounting on the engine the carburettor should be checked for operation and adjusted. To this end:

1. Adjust the free travel of control cables within the limits of 1—2 mm in cable jackets.

2. Start the engine and warm it during 15—20 min running at medium power setting.

3. Close the fuel valve.

4. Bring the crankshaft revolution number to minimum by turning screw 2 (Fig. 9), the throttle cable being completely slacked.

5. Find out that position of screw 3 while its rotation in which the engine accelerates to obtain maximum stable revolutions at idle running.

6. Repeat the operations according to items 4 and 5 twice or thrice, set up minimum stable revolutions at idling.

7. Then check rideability of the motorcycle in the fourth gear at a speed of 15 kms/hr with the throttle being completely opened. In case the motorcycle fails to pick up speed and the engine misses, lower the throttle needle by one mark down and repeat the operation as many times as it is necessary for the motorcycle to pick up speed smoothly and without jerks.

8. After each displacement of the throttle needle it is necessary to adjust the idle revolutions (items 4—6).

The adjustment of the carburettor is considered to be normal if the cold engine misses at the beginning of motorcycle run but this trouble is eliminated after warming the engine.

Data for Adjustment

Diameter of orifice, mm of:	
spray nozzle	2.02
idling jet	0.8
passage	1.4
Output, cm³/min, of:	
main fuel jet	135
idling air jet	50

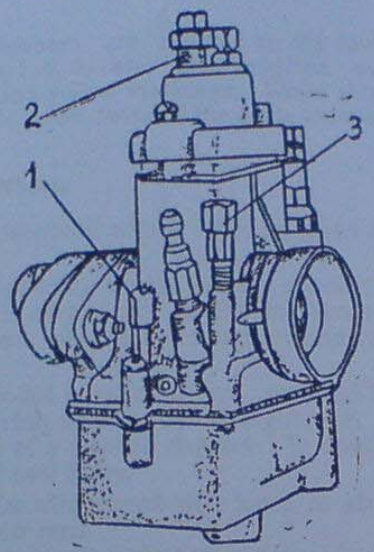

Fig. 9. Carburettor K-65:

1—float depressor; 2—idling screw; 3—screw to control mixture quality

VIII. RUNNING GEAR

Frame represents a weld construction on witch the main units and mechanisms of the motorcycle are mounted: engine, front fork with steering; petrol tank, electrical equipment, rear wheel suspension.

Front fork (Fig. 10). Disassembly of the front fork may be partial or complete (it is not recommended to disassemble the front fork completely without necessity).

The front fork is subject to partial disassembly to change oil in the shock absorbers and to complete disassembly — to repair and replace worn units and parts.

To change oil in the fork shock absorbers do the following:

— rest the motorcycle on the stand;

— turn out coupling plugs 1;

— take springs 14 out of each shock absorber and wash them;

— turn out and take out axle 34 of the shock absorber tube;

— drain dirty oil;

— fill 100—150 cm³ of petrol or kerosene through the hole in the main tube of the shock absorber and through the hole for the shock absorber axle drain the washing fluid (do not rock the fork when draining oil and washing fluid as due to displacement of the sliding tube relative to the shock absorber tube, the holes for the shock absorber axle will get misaligned).

Then perform assembling in reverse sequence. Fill the shock absorber with pure oil before screwing up coupling plug 1 (see lubrication chart).

Rear Wheel Suspension

The lubrication of attachment unit of the rear fork to the frame should be performed every 2000 km run through the lubricator on the fork.

To disassemble the rear suspension proceed as follows;

1. Remove the rear wheel and the main gear.
2. Remove the spring hydraulic shock absorbers of the rear suspension.
3. Having unscrewed the nut tightening the rear fork, extract the axle (there is a profile for the key from the opposite side on the axle head).
4. Remove the rear fork.

Assembling is performed in reverse order.

The main faults of shock absorbers (Fig. 11) are loss of elasticity, failure and wear of rubber parts of hydraulic damper, that may lead to shock absorber fluid leakage and failure of shock absorber as a whole. Operation failure of hydraulic damper causes the deterioration of stability inrough roads especially during movement at high speed. There appeared knocking in shock absorber and driver's hands feel rigid shocks.

The shock absorber fluid may leak through the rod gland and between the guiding bush and the cylinder, pressing out the packing rubber ring.

While leakage between the nut and the cylinder at first tighten the nut and if the leakage is not eliminated replace the packing ring.

Spring forces of shock absorbers may be adjusted in dependence with the load by means of a wrench supplied in the SPTA set. For this purpose there provided four grooves for the wrench on the outer surface of the shock absorber guiding bush.

The hydraulic shock absorbers are marked on the lower shackle by indexes: rear—0, 1, 2, 3, and are supplied with springs of white, red, green and yellow markings. While shock absorber replacing one should select those of the same marking in pairs.

Wheels

On the motorcycle there mounted wheels with stamped interchangeable separate rims.

While operation and depending on the service conditions the following defects of wheels may occur; cracks and bending of rims, wear of holes in them, wear of hub bearings and tyre wear.

The wheel rims heavily bended or cracked are replaced for new ones, small bending of rims should be straightened by hammer strikes with the help of a wooden support. In case of hole wear in wheel rims drill new holes.

Pins and nuts of wheel rim attachment with worn or stripped thread are replaced for new ones.

The necessity of wheel hub bearing change appears due to large play, hub gnashing and unnormal hub heat during motorcycle motion.

During motorcycle operation the wheel bearings should be lubricated periodicaly. The lubrication is filled during hub disassembly (see Lulrication Chart).

To remove the front wheel (Fig. 12) rest the motorcycle on the central support, disconnect the hand brake cable, screw out the axle nut and slacken the nuts of stop bolts in fork brackets. Holding the wheel drive the axle out of the front fork hole and remove the wheel. Unscrew the hub nuts, remove the hub. Thereafter unscrew the rim nuts, separate the rim parts and remove the tyre.

Installation of the wheel is performed in the reverse order.

To remove the rear wheel (Fig. 8) it is necessary to lift the motorcycle, put support under it, unscrew the axle nut, disconnect the brake rod, take the axle out of the rear fork hole, withdraw the lock, remove the wheel not taking the main gear off.

