

ZUNDAPP

**Servicing Manual for
Two-Stroke Engines, 50 cc
3, 4 and 5 Speeds**

**Travaux sur moteurs
deux temps de 50 ccm
à 3, 4 et 5 rapports**

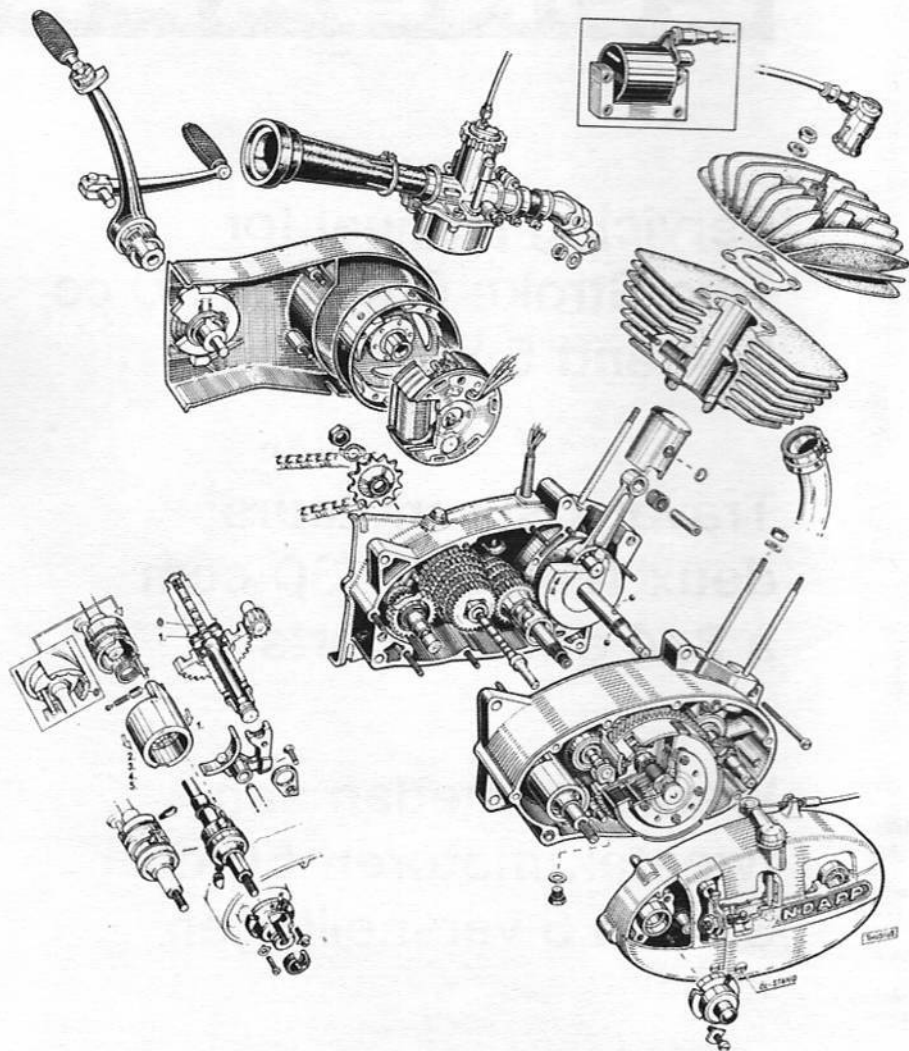
**Werkzaamheden aan
tweetaktmotoren 50 cc
3, 4 en 5 versnellingen**

Edition March 1975 / Edition de Mars 1975 / Uitgave Maart 1975

Engine, Type 284, 5 speeds – Pedal gear change – Kickstarter

Moteur, Type 284, 5 rapports, sélection au pied, kickstarter

Motor-Type 284, 5-versnellings-voetschakeling, kickstarter



Transmission arrangement applies with appropriate modifications to all engines described in the manual.

Le montage de la boîte (vue éclatée) est analogue pour tous les moteurs décrits dans le présent opuscule.

De constructie van de versnellingsbak geldt in wezen voor alle motortypes, die in deze handleiding worden beschreven.

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Introductory Notes

The comprehensive text of this extensively illustrated manual on engine dismantling and assembly applies with appropriate modifications to all models with manual or pedal gear change and kickstarter. Where the assembly sequence differs in a few respects, or where different tools are needed, special reference is made to the changes in the relevant chapters. The manual covers the following engine models:

Type/code	Starting by	Gear Change System	Gears	Cooling by
266	Pedal	Manual	3	Airflow
266	Pedal	Pedal	3	Fan
276	Kickstarter	Pedal	4	Fan
278	Kickstarter	Pedal	3	Airflow
278	Kickstarter	Pedal	3	Airflow
278	Pedal	Pedal	3	Fan
280	Kickstarter	Pedal	4	Fan
280	Kickstarter	Pedal	4	Airflow
280	Pedal	Pedal	4	Airflow
280	Pedal	Pedal	4	Water
284	Kickstarter	Pedal	5	Fan
284	Kickstarter	Pedal	5	Airflow
284	Kickstarter	Pedal	5	Water

Complete dismantling of an engine is only called for in cases of damage to the gearbox, crank drive, kickstarter assembly (except for kickstarter spring) or the manual gear-change assembly. Defects of the gear selector mechanism – steel-ball selector mechanism for pedal-change engines – clutch, crankshaft drive gear of engines with either manual or pedal gear change, can be remedied after taking off the clutch housing cover. Consequently, the engine need not be taken off the frame. But in all these cases, the gearbox oil must be drained off through the drain plug in the bottom of the housing. This is preferably done while the engine is still warm. Gear-change pedal, kickstarter pedal with return spring, plain pedal, chain sprocket, flywheel magneto (wheel and baseplate), cylinder with piston, cylinder head and fan assembly can all be taken off and fitted without dismantling the engine. Here, of course, the oil need not be drained from the gearbox.

For air-cooled engines, disregard all references to the fan system.

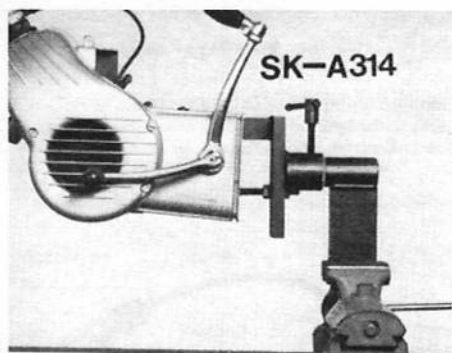


Fig. 1
Image 1
Afb. 1

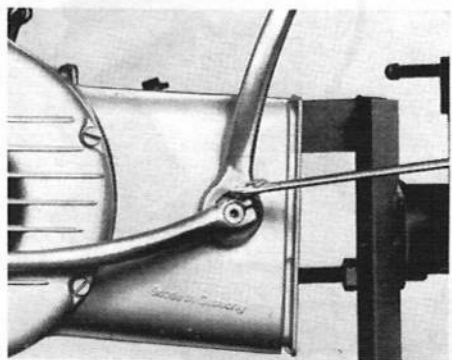


Fig. 2
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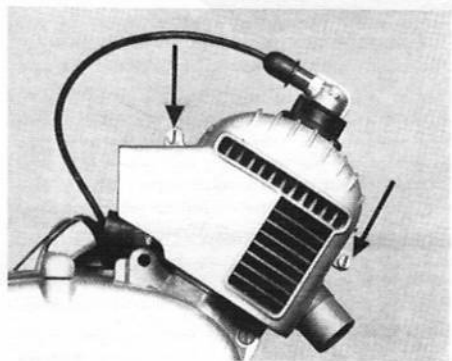


Fig. 3
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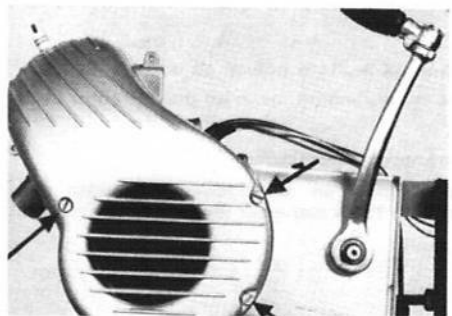


Fig. 4
Image 4
Afb. 4

1. Dismantling Engines

a) Taking off Gear Change Pedal and Fan Casing

Fit engine into service fixture SK-A 314, draw off spark plug connector (fig. 1).