Thereafter unscrew the hub nuts, remove the hub, then separate the rim parts and remove the tyre.

Installation of the wheel is the reverse of the removal procedure.

Plane misalignment of wheels should be checked by straight rack of 2 m having applied it to the wheel side surfaces and pulling (lowering) the guides (left, right) of main gear chain tension align the wheel planes. Misalignment of wheel planes should not exceed 5 mm.

Tyres

Inspect the tyres before the beginning of each run.

For the tyres to wear evenly interchange the front and rear tyres every 2000 km.

The damaged tyre casings should be changed. Also check tyre pressure. Do not ride with the tyres underinflated or damaged.

While keeping of casings and inner tubes one should turn them periodically (once in 2—3 months) changing the point of rest or support.

It is intolerable to keep the tyres with petroleum products and chemicals having a detrimental affect on rubber.

Only proper types of casings, tubes, flaps and rims of corresponding sizes are subject to mounting. The wheel should not have any damages. The rim should be cleaned from rust and painted or chrome-plated.

In so doing it is necessary to observe the regular arrangement of tyre relative the rim.

After the tyre mounting for the rim one should inflate the tube to the required pressure, then eject the air completely, inflate a second time to avoid the formation of folds in casing.

While tyre operation the drivers should follow the requirements greatly affecting on tyre service life.

It is recommended urgently:

— after riding every day perform the tyre inspection for defects and removal of any foreign objects clogged in thread and side wall of tyre;

— observe the standards of loads and air inner pressure in the tyre. Do not lower the pressure in the tyre if it increases as a result of heating while motorcycle motion;

— do not allow the long parking (more than 30 days) with low-pressure tyres;

— set the motorcycle on the central support while long parking;

— avoid abrupt brakings and catching of the side wall against the tyre;

— check the good condition of valves and presence of caps for every tyre, availability and working order of the pump, presence of tyre patch kit and spare core.

Depending on service conditions the tyre life is 20 000—40 000 km run.

The possible maximum load of tyre is 210 kg.

Saddle is detachable. It is locked by a latch positioned in the saddle rear part. To open the saddle it is necessary to insert the key into the latch hole and turning the key counter-clockwise disengage the locking latch lever with saddle tray. Having raised the saddle rear part remove the saddle. Under the saddle there provided tools and accessories.

Brakes. Safe riding is largely dependent on efficient brakes. Therefore regular attention should be paid to the proper service conditions of the brakes.

Wear of brake facings increases the free play of the brake levers, so it is necessary to check them systematically and adjust the value.

The free play of the front brake is adjusted by the adjusting screw and that of the rear brake — by the adjusting nut. The free play of the end of the hand and pedal brake levers should be 5—15 mm. The front and rear brake levers are provided with splines for additional adjustment in the event the adjusting screw or nut fails to give sufficient results.

When ispecting the brakes the internal parts should be cleaned. If oily, the brake shoes should be washed in petrol or filed.

IT IS STRICTLY FORBIDDEN TO BURN THROUGH THE BRAKE SHOES BY FIRE!

IX. ELECTRICAL EQUIPMENT

Electrical equipment and instruments are subdivided into the following main groups:

a) sources of electric power — storage battery, dynastarter, automatic voltage regulator, reverse-current relay and starting relay (generator-regulator);

b) ignition system — ignition coil, breaker, capacitor, spark plug;

c) using equipment of electric power — lighting (head lamp, tail lamp), signalling (horn, direction indicator);

d) distributing equipment, wiring and instrumentati (dimmer-distance switch, direction indicator switch, la switch during evening ride; stop lamp, neutrals; light re breaker, pilot lamps, speedometer fuses, distribution panels a terminals).

Storage battery supply current all the using equipment electric power during parking, electric starting and also w riding at low speeds (dynastarter low speed).

The motorcycle is provided with two lead starting sto batteries БМТС-9 of 12 V, interconnected in parallelly. Earth is from the negative terminal (—).

The normal operating temperature range is +50°C to —2

Storage Battery Maintenance. 1. The storage batteries ply starting current up to 120 A at a short-time switching (with 2 min intervals) and supply power for lighting and While riding the storage batteries are recharged by the rator.

2. The storage battery is manufactured dry (without rolyte) in charged condition to provide quick chargin long-term storage as being dry before working condition to two years).

3. Prior to bringing the storage batteries into workin dition (before the first charging) perform the followin rations:

a) screw out the plugs;

b) open the gas-escape channel (opening) of the p piercing of the plastic diaphragm with the sharp metal or by cutting of the protrusion which covers the open the plug lower part;

c) fill the storage batteries with electrolyte (wate tion of battery sulphuric acid of 1.250—1.270 density at perature of 20°±5° C). For countries with tropic clim density should be 1.23—1.24 at 30°±5° C.

It is forbidden to fill the storage batteries with solut other acids.

4. The electrolyte should be prepared in an acid-re containers (made of ebonite, porcelain, ceramics, lea pouring the strong concentrated sulphuric acid into d water permanently stirring the solution.

5. The electrolyte lever in all storage batteries sh 8—10 mm beyond the protective screen.

6. The electrolyte being filled, keep 2—3 hours and th nect the storage batteries for charging.

Connect the negative and the positive terminals of the storage batteries to the corresponding terminals of the charging circuit. Charging should be performed by the direct current.

7. The current value of the first and all further, charges is indicated in Table 1.

Table 1

Charge	Charge stage	Charging current, A	Charge duration
First	1	1.6	5 hours
Second and all further	1	1.6	Until 2.38—2.40 V at each cell or 7.1—7.2 V at the storage battery are obtained. Then the current should be of the 2-nd stage
Second and all further	2	0.8	Until charge completetion, i. e. when intensive gassing occurs at each cell the electrolyte density and voltage should be constant during two hours

8. The duration of the second and all further charges is approximately 20 hours.

9. When charging the electrolyte temperature should not exceed +45° C, otherwise make an interval to cool the electrolyte to 30—35° C and then continue charging.

It is permitted use artificial cooling of the storage batteries.