Take off gear change pedal. To do so, take off the hexagon screw (10 mm WAF spanner) even before taking the engine from the frame (fig. 2).

This only applies to pedal gear change engines.

Take off fan casing cap, first removing two cylindrical screws, M 5 x 15 (fig. 3).

Remove 3 cylindrical screws, M 6 x 45, from the left side of the fan casing, then take casing off (fig. 4).

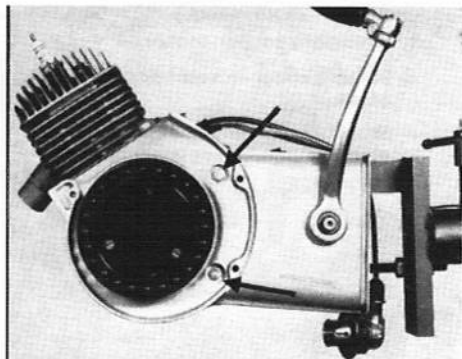


Fig. 5
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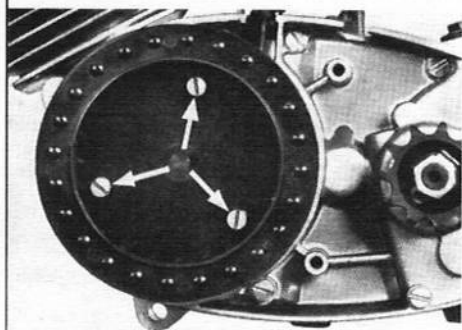


Fig. 6
Image 6
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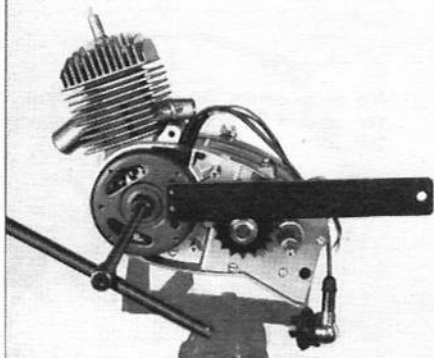


Fig. 7
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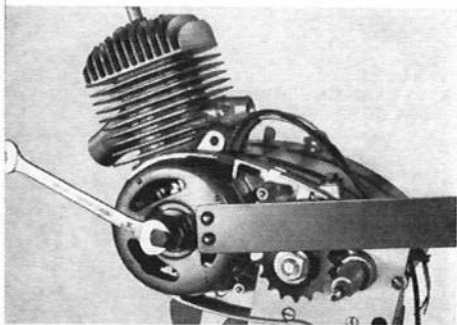


Fig. 8
Image 8
Afb. 8

b) Taking off Casing Cover, left and Kickstarter Assembly

With a 10 mm socket key, take off 2 hexagon screws, M 6 x 45, then remove left-hand casing cover, complete with kickstarter, kickstarter spring and cover plate which also acts as the kickstarter stop (fig. 5). On air-cooled engines, slacken 2 cylindrical screws, M 6 x 55, instead of the hexagon screws mentioned above.

On engines with pedal starting and pedal gear change, you can take the gear off the kickstarter spindle.

Take the 3 cylindrical screws, M 6 x 12, off the flywheel magneto, then remove fan (fig. 6).

c) Dismantling Ignition System

Holding the flywheel firmly with service tool SK-A 297, take off the poleplate nut with socket spanner (fig. 7).

Fit press-off bolt SK-A 263 to wheel, hold assembly firmly in position with tool SK-A 297 and press wheel off the magneto spindle on the crankshaft. Remember the key which secures the wheel to the crankshaft (fig. 8).

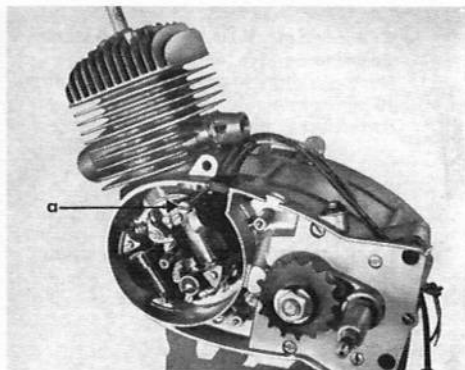


Fig. 9
Image 9
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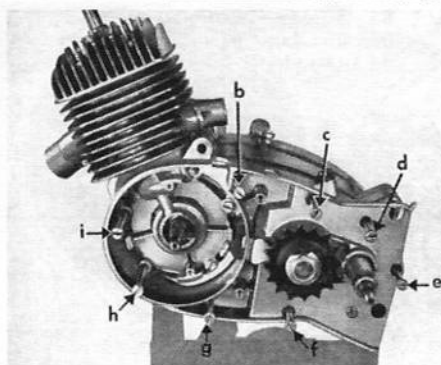


Fig. 10
Image 10
Afb. 10

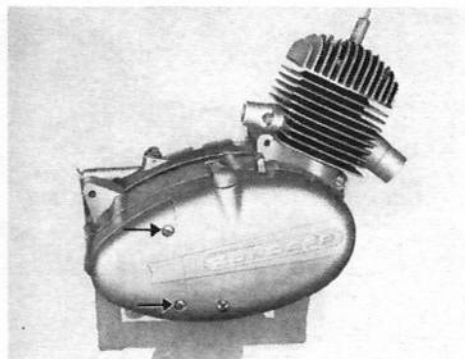


Fig. 11
Image 11
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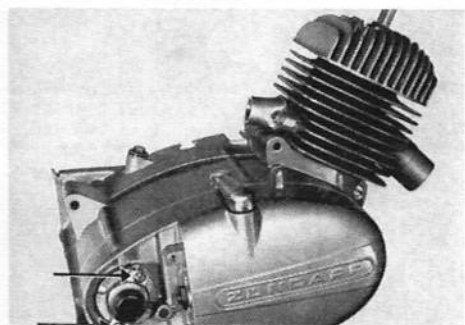


Fig. 12
Image 12
Afb. 12

If the work described in the following passages is confined to the clutch and pedal gear change system, the base-plate can remain on the left casing. If the engine must be completely dismantled, take the plate off now, first removing the 2 cylindrical screws, M 4 x 15, and the casing screw, M 6 x 98, complete with cable clip (fig. 9).

d) Taking off Clutch and Cover for Gear Change Setting Controls

Take casing screw (a) with cable clip and screws (b) to (i) off the left-hand casing cover.