10. At the end of the first charging the electrolyte density should be 1.280±0.010 (at 30° C). For countries with tropic climate the density should be 1.25±0.010 (at 30° C).

If the electrolyte density at the end of the first charge (5 hours) is lower than 1.270, one should continue charging to get the proper density value but charging time should not exceed 10 hours. Prior to disconnecting the storage batteries from charging adjust the electrolyte level according to item 5.

11. After the storage batteries have been charged carefully wipe them with wet waste and then with a dry one. Screw the plugs home into the cover holes. Lubricate the bolts, washes and nuts with technical petroleum jelly. The reafter the storage battery should be put into operation.

12. One should bear in mind that while using the storage batteries on the motorcycle at subzero temperatures the storage batteries capacity abruptly lowers and the electrolyte in the discharged batteries may freeze and break the monoblock at

12—16° C. To avoid this the electrolyte of the discharged battery is not lower than 1.230 in winter.

13. In servicing the storage batteries observe the following requirements:

a) to prevent the batteries from indercharging and over charging which abruptly reduce their service life, it is necessary to check the generator-regulator periodically. The latter should provide voltage of 13.6±0.6 V in the charging circuit;

b) every 10—15 days check the degree of battery charging by testing the density of electrolyte and perform additional charging in due time.

It is not recommended to permit deep discharge as this may result in sulphating of the plates;

c) maintain the electrolyte at the normal level by replenishing with distilled water. Do not top up with acid unless it is definitely determined that the electrolyte level is below normal due to its escape from the cell;

d) keep the storage battery clean. If clogged, clean the vent openings (gas-escape channel) in the plugs;

e) lubricate the bolts, nuts, washers, terminals. When tightening or screwing the nuts out it is necessary to use two wrenches in order to prevent the terminals from breakage;

f) never interconnect the terminals of different polarity to check the charge;

g) every 30—35 days charge the storage batteries by current of the second stage as far as charge completing in accord with Table 1.

h) every three months perform the control-training cycle, i. e. charge, discharge and charge again. Perform the discharge at 10-hour mode, given in Table 2.

Table 2

Nos. per order	Specifications	
1	Discharge current	1.0 A
2	Capacity	10.0 Ahr
3	Final voltage of: cell	1.70 V
	battery	5.10 V

14. The operating batteries should be kept charged with the electrolyte.

Before installing of the batteries for storage proceed the following preparation;

a) charge the batteries completely and at the end of charging check the density of the electrolyte which should be 1.280±0.010 (at 30° C). If the density of the electrolyte at the end of charging is differed from the normal one, go on charging and get it up to 1.280±0.010 (for countries with tropic climate—1.25±0.010 by adding water or acid depending on lowering or increasing the density of the electrolyte and set the level of the electrolyte according to item 5;

b) set the vent plugs into all cels, battery surface should be washer by water and wipe dry with rags;

c) clean the bolts and nuts from dirt and lubricate with the technical petroleum jelly;

In winter the storage batteries with the electrolyte should be kept in cold room at temperature not above 0° and not below—25° C. In summer it is permissible to store the batteries at temperature not above +35° C.

During storage once a month one should check the density of the electrolyte and when it lowers down to 1.230 (at 15° C) during storage at the temperature range 0°—25° C the storage batteries should be charged.

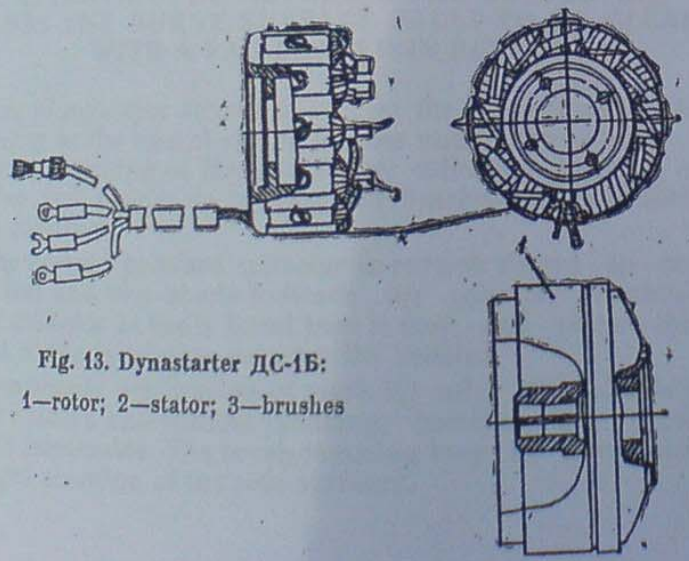

Fig. 13. Dynastarter ДС-1Б:

1—rotor; 2—stator; 3—brushes

Before battery setting on the motorcycle after storage regardless of electrolyte density value it is necessary to charge by current in two stages according to Table 1.

Dynastarter if a d. c. electrical machine capable of performing both in the starting and generating duties.

The main parts of the dynastarter (Fig. 13) are: rotor, (armature), exciter (stator), brush device (four brushes with brushholders).

The dynastarter armature is a bulky bell-shaped flywheel consisting of a flange with conic sleeve to attach the engine at the crankshaft end, armature core connected to the flange by special screws, end collector and armature winding. In the inner grooves of the armature core there provided two-layer sectional winding, the ends of which are brought into the end collector lamel slits.

The armature is mounted at the conic trunnion of the crankshaft and secured by dowel, washer and nut.

The exciter has a steel body on which twelve electromagnets are mounted, six of them (every second) serve as exciters while dynastarter as generator. Their windings are connected in series and switched parallel with armature electric circuit.

Six other coils are connected between each other and the armature circuit in series (series winding). These coils operate during starter action.

Four copper-coal brushes of grade M1 are secured in the brushholders connected in pairs and mounted at the stator body. The first pair is eathed, the second one is separated from earthing and connected with the outlets by series and parallel windings of the exciter.

The dynastarter operates in conjunction with the generator regulator and storage batteries. Dynastarter power is 87.5 W, in starter mode it is 180 W.