Three screws remain on the casing, 2 at the magneto and 1 below the starter spindle (fig. 10).

Remove connector cover closing off the clutch re-setting and gear change setting controls for pedal gear change engines. The cover is fixed with two countersunk fillister-head screws, M 5 x 20, to the right-hand casing cover (fig. 11).

On engines with manual gear change, the setting dome for adjusting the gear change assembly is not provided. Slacken 2 fixing screws, M 6 x 15, on the setting dome (fig. 12).

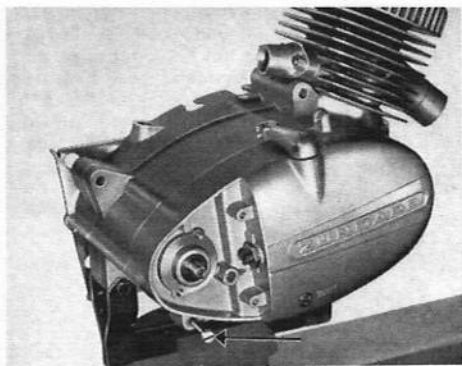


Fig. 13
Image 13
Afb. 13

Take off setting dome, remove cylindrical screw, M 6 x 50, underneath starter spindle (fig. 13).

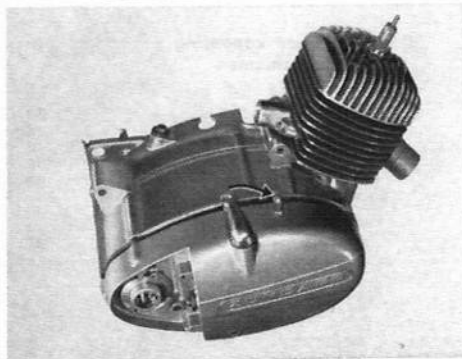


Fig. 14
Image 14
Afb. 14

Operate the clutch lever to press off the clutch housing cover. Located inside the clutch housing cover are:

- Clutch spindle with lever
- Clutch dog (tongue)
- 2 leaf springs for clutch dog
- Ball-headed threaded pin for re-setting clutch dog
- Bush for pedal and gear change spindle
- Gearbox oil level checking screw
- Guide pin for selector slide (pedal gear change engines only).

On engines of type 276 and 280, the third crankshaft bearing is a needle bush, on engine 284 a ball bearing.

Engines 266 and 278 have no third crankshaft bearing (fig. 14).

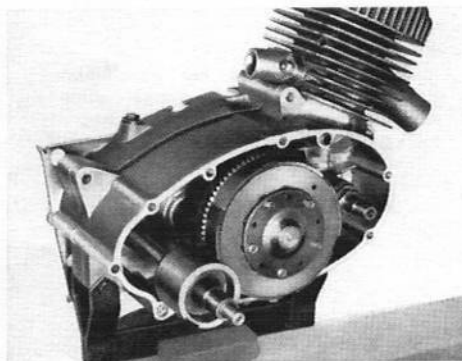


Fig. 15
Image 15
Afb. 15

e) Taking off Pedal Gear Change Spindle and Selector Slide

Take off pedal gear change spindle and selector slide (fig. 15).

Only on engines with pedal gear change.

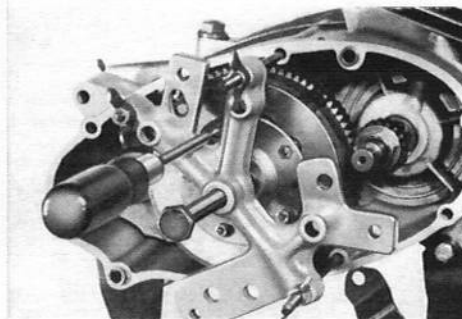


Fig. 16
Image 16
Afb. 16

f) Dismantling Clutch

Fit service tool SK-A 235 to clutch with 3 studbolts, SK-A 292. Take off 5 nuts, M 4, with the 7 mm socket key. Slacken the clamping bolt, and clutch thrust plate, springs and spring bushes can now be taken off (fig. 16).



Fig. 17
Image 17
Afb. 17

Bend up the tab washer, fit hold-down tool SK-A 297 to clutch thrust plate, then release clutch nut with the socket key (fig. 17).

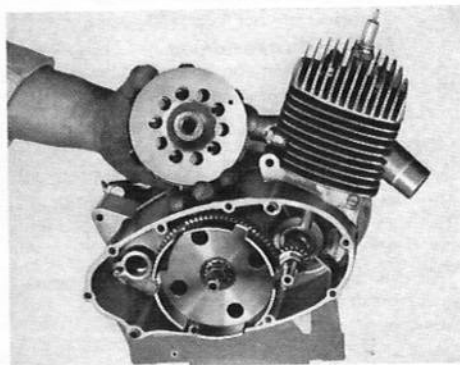


Fig. 18
Image 18
Afb. 18

Take off clutch, complete with hub and the packing washers behind the hub (fig. 18).

The clutch gear remains inside the right-hand casing, held by a snap ring on the inside (gearbox).

Note

This does not apply to engines of type 284, where the clutch gear, complete with ball bearing, can be pulled off from outside, after which the steel-ball selector can be removed.

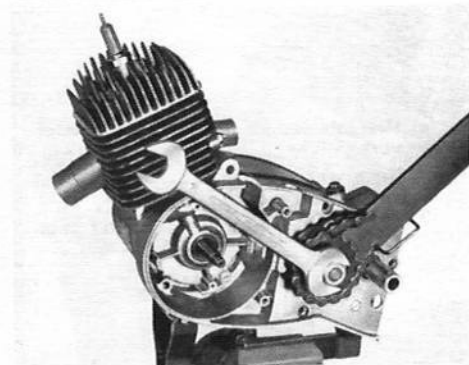


Fig. 19
Image 19
Afb. 19

g) Taking off Chain Sprocket

Bend open the locking tab washer and with an open-ended spanner take off the hexagon nut (if necessary, use a two-arm puller tool, fig. 19).

h) Taking off Cylinder and Piston

Take off cylinder head and cylinder. Remove the 4 nuts, M 7, with the 11 mm socket key. Take off the washers underneath, then lift away cylinder head, head gasket, cylinder and base gasket; take off piston rings (fig. 20).



Fig. 20
Image 20
Afb. 20

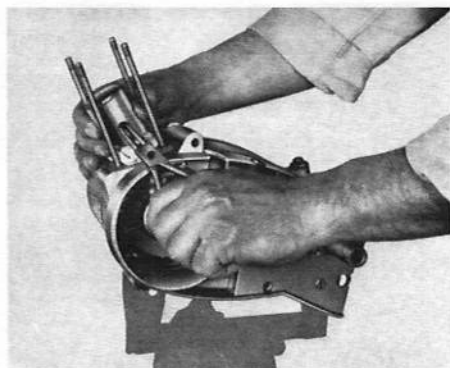


Fig. 21
Image 21
Afb. 21

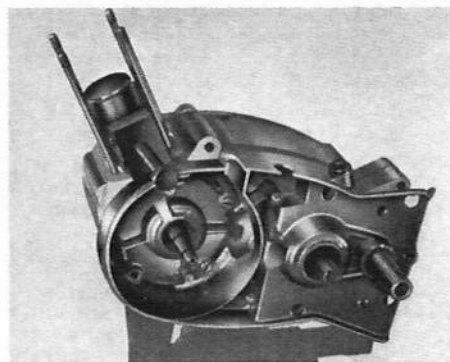


Fig. 22
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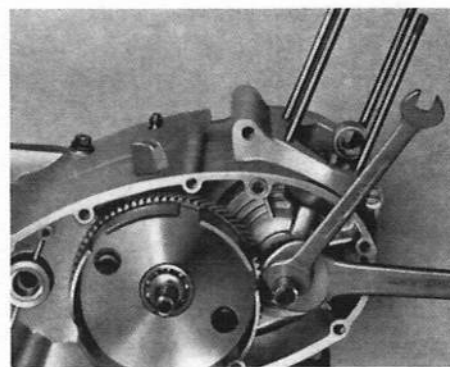


Fig. 23
Image 23
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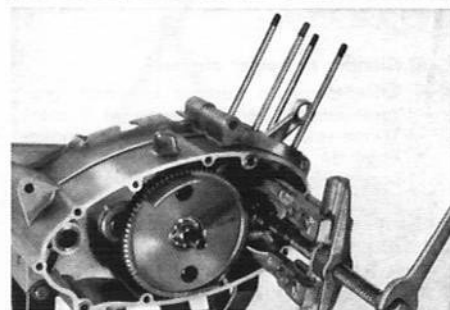


Fig. 24
Image 24
Afb. 24

Cover up crank casing, then with pointed-nose pliers draw off the retaining ring for the gudgeon pin (do not use a screw driver, fig. 21).

Fit gudgeon-pin press-off tool SK-A 64 and press off the gudgeon pin (fig. 22).

Note

Remove gudgeon pin needle bearing from connecting rod and put it away, well protected from dust and dirt.

i) Taking off Crank Casing

To take the gear off the crankshaft, first bend up the locking tab washers. Hold assembly steady with the 11 mm spanner applied to the crankshaft flats, then with the 19 mm spanner take off the hexagon nut and pull off the gear.

Note

Take care not to loose the two 5 mm balls underneath the gear (fig. 23).

If the drive gear cannot be pulled off by hand, use a standard two-arm pulser tool (fig. 24).

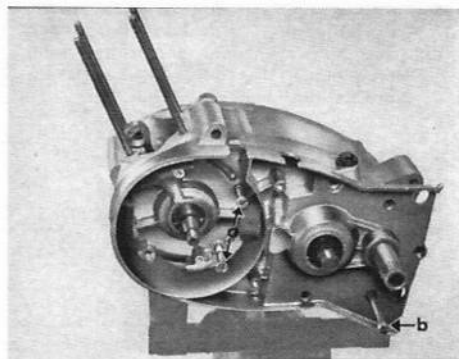


Fig. 25
Image 25
Afb. 25

Take the remaining screws from left-hand casing, 2 in magneto section, M 6 x 35 (a) and 1 under starter spindle, M 6 x 65 (b) (fig. 25).

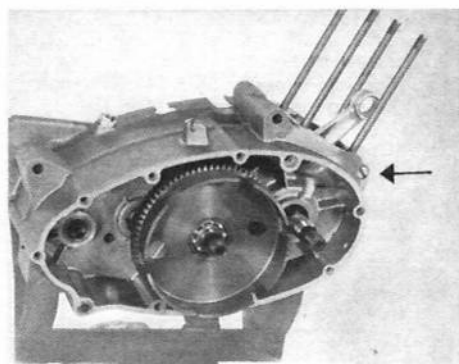


Fig. 26
Image 26
Afb. 26

On the right-hand side, take one screw, M 6 x 45 (M 6 x 50 for scooter engines), off the base of the cylinder (fig. 26).

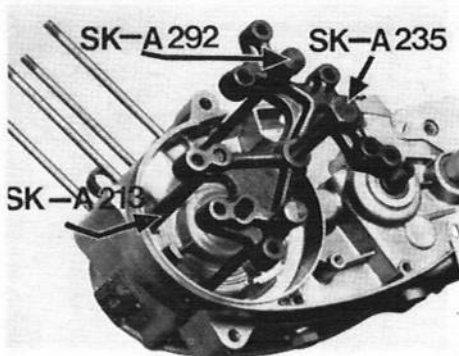


Fig. 27
Image 27
Afb. 27

Fit service clamp SK-A 235 by 2 stud-bolts, M 8 (SK-A 246) and 1 locating bolt (SK-A 213) on the left-hand side above the magneto spindle (fig. 27).

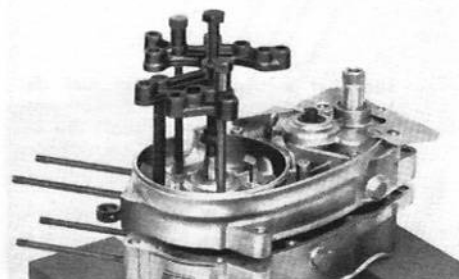


Fig. 28
Image 28
Afb. 28

Take the gearbox block from its mounting frame and place it, right-hand side facing down, on two wooden blocks. Turn the press-off bolt and at the same time press on selector and starter shafts to prize the two gearbox halves apart. Then carefully lift off the top half (left) (fig. 28).

Before taking out the various shafts, note the position and number of washers and spacer rings fitted, as well as the correct meshing position of gears (and mark these with a reference line for preference). This may save you considerable gauging and setting work when the engine is re-assembled.

Take out shafts in this sequence:

1. Gear selector shaft with selector gears and steel-ball assembly
2. Starter shaft
3. Main drive shaft
4. Crankshaft

Lift shaft (1) at the bottom selector gear to keep selector spindle, balls and selector gears together (fig. 29).

For engines with manual gear selection, the steel-ball selector remains in the selector fork on the right-hand casing.

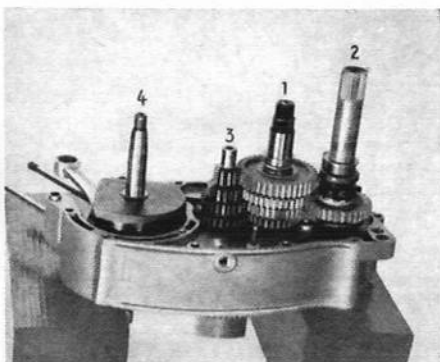


Fig. 29
Image 29
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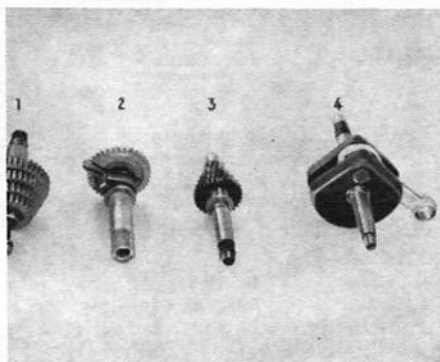


Fig. 30
Image 30
Afb. 30

Carefully inspect all shafts and gears for traces of wear and proper alignment as soon as you have taken them off (fig. 30).

j) Taking off Bearings, Bushes and Clutch Gear

On engines of type 284, the 19 rollers, 5 x 3.5 dia., can be taken out after removing spacer ring 281.05.152 (fig. 31).