While engine electric starting the contact in starting relay is locked, the dynastarter being operated as a starter providing the engine starting. The starting relay contact being unlocked, the dynastarter operates as a shunt generator of direct current providing the supply for the entire electrical equipment (lighting, ignition system, cell charging).

Dynastarter maintenance. Dynastarter disassembly is performed in the following order: remove the breaker cover, disconnect the wire connected to it, remove the fan cover with the breaker. Then remove the base with the cam.

Screw out the nut by the socket wrench and shift the rotor outwards by a special remover. The stator is secured to the gland body by four bolts.

The dynastarter is assembled in the reverse order. It is necessary to provide tight but not too close fit of the left gland to the rotary part. The felt should be impregnated with oil. The nut securing the dynastarter on the shaft should be tightened safely (tightening moment is 3.8—4.2 kgfm), the dowel should be set tightly without gaps, all the bolts should be tightened uniformly and closely. Violation of this should lead to the crankshaft trunnion breakdown and dynastarter damages. For proper dynastarter operation one should observe the condition of its winding, collector, brushes, fitting and armature attachment on the crankshaft.

Regardless of the felt packing the winding surface is covering with dust in time. The smallest coal particles also deposit because of brush wear.

Every 8000—10 000 km run all the dynastarter parts should be cleaned by a brush slightly wetted in pure petrol and wiped dry.

The dirty surface of the colector should be wiped by rags slightly moistened in petrol if burnt they should be ground with thin sandpaper and thereafter the abrasive dust should be removed.

ATTENTION! DO NOTGRIND THE COLLECTOR UNLESS THE BURNT SURFACE FALLS TO BE CLEANED WITH A RAG SOAKED IN PETROL

Use of unproper screws to secure the fan impeller when repairing or the loss of spring washes under the screws may result in punching of the dynastarter collector, swelling of its lamelas and inevitable breakage of brushes and brushholders while starting.

The normal polished collector is reddish drown in colour. Heat tint and blue shade indicade the collector overheating. If the collector is badly burnt turn it dorn and restore the undercut of the insulation between the lamelas.

One should use brushes of mark M1 only. They should slide in the holders and without jamming; however, thir excessive play is intolerable. The brush jamming may be eliminateddue to slight cleaning of the side surfaces.

The dynastarter brushes should be changed if their length is reduced to 11 mm due to wear out (the new ones are of 16 mm).

Generator regulator represents an electromagnetic apparatus containing the voltage regulator, reverse-current relay and starting relay (Fig. 14).

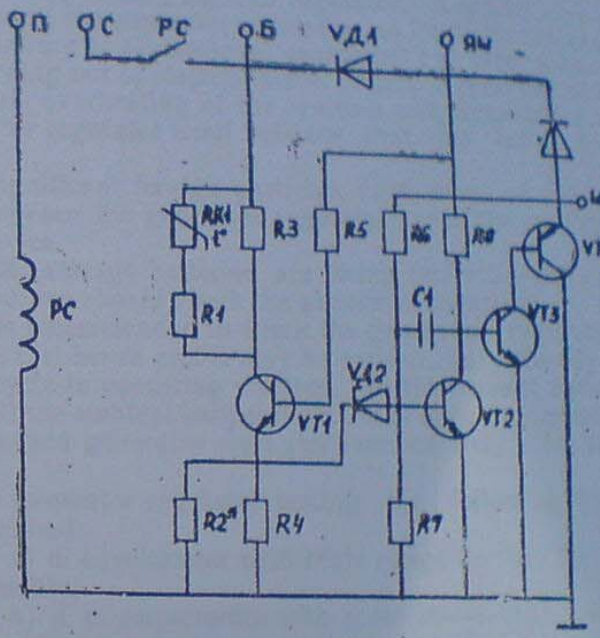

Fig. 14. Generator regulator wiring 2903.3702 diagram:

VT1, VT2—transistor KT 310БМ; VT3—transistor KT817Г; VT4—transistor KT837X; ВД1—diode ВСУ-10-1; ВД2—stabilitron Д818Б; ВД3—diode КД223А; C1—condenser К73-17-250-В-0.33 mu f±100-В; RK1—thermoresistor ММТ-1-0.25-1±20%-В; R1—resistor МЛТ-0.25-560 Ohm±5%-А-Д1-В-Р; R2—resistor МЛТ-0.5 (from 200 to 510) Ohm±5%-А-Д1-В-Р; R3—resistor МЛТ-1.0-100 Ohm±5%-А-Д1-В-Р; R4—resistor МЛТ-1.0-430 Ohm±5%-А-Д1-В-Р; R5—resistor МЛТ-0.25-3.9 KOhm±10%-А-Д1-В-Р; R6—resistor МЛТ-0.25-20 KOhm±5%-А-Г-В-Р; R7—resistor МЛТ-0.25-820 Ohm±5%-А-Д1-В-Р; R8—resistor МЛТ-1.0-560 Ohm±5%-А-Д1-В-Р

Starting relay is the electromagnet with movable armature and winding 1 connected to terminal «П» and generator regulator earth.

While engine starting terminal «П» of the generator regulator is connected to the storage battery through the contacts closed by ignition switch «К». The core is magnetized, attracts the relay armature and closes the spring contact 6 and stationary one 7. Then the current from the battery gets the series winding of the starter.

Voltage regulator. The voltage changes depending on the generator rotary speed. It may reach a great value (a few tens of volt). To maintain the voltage at a definite level the voltage regulator is used.

As the voltage increases at the dynastarter terminals, the current grows in parallel winding 5 of the regulator and when it gets the specified value the device is adjusted for, the electromagnet armature breaks the upper contact.

Additional resistors Rд+Ry are connected the exciter winding circuit as a result the voltage drops, attractive force of magnet decreases and the armature again closing the upper contacts short-circuits the resistors. The voltage at the dynastarter terminals increass again and the process is repeated. At further speeding up of the generator attractive force of the armature increases as far as lower pair of contacts is closed — is short circuited for Rш (resistor of exciter winding).

The exciting current decreases abruptly due to generator voltage drop. The contacts open and the process is repeated. The oscillation frequency of the regulator armature is more than 50 Hz as a result the voltage oscillations to not affect the using equipment operation. The great frequency of oscillations is attained by connection of the regulator parallel winding end to earth not directly but through resistor Ry.