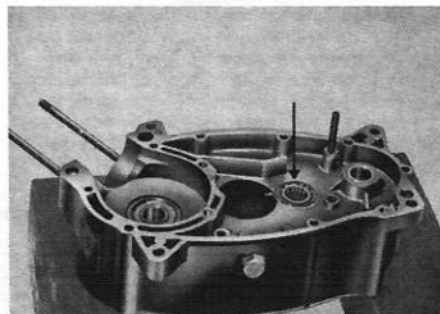


Fig. 31
Image 31
Afb. 31

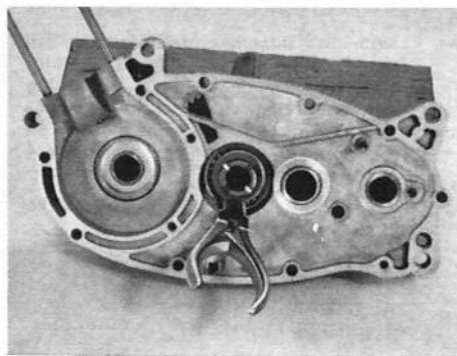


Fig. 32
Image 32
Afb. 32

The clutch gear can only be pressed off after taking the circlip in the casing behind the ball bearing from its seat with a pair of pointed pliers.

If clutch gear and both ball bearings are in perfect condition, they need not be taken off (fig. 32).

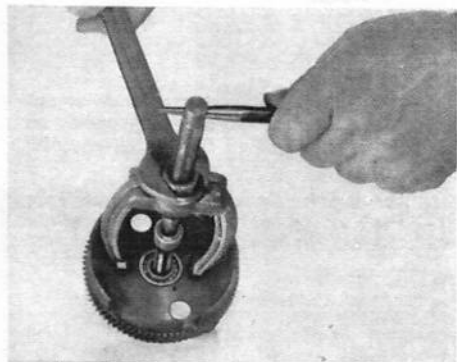


Fig. 33
Image 33
Afb. 33

If necessary, pull the ball bearing from the clutch gear with a standard bearing puller tool (fig. 33).

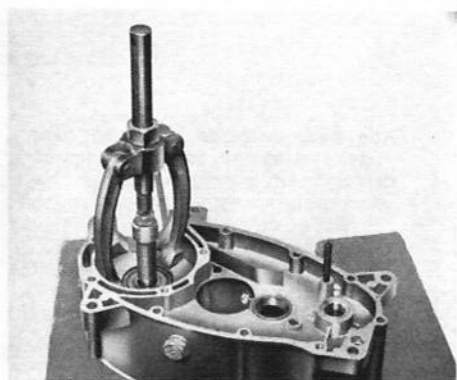


Fig. 34
Image 34
Afb. 34

Casings should be warmed first for easy withdrawal of ball bearings and bushes. Or use the puller tool to remove them (fig. 34).

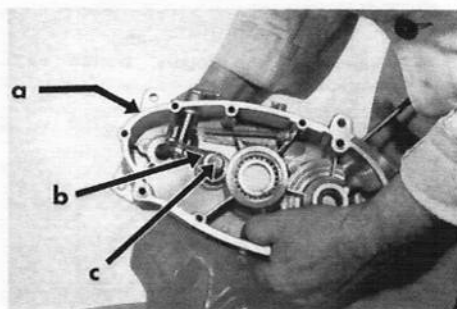


Fig. 35
Image 35
Afb. 35

k) Taking off Steel Ball Selector on engines with manual gear change

Bend up the tab of the washer securing the locknut of setscrew (a). Slacken nut, turn setscrew until selector fork (b) can be swung away and selector (c) can be taken out (fig. 35).

2. Engine Assembly

Before re-assembling the engine, first clear all parts thoroughly, remove the sealing compound from casing rim surfaces and check that all parts and sealing faces are in perfect condition. Replace defective or damaged parts with **Original ZUNDAPP Spare Parts**. Gaskets and sealing rings must always be replaced by new ones.

Make sure that all parts, such as spindles, shafts and bearings, are pressed home all the way to the stop in their locating bores, seats, etc.

For the crankshaft, use exclusively bearings of C-3 fit which give the necessary increased play. To fit a ball bearing, always heat its housing to approx. 85°C. Coat the sliding and stop faces of all moving parts with a generous film of oil.

2. Remontage des moteurs

Avant de commencer cette opération, il est impératif de nettoyer convenablement toutes les pièces du moteur; d'éliminer la matière lutante sur les plans de joint et de contrôler le bon état de ces derniers. Toute pièce défectueuse ou endommagée est impérativement à remplacer par une **pièce ZUNDAPP d'origine**. Tout joint ou toute bague-étanchéité est obligatoirement à remplacer par du neuf.

Toutes les pièces, telles qu'arbres, roulements, etc. ... doivent reposer en butée dans leurs logements. Le vilebrequin ne doit reposer que sur des roulements C-3, les seuls à posséder le plus grand jeu exigible.

Les points de carter ou doivent être montés des roulements sont à porter à une chaleur approximative de 85°C. Toutes les pièces mobiles doivent être convenablement lubrifiées sur leurs surfaces de roulement ou de friction.

2. Montage der motoren

Voor begin van de montage moeten alle motoronderdelen grondig worden gereinigd, de cartermaden van vloeibare pakkingresten worden ontdaan en op hun onberispelijke toestand gekeurd. Defekte of beschadigde onderdelen worden door **originele ZUNDAPP-onderdelen** vervangen. Pakkingen en pakkingringen worden principieel altijd vernieuwd.

Alle onderdelen, zoals assen, lagers, enz. moeten zich tot aan hun aanslag in de daarvoor bestemde boringen resp. lagerzittingen bevinden. Voor het lagere van de krukas moeten uitsluitend C-3 lagers worden gebruikt, daar zij de vereiste grotere speling bezitten.

Voor de montage van de kogellagers moet het betreffende onderdeel tot een temperatuur van $\pm 85^{\circ}\text{C}$ worden verwarmd. Beweegbare delen moeten op hun loop- en aanloopvlakken worden geolied.

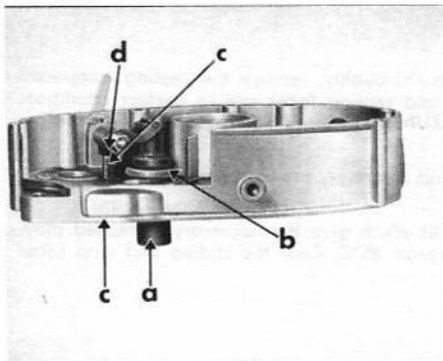


Fig. 36
Image 36
Afb. 36

a) Setting Steel Ball Selector on engines with manual gear change

On engines with manual gear change, set the steel ball selector with the setscrew so that the spherical part sits exactly in the centre of the selector shaft bores corresponding to the highest gear (3rd).

Use setting gauge SK-A 232 (a) to carry out the adjustment, fitting it into the bearing bush of the right-hand casing in place of the selector shaft and securing it with locking snap ring SK-A 233 (b).

Now press the inner face of the selector at the selector lever guide against the end of the setting gauge. Turn in threaded pin (c) until all play in stop bracket (d), and thereby in the selector, is reliably eliminated. Tighten locknut and secure setting with the tab washer. Slacken nut on gauge and take gauge off (figs. 36 and 37).