To eliminate overvoltages of excitation winding while contact opening resistor Rш is used.

Due to levelling winding 4 the specifications of the voltage regulator are improved.

To reduce the affect of the temperature on the regulated voltage there is a magnetic shunt representing the plate made of ferronickel alloy connecting the core with the regulator armature. Magnetic conductivity of this alloy changes with temperature variations and due to this fact the magnetic flow change is compensated in the regulator magnetic system.

Reverse-current relay. As the voltage developed by the generator becomes lower than the voltage on the battery terminals, the generator is cut off by means of reverse-current relay and cut is again at reverse ratio of voltages.

Checking of the generator regulator. A special care should be given to the generator regulator as its malfunctioning may cause failure of all electrical equipment and other units.

Burning out of electric lamps, improper operation of storage batteries, overheating of the ignition coil, dynastarter and the generator regulator itself indicate that the latter is out of order.

Insignificant foreign particles, dust, drops of moisture getting between the generator regulator cause the malfunction of this device.

If the storage batteries are being undercharged or overcharged one should check the generator regulator.

It is recommended to check the generator regulator on a special test bench and it may be carried out directly on the motorcycle in operating position. In this case it should be cooled till the ambient temperature. It is not recommended to test the warmed generator regulator immediately after the engine stop.

For generator regulator testing the following instruments are required:

a) d. c. voltmeter with scale range up to 30 V, extra fine quality;

b) d. c. ampermeter with scale 15—0—15A, extra fine quality at least;

To check the starting relay of the starter directly on the motorcycle with the engine at rest, connect the portable lamp to the generator regulator terminal «С» and to the earth of the motorcycle having disconnected the dynastarter outlet from terminal «С».

When the starting contact is depressed or the positive terminal of the storage batteries is directly connected to terminal «П» with the lead the pilot lamp should light up indicating that the starter switch relay is in proper condition.

Starter relay armature should operate at 2 to 6 V.

Reverse-current relay is checked with the storage battery being connected. To check the reverse-current relay directly on the motorcycle disconnect the wire from generator regulator terminal «Б» and using an additional wire connect the ampermeter between this wire and terminal «Б».

Connect the voltmeter between terminal «Яш» and earth of the generator regulator. Gradually increasing the engine speed determine the voltage at which the reverse-current relay closes. This moment is indicated by deffection of the ampermeter pointer. The decreasing the engine speed note the value of reverse current which opens the reverse-current relay contacts. The reverse-current relay armature should operate at 11.9 to 12.9 V. The reverse current being cut off, the value should not exceed 10 A.

To check the voltage regulator make the following corrections into the circuit diagram:

a) disconnect the storage batteries (after the engine starting). Connect the using equipment or load rheostat to terminal «Б» of the generator regulator so that the load on the generator is approximately 7 A. Maintain the engine speed above that at which the reverse-current relay puts into action for normal engine operation;

b) connect the voltmeter between the earth and generator regulator terminal «Б».

Set the dynastarter to run at 3000 rpm and then observe the reading of the regulated voltage by the voltmeter which should be within 13.3—14.9 V.

Repair and readjustment of the generator regulator should be carried out only at a special repair agency.

Ignition coil represents a transformer with windings of low and high voltage and is designed for getting the high voltage current pulses to provide the breakdown of the spark gap in the spark plug.

The ignition coil is not repaired in the event of failure..

Breaker with capacitor. The main parts of the current breaker are: breaker lever, contact post and the cam. The breaker lever is a metal one, punched with a textolite pad which slides along the cam profile. The textolite or caprone bush separates the breaker lever from the axle and earth. The breaker contacts are made of tungsten. The force of lever spring at pad location should be within 500—600 g. The gap between the contacts should be 0.7—0.4 mm. The gap adjustment should be performed by turning the contact post eccentric.

Felt is served as a lubricant for breaker cam profile.

The capacitor of 0.17—0.25 mu f by capacity is arranged parallel to the breaker contacts. The capacitor reduces the sparking between breaker contacts and the current is decreased in

the primary circuit as a result the higher voltage is induced in the secondary winding of ignition coil.

Spark plug. Spark plug A17B (with thread 14×1.25 СТИМ) is undetachable one. The packing is provided between the spark plug and the cylinder head. The gap between the neutral and side electrodes of the spark plug should be 0.6—0.7 mm. Spark plug tightening force is 2.0—2.1 Nm.

Every 1000 km run it is necessary to:

1. Perform the mechanical cleaning of the spark plugremove the carbon.
2. Wash the spark plug.

The spark plug should not be repaired in the event of failure.

Headlight. The sealed beam ФГ 137 Б is used in the motorcycle. The headlight is secured by two bolts to the brackets. The adjustment of light beam direction is performed by headlight body turning relative to the brackets. Duble-filament bulb A12-50+40 is used in the sealed beam.

To change a bulb one should remove the sealed beam. Carefully press the terminal panel by hand and turning it counterclockwise so as the panel fixing lugs should come out of grooves, remove the panel and take out the bulb. The lamp holder of the cowl lamp is secured by the spring catches. To withdraw the holder it is necessary to pull it.

To adjust the light beam direction of the headlight it is necessary to:

— set the motorcycle (at normal tyre pressure) at the flat platform as far as 5 m opposite the white screen located in the shade (house wall of light colour may serve for this purpose);

— mark the corresponding centre of the headlight at the screen;

— switch on the dim light of headlight and adjust it having released the side screws to attach the sealed beam by turning the adjusting screw in the lower part of the headlight, then the centre of light spot should be 10 cm lower the headlight centre;

— secure the sealed beam in that position.

Direction indicators. Light signalling of the directions is carried out by indicators (bulb A12-21) operating together with relay-breaker PC-57B.

Direction indicator switch. Switching of direction indicator is performed by a switch on the left side of the handlebar.

The switch has three positions: in the middle position of the lever the indicators are cut off, in left position the left-hand direction indicators are cut in, in right position—the right-hand ones are switched.

Relay-breaker PC-57B is designed for getting the intermitten light signal by means of flickering incandescent lamps. It means the turn direction of the motorcycle.

Tail lamp serves for registration mark lighting and also for braking signal indication for the transport behind and light deflector. The tail lamp is provided with a bulb for registration mark lighting and stop lamp A-12-21+6.

Stop light. Stop light switch BK854 mounted at the frame has normally opened contacts closing due to foot brake pedal pressing, stop light in the tail lamp being lighted.

Horn. D. c. horn, type C205Б, is mounted on the motorcycle. The adjusting screw at the horn cover may change horn sounding.

Pilot lamps (indicators). The instrument board has four indicators with symbols; orange, blue, green and red. Underheath there are sockets with control bulbs A12-1.

Orange indicator marked with pointers «right-left» controls the direction indicator operation and lights (flashing) when the direction indicator is switched on.

The blue indicator marked by headlight conventionally lights with distance light being switched.

The green indicator marked by latin letter «N» is on when the gearbox is in neutral position. The red one marked conventionally by storage battery with terminals «+» and «—» is on while batteries discharge.

With the ignition on and the engine at rest, the red pilot lamp is at full glow due to storage battery operation. As the engine attains steady running the lamp grows dim and goes out (at approximately 1200—1400 rpm). Otherwise it is the indication that the electrical system is faulty. If burnt out, the pilot lamps should be replaced with new ones. Their good condition should be checked by connecting them directly to the storage batteries.

Portable lamp may be used in the motorcycle as a lighting device, feeler for current detection in different circuits of cut-in electric circuit, ignition moment indicator, double-end feeler to determine short-circuit (or proper condition of the circuit), isolation (or break) of the circuit, operation of the starter relay, the

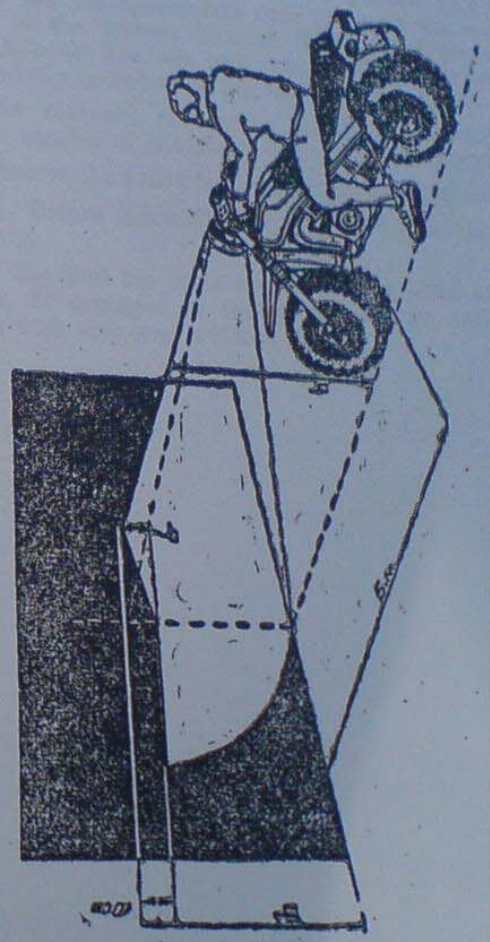

Fig. 16. Adjustment of headlight

reverse-current relay and the voltage relay together with the dynastarter; load for storage batteries complete discharge and for intraelement break checking of the storage battery.

Speedometer. The motorcycle has speedometer СП-131 including speedometer itself (speed indicator) and running counter. The speedometer gets rotation from the reducer secured at the gearbox crankcase through a flexible shaft. For normal operation of the speedometer it is necessary to connect the flexible shaft with the speedometer reducer and the speedometer safely but without tension. The flexible shaft cable having been secured in the speedometer should provide small (2—3 mm) free longitudinal play. The shaft is secured in the speedometer reducer in the same manner. The free play should be checked by connecting the shaft ends by turns and shifting the cable free end along the axis.

Fuses are intended for electrical circuit protection of the motorcycle. The fuse is rated at nominal current of 10A. Its core is made of a wire: a copper one of 0.23 mm; a brass one 0.25 mm, max.

Connection panels are intended for connection of the separate section of wiring while circuitry wiring.

Electrical wiring of the motorcycle should be carried out by wires of type ПГВА. To make the wiring easier and protect the wires from the mechanical damages the latters are enclosed into the tubes made of polyvinyl chloride. The wires have the coloring in accordance with the motorcycle electrical system applied to the Maintenance Manual.

The electrical wiring should be inspected regularly. A special care should be given to the quality of contacts, insulation, wire laying and reliability of lamp fixing in the holders. The wire insulation being worn out (as a result of improper securing) this place should be insulated by electric tape and the wire should be secured.

Give a special care to see that the wires are properly earthed (regulator relay and storage battery wire earthing).

While wire connection one should take into account the varicoloured wire ends in order to make electrical wiring diagram checking easier.

While dynastarter mounting one should observe the marking of wire terminals.

X. MOTORCYCLE LUBRICATION

The lubrication of the mechanisms units and separate parts should be carried out in strict compliance with the Lubrication Chart and the appropriate data given in the corresponding sections of the present Manual. The use of recommended grades of lubricants and oils and timely lubrication will contribute to dependable operation of the motorcycle.

The seasonal lubrication should be carried out regardless of the number of kilometers covered by the motorcycle.

Observe the following lubrication requirements:

1. Before lubrication remove dirt and old lubrication thoroughly.

2. See that the seals and protective boots are in proper condition. If damaged or faulty replace the seals and protective boots with new ones without delay.