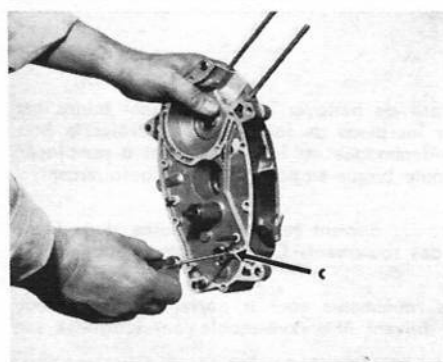


Fig. 37
Image 37
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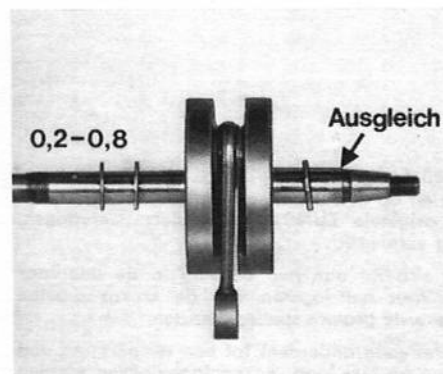


Fig. 38
Image 38
Afb. 38

b) Pre-assembling Crankshaft for Fitting into Right-hand Casing

To the crankshaft downdrive side, fit one washer (bevel facing crank cheek) and another of 0.2-0.9 mm thickness (as dictated by engine type, see fig. 38).

The object is that after you have measured the crankshaft (0.1 mm axial play) and fitted both casing sections with paper gasket together again, the conrod bore centre line coincides with the clearance between the two stay-bolts (see fig. 73).

Next, slide a washer on the magneto-side shaft stub (bevel facing crank web).

Fit crankshaft into right-hand casing, pre-heating the inner ring of the ball bearing with a mandrel (fig. 39).

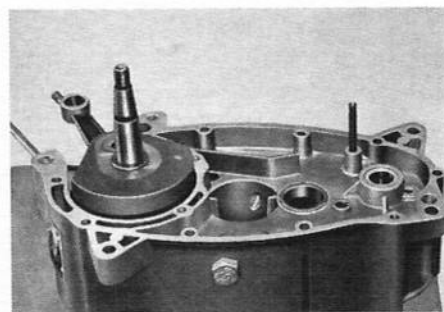


Fig. 39
Image 39
Afb. 39

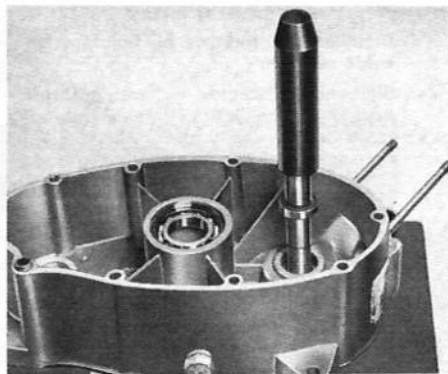


Fig. 40
Image 40
Afb. 40

c) Mounting Sealing Ring and Gear on Crankshaft Downdrive Side, Fitting Clutch Gear

Mounting sealing ring on crankshaft: Use tool MV-6-339 (assembly sleeve) to avoid sealing lips being damaged by the crankshaft thread. Drive ring home with hollow punch MV-6-347 (fig. 40).

Stick two 5 mm balls with a little grease into the reception pockets on the crankshaft, slide on (primary drive) gear. Secure with tab washer and hexagon nut (fig. 41).

Running-down torque 5 mkp/36.25 lb-ft.

Fit clutch gear into the bearing on the right-hand casing and secure it on the opposite side with the circlip (see fig. 32). The fully pre-assembled casing half is shown in figs. 24 and 26.

Fig. 41
Image 41
Afb. 41

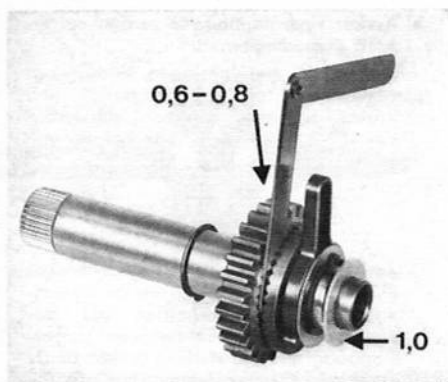
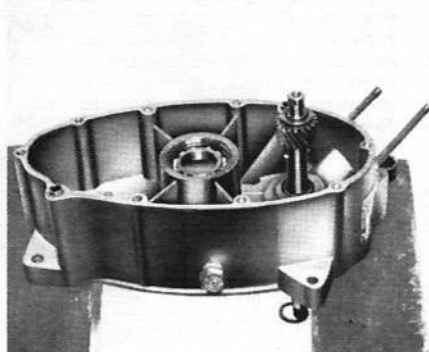


Fig. 42
Image 42
Afb. 42

d) Pre-assembling Kickstarter Spindle

Check the clearance of opposing teeth between driver and kickstarter gear on the spindle. It should lie between 0.6 and 0.8 mm. Correct by fitting packing washers between circlip and driver. On the short spindle section (shouldered), fit a 1 mm washer on 4-speed models, or 0.5 mm on 3-speed engines (fig. 42).

e) Pre-assembling Main Drive Shaft

Slide a packing washer of 1 mm on the longer shaft end (fig. 43).

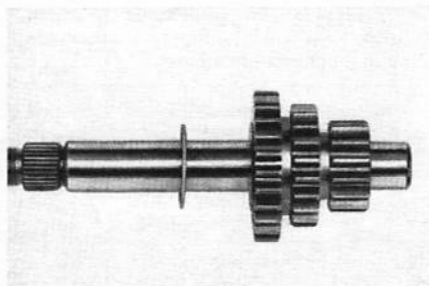


Fig. 43
Image 43
Afb. 43

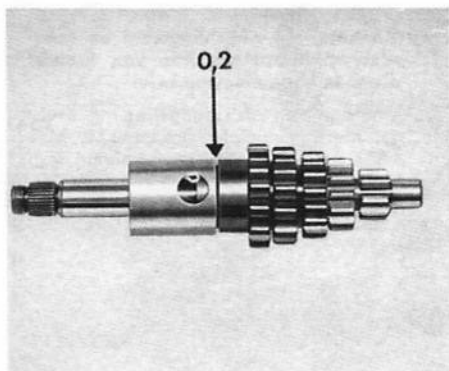


Fig. 44
Image 44
Afb. 44

On 5-speed engines (type 284), fit a washer of 0.2 mm between gear cluster and spacer tube. To ensure proper lubrication, check that bores in spacer tube lie on the gear side (fig. 44).

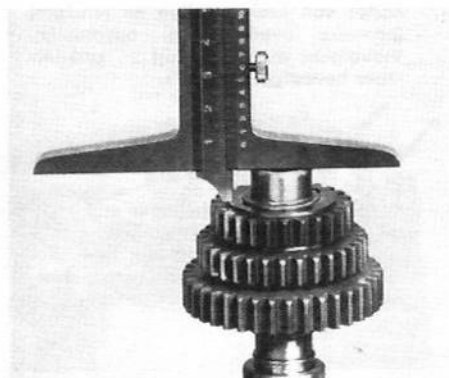


Fig. 45
Image 45
Afb. 45

f) Measuring Selector Spindle Gear Set

First gauging from end face of spindle to side face of top gear (fig. 45).



Fig. 46
Image 46
Afb. 46

Second gauging from spindle end face to collar on spindle (fig. 46).



Fig. 47
Image 47
Afb. 47

Compensating play between 1st and 2nd gear.