XI. LUBRICATION CHART

Nos. per order	Lubrication points	Lubrication should be performed periodically after running, km	Qnty of points	Grade of lubricant or oil	Lubrication instructions
1	2	3	4	5	6
1	Engine	Every refilling		ESSO-2T, SHELL-2T SAE 30/40W	Fill fuel tank with mixture of oil and petrol in specified proportion
2	Gearbox	2000	1	Engine oil	
	a) level and filling check			SAE 40-50	
	b) oil change	4000		— » —	
3	Control cables	4000	1	— » —	Wash in petrol, then oil
4	Wheel hubs	4000	2	SHELL RETINAX A	Lubricate
5	Wheel brake cam shafts	4000	2	SHELL RETINAX CD	Disassemble, wash and lubricate
6	Pendulum	4000	2	SHELL RETINAX A	Lubricate
7	Speedometer reducer	4000	1	SHELL RETINAX CD	Ditto
8	Breaker arm pin	10000	1	Engine oil	Ditto
9	Felt for lubrication	1000		— » —	Lubricate by dripping
10	Steering column bearings	15000	2	SHELL RETINAX A	Disassemble, wash and lubricate heavily
11	Final drive chain	4000	1	Graphite lubricant for chains	Wash in petrol anb lubricate
12	Suspension dampers, oil change	10000	2	Oil for shock absorbers, SAE 20	Lubricate if necessary
13	Front fork	10000	2	— » —	— » —
14	Final drive	2000		SHELL RETINAX A	
	a) inspection and filling with lubricant				
	b) lubricant change	4000			Wash crankcase with kerosene and fill with fresh lubricant

XII. MOTORCYCLE SLUSHING

When slushing the motorcycle the painted surfaces should be washed and wiped.

The unpainted metal surfaces should be wiped with kerosene and lubricated with technical petroleum jelly.

Depending on the last lubrication date lubricate all or separate places according to schedule of operations.

Warm up the engine by running for 20—30 km, remove the air cleaner and increasing the gas supply pour 15—20 cu cm of oil into the carburettor diffuser by means of oiler.

Drain petrol from the tank, dry the tank and rinse it with oil.

Storage Battery Slushing

When being out of service (in winter) or because of other breaks in operation, the storage battery should be kept with electrolyte and fully charged (the electrolyte density being 1.27 g/cu cm at +15° C) in a cool place at a temperature of 0° C, not more, minimal temperature of storage place should be not below —25° C.

The storage battery should be kept clean, dry with plugs being screwed up; the bolts, nuts and the battery terminals being cleaned of dirt and lubricated with technical petroleum jelly.

Every month during storage check the state of charge of the battery by testing the electrolyte density. The latter being lowered to 1.23 g/cu cm at +15° C, recharge the storage battery.

The storage period is over, the storage battery is installed on the motorcycle fully charged.

Storage

The motorcycles should be stored in a storehouse with natural ventilation.

Never store the motorcycles and their accessories in the same storehouse with hemically active substances.

XIII. POSSIBLE FAULTS AND TROUBLE SHOOTING

Trouble	Trouble cause	Remedy
1	2	3
Engine fails to start:		
a) no petrol in float chamber	No petrol in fuel tank; cock hole or petrol pipe is choked	Fill with fuel or disassemble and clean fuel feeding system
b) normal mixture is not formed	Low grade of fuel. Fuel is not mixed with oil	Change fuel. Mix fuel and oil thoroughly
Engine fails to start: it is hard to start or misses	Defective spark plug	Change spark plug
	Oil or carbon on spark plug electrodes and insulator	Clean spark plug and set home
	Dirty or burnt breaker contacts	Clean contacts
	Maladjusted gap between breaker contacts	Adjust gap according to Manual
	Ignition coil is faulty	Check primary winding break and breaker «for spark» by plug by means of feeler
Engine misses	Leaky crankcase in joint places of its halves	Tighten up screws having released cylinder attachment nuts or overhaul engine
	Irregular or insufficient fuel feed	Clean feed system
	Water in fuel	Change fuel
	Dirty or leaky needle valve	Clean needle valve
	Leaky float	Repair or replace float
	Thick carbon layer on exhaust opening edge	Clean cylinder bore and pipe
	Muffler pipe openings are clogged partly or completely	Clean pipes by wire, check by exhaust jet
	Insufficient amount of oil in fuel	Carefully observe recommended ratio of fuel and oil specified in Manual
Engine overheats and fails to develop full speed	Brake shoes are too tightened (drum gets warm heavily)	Adjust free play of brake lever
	Clutch slips	Adjust according to Manual

1	2	3
	Capacitor is defective or contact is poor	Change capacitor. Provide contact
Ignition system is in good condition but engine fails to fire or fires irregularly	Poor compression: a) punctured cylinder head gasket	Change gasket
	b) badly worn working surfaces of cylinder and piston rings	Engine requires repair with replacement of worn parts
	c) burnt or broken piston rings	Clean piston grooves or replace rings
Engine starts but stalls and fails to operate under load	Sunk down needle in throttle chamber	Take out throttle and return needle to its appropriate place
Engine is hard to start	Clogged jets	Blow through jets
Racing of engine after starting	Defective LH oil seal of crankshaft	Overhaul engine, replace oil seals
	Defective RH oil seal of crankshaft	
	Defective or unpressed oil seal cover gasket	
	Long riding in high gears with unsatisfactory service conditions	It is recommended to ride low gears at long lifting, along sand, mud, etc.
	Broken valve plate	Replace valve plate
	Thick dust layer on cylinder outer surface and its head	Remove fan air offtake and perform cleaning
	Ignition advance or delay	Reduce or increase ignition
Sudden stop of engine: a) mechanical damages	Piston tacking in cylinder (wedging) as a result of overheat	
	Stopping of crankshaft by other mechanisms of motorcycle	Check dynastarter, crankshaft, gearbox, main gear transmission and driving wheel by rotation
b) feed system is faulty	Clogged holes in parts of petrol system	Clean
		Insufficient amount or lack of petrol in petrol tank
c) ignition system is faulty	Break or short circuit in electrical circuit	Check by probe and inspect fuse
Clutch slips	Maladjustment	Adjust as specified in Manual
	Jamming of cables or levers	Inspect and eliminate
	Worn or broken clutch plates	Disassemble clutch and replace plates