Mount gears as follows:

Lubricating groove of gear for 1st gear faces gear for 2nd gear.

Having gauged the gear set, fit spacer washers as required. For all other selector gears, the arrow at the side must face in running direction or towards the next larger gear (fig. 47).

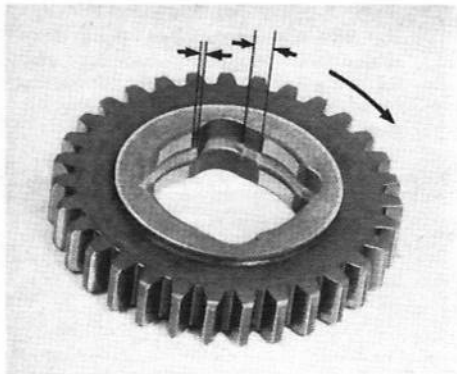


Fig. 48
Image 48
Afb. 48

Before you fit each selector gear, place four 7 mm dia. balls without grease into the spindle.

With the gears correctly gauged the end face of the top one should be flush with the collar on the spindle.

Selector gears are correctly mounted if, looking at the assembly from above (as in fig. 46), the broader flat on the ball reception pocket always points in the clockwise direction (fig. 48).

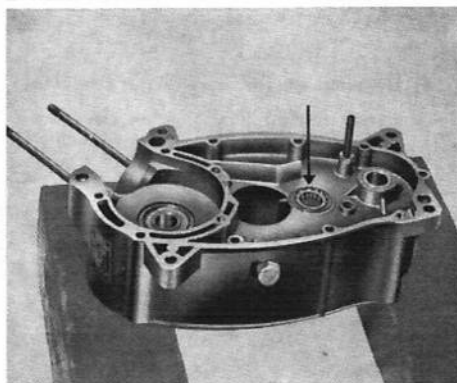


Fig. 49
Image 49
Afb. 49

On engines, type 284, stick 19 rollers, 5 x 3.5 dia., with a generous grease coating into the bearing ring of the right casing, then slide spacer ring 281-05.152 on the roller assembly (fig. 49).

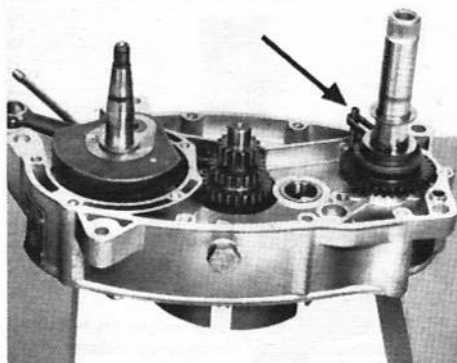


Fig. 50
Image 50
Afb. 50

g) Fitting Kickstarter Spindle, Main Drive Shaft and Selector Spindle

When fitting the kickstarter spindle, check that the brake spring hooks into the clamping pin for the driver.

Insert the main shaft into the clutch gear (fig. 50).

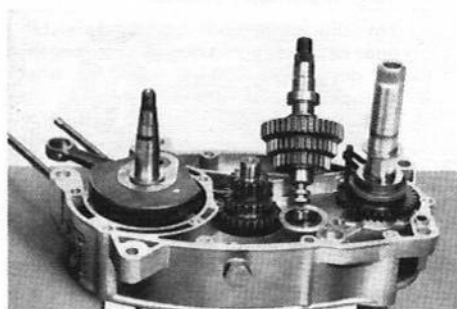


Fig. 51
Image 51
Afb. 51

Mount selector spindle complete with steel ball selector (fig. 51).

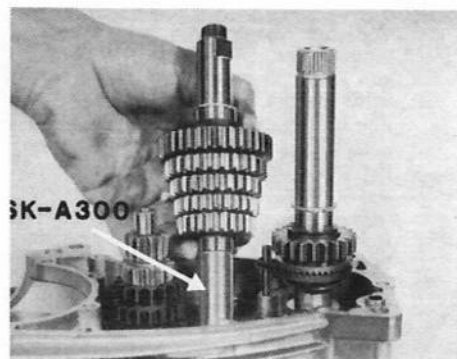


Fig. 52
Image 52
Afb. 52

On engines of type 284, take care to keep the 19 rollers in position as you do so. To make insertion into the roller bearing easier, it is advisable to use centring mandrel SK-A 300 (fig. 52) with its pronounced taper.

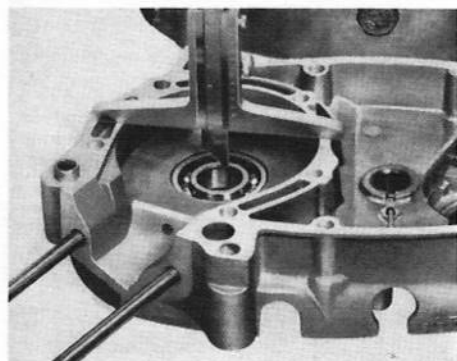


Fig. 53
Image 53
Afb. 53

h) Measuring Crankshaft

The following descriptions of gauging procedure are to be understood as examples only, i.e. the figures given do not necessarily agree with the values actually measured.

Fit casing gasket. Measure from sealing face to ball bearing in the left-hand casing = 18.3 mm (fig. 53).

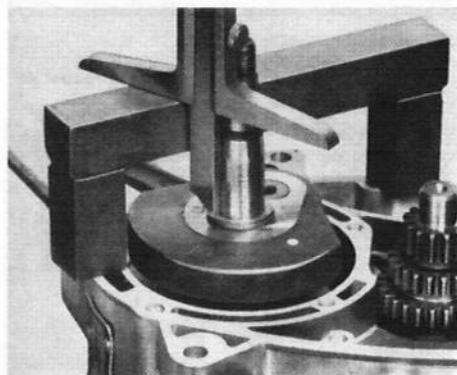


Fig. 54
Image 54
Afb. 54

With gauging yoke SK-A 206, find the dimension from the right-hand casing parting face to the bevelled washer at the crank web = 17.7 mm.

$$\begin{array}{r} \text{Example:} \quad 18.3 \text{ mm} \\ - 17.7 \text{ mm} \\ \hline = 0.6 \text{ mm} \end{array}$$

To retain the required axial play of 0.1 mm, fit washers to make up 0.5 mm to the magneto side of the crankshaft (fig. 54).

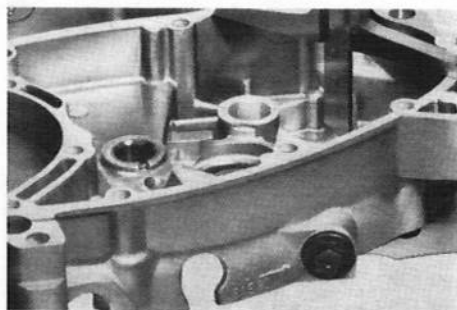


Fig. 55
Image 55
Afb. 55

i) Measuring Kickstarter Spindle

Gauge from the sealing face in the left casing to the bush = 41.1 mm (fig. 55).

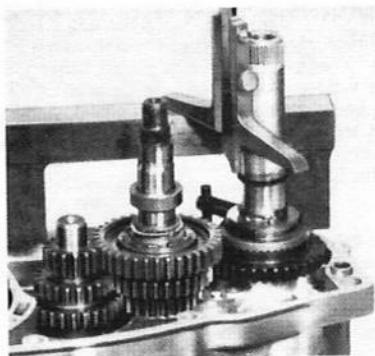


Fig. 56
Image 56
Afb. 56

Dimension from parting face on right casing to circlip (stop of kickstarter spindle) = 40.2 mm.

$$\begin{array}{r} \text{Example:} \quad 41.1 \text{ mm} \\ \quad \quad \quad - 40.2 \text{ mm} \\ \hline \quad \quad \quad = 0.9 \text{ mm} \end{array}$$

To retain the required axial play of 0.1–0.2 mm, fit washers to make up 0.8 mm ahead of the circlip on the spindle (fig. 56).

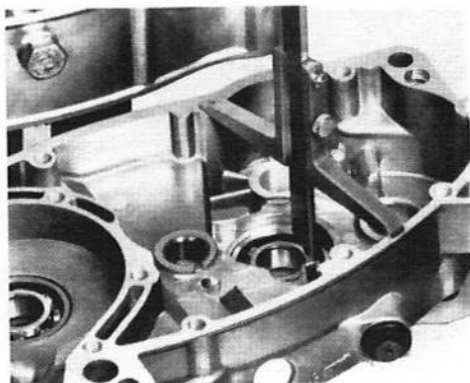


Fig. 57
Image 57
Afb. 57

j) Measuring Selector Spindle

Gauge clearance from parting face of left casing to inner ring of selector spindle ball bearing = 41.4 mm (fig. 57).

Gauge clearance from parting face of right casing to selector spindle collar = 40.8 mm.

$$\begin{array}{r} \text{Example:} \quad 41.4 \text{ mm} \\ \quad \quad \quad - 40.8 \text{ mm} \\ \hline \quad \quad \quad = 0.6 \text{ mm} \end{array}$$

On engines without speedometer drive, measure to end face of spacer ring. To retain the required axial play of 0.1 mm, make up 0.5 mm with washers at the selector spindle collar (fig. 58).

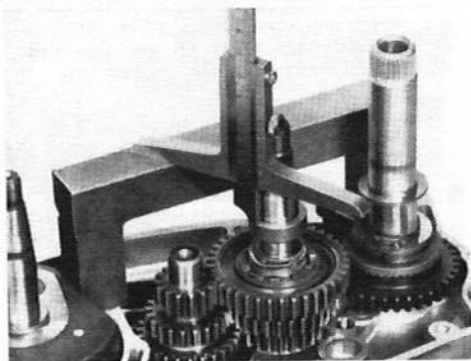


Fig. 58
Image 58
Afb. 58

The following instructions (k to m) refer to engines of type 266 with pedal start.

k) Measuring Intermediate Shaft

Place gauging yoke SK-A 206 on the parting face of the right casing and gauge to the intermediate shaft bush = 10 mm (fig. 59).

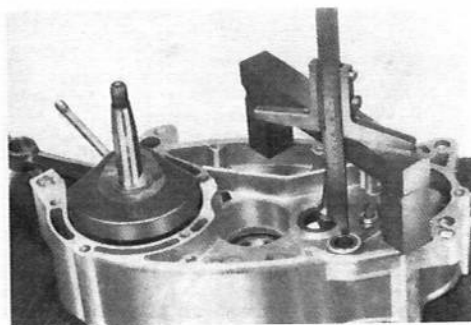


Fig. 59
Image 59
Afb. 59

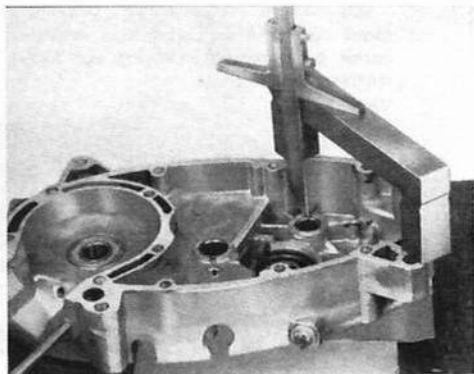


Fig. 60
Image 60
Afb. 60

Place yoke SK-A 206 on parting face of left casing and gauge to intermediate shaft bush = 30.1 mm (fig. 60).

Fit a 0.5 mm washer ahead of the circlip on the intermediate shaft (see arrow), then measure with caliper gauge from the washer including intermediate ring = 39.3 mm.

Example:

Right-hand casing	10.0 mm
Left-hand casing	+ 30.1 mm
	= 40.1 mm
Intermediate shaft	39.3 mm
	= 0.8 mm
Axial play	0.1 mm
	= 0.7 mm

Make up the difference by fitting washers ahead of the intermediate gear (fig. 61).



Fig. 61
Image 61
Afb. 61

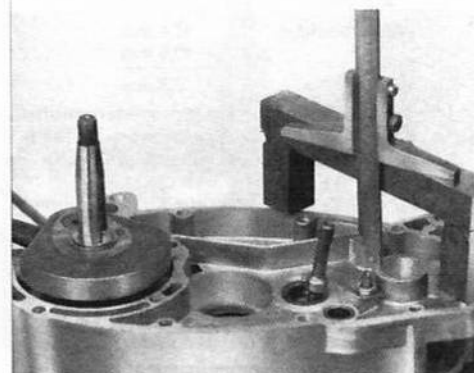


Fig. 62
Image 62
Afb. 62

1) Measuring Axial Play of Pedal Spindle

Fit gauging yoke SK-A 206 to the parting face of the right casing and gauge to the stop face in the casing = 2.4 mm (fig. 62).

Then fit the yoke to the parting face of the left casing and gauge to the bush for the pedal spindle = 41.3 mm (fig. 63).

To give this dimension, the spindle is fitted with a 20 mm spacer tube (a) on the long shaft end, a 1.5 mm washer (b) ahead of the tube and a spacer of 8 mm (c) at the short end. Measure with the caliper gauge the overall dimension across short spacer tube, starter gear, long spacer tube and 1.5 mm washer = 41.7 mm.

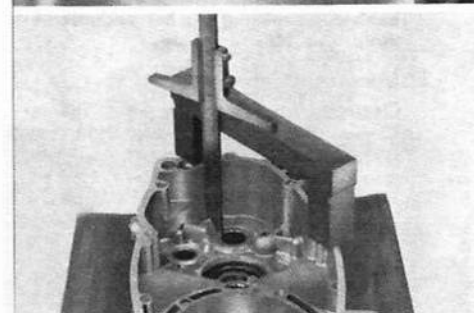


Fig. 63
Image 63
Afb. 63

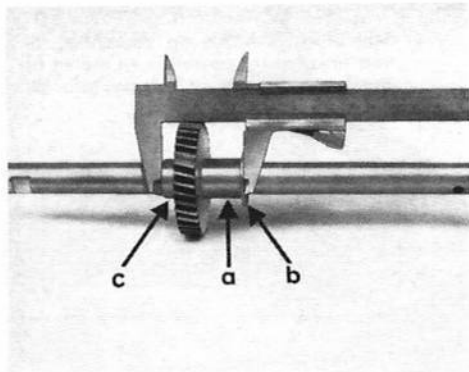


Fig. 64
Image 64
Afb. 64

Example:	
Right-hand casing	2.4 mm
Left-hand casing	+ 41.3 mm
	= 43.7 mm
Pedal spindle	- 41.7 mm
	= 2.0 mm
Axial play	- 0.1 mm
	= 1.9 mm

Make up the difference of 1.9 mm with washers (c) at the short spindle end (fig. 64).

m) Measuring Axial