1	2	3
Clutch drags, it fails to disengage completely	Jamming of cable in sheath	Lubricate or replace cable
	Maladjusted free play	Adjust free play of clutch lever according to Manual
	Too thick oil is used or it became thick	Replace oil and use recommended oils. It should be diluted by kerosene in winter
Clutch fails to disengage at all	Broken cable	Replace cable
	Turned off central nut holding clutch drum	Tighten nut and lock it
	There is no ball between rods after disassembly	Check and insert ball
Gears fail to change	Incomplete disengagement of clutch	Adjust clutch
	Possible broken separate parts	Perform inspection and correction
	Drum with forks or other parts are installed improperly as a result of unskilful overhauling	Overhaul gearbox
Gear engages in motion	Worn gear clutch cams	Replace gears and inspect clutch mechanism
	Defective gearshift mechanism. Gearbox maladjustment	Eliminate defects according to recommendations
Self-shifting of fourth gear	Free play of gear 6 (see Fig. 6)	Shift main gear bearing race and put adjusting washers
Noise in gearbox	No oil in gearbox	Fill in required amount of oil
	Damaged bearing or any part	Observe thoroughly and perform replacement or correction
	Foreign object in crankcase	Inspect and remove
Oil leakage out of crankcase	Secondary shaft oil seal is faulty	Replace oil seal
	L. H. oil seal of crankshaft is faulty (engine smokes)	Replace oil seal
	Faulty gaskets between crankcase parts or under inspection hole cover	Replace gasket
	Burrs at side surfaces as a result of careless disassembling	File bright

1	2	3
	Running Gear Troubles	
Loosening of joints	Loose attachment of engine on frame	Should be checked by inspection
	Undertightened fastenings of front and rear forks	Should be checked by inspection
Frame defects	Frame deflection as a result of impact while operation (alignment of wheel planes is faulty)	Should be checked by inspection or gauge. Correct place of deflection
	Cracks and fracture of frame	Check by inspection
Front fork is faulty	Fork brackets or front fork main tube are bent as a result of impact while operation	Check by inspection and gauge Ruler or profile may be used
	Hard wear of hinge joints	Check by inspection, replace damaged parts
	Cracks or fracture of parts	Check by inspection
	Steering column bearings are overtightened	Slacken tightening
	Steering column bearings are too loose	Check tightening
Rear fork defects	Hinge joints are badly worn	Inspect. Change worn parts
Hydraulic shock absorbers are faulty	No oil in one shock absorber (different resistance)	Disassemble shock absorbers Change gland packing Fill in oil
	Jamming of piston or shock absorber rod	Inspect for scores. Measure rod non-rectilinearity
Tyre defects	Worm tyre thead pattern or its irregular wear	Detect by inspection. Interchange tyres
	Tyre pressure is too small	Check by manometer
Defective wheel hubs	Wear of one or several bearings in wheel hub	Check for free play. Change if necessary
	Rims or other parts are bent	Inspect and correct
	Weakened attachment of rim disks on hub	Check nut tightening

1	2	3
Brake system damage	Drum braking by shoes due to maladjustment	Check by wheel rotation. Abjust
	Presence of much dirt or foreign objects	Inspect and clean
Pilot lamps fail to light	Storage battery does not supply electric circuit	Check for voltage at storage battery terminals, clean them from oxides
	Blown out fuse in using equipment circuit	Replace fuse
	Defective wiring	Perform inspection
	Central switch is faulty	Perform inspection
	Blown out filaments of pilot lamps	Check lamps
Lamps light but darken	Heavily discharged storage battery	Charge as specified in Manual
	Poor contact in circuit	Clean contacts
Mechanical loss of power	Engine is faulty	Eliminate defects
	Dynastarter armature rubs against exciter poles	Check armature fitting
	Brushholders rest against armature collector	Check attachment of crankshaft R. H. oil seal body
Storage battery is faulty	Heavily discharged or unfit for starting	Eliminate defects as specified in Manual
	Poor contact in electric circuit	Check, clean and tighten contacts
Generator regulator is faulty	Broken bus «earthing» on generator regulator base	Check by inspection. Set separate wire
	Oxidation or combustion loss of starter relay copper contacts	Check by shorting of terminals «С» and «Б» of generator regulator
	Burnt starter relay winding	Check by inspection. Set ignition key into initial position
Dynastarter defects	Collector brushes are worn or out of order	Perform inspection of brushes and brushholders
	Short circuit of armature winding to earth	Check by tester
	Earthing of brushholders due to graphitic dust of great amount	Clean dynastarter

1	2	3
Defective signal system		
Horn does not sound	Switch with horn button is faulty	Perform visual inspection having disconnected from handlebar
	Horn breaker or its contacts are out of order	Inspect and clean contacts

XIV. SPARE PARTS, TOOLS AND ACCESSORIES (SPTA)

Nos. per order	Name	Qnty	Remarks
1	2	3	4
1	Bag for tools	1	While operation the tools and accessories are located under the seat
2	Combination pliers 150	1	
3	Screwdriver 175×0.9	1	
4	Wrenches:	1	
	socket wrenches 14; 17	1	
	socket wrenches 22	1	
	spanner 8×10	1	
	spanner 17×22	1	
	spanner 12×14	1	
5	Screwdriver 100×0.4	1	
6	Special wrench	1	
7	Tommy bar И-1	1	
8	Pump ИЖ 49.28-7	1	
9	Tyre patch kit APM	1	
10	Ignition and hood lock key	2	
11	Dynastarter remover	1	
12	Spark plug and breaker feeler	1	
13	Coupling link	1	
14	Bulb A-12-1	1	
15	Bulb A12-21-3	3	
16	Fuse	4	
17	Service Manual	1	
18	Rear view mirror	2	
19	Tyre manometer МД 214	1	
20	Portable lamp	1	
21	Operating Instructions for Storage Battery	1	
22	Piston ring	2	
23	Wrench insert	1	
24	Storage battery	2	
25	Wrensh of handlebar nuts and exhaust pipe	1	
26	Wrench for antijoy ride device	2	
27	Instructions on assembling the rear view mirror	1	
28	Storage battery tray	1	
29	Valve plate	1	
30	Coupling	1	
31	Spark plug A17B	1	

LIST OF APPLIED ILLUSTRATIONS

CONTENTS

Инструкция по эксплуататации на мотоцикл
специальной повышенной проходимости
ТМЗ-5.952

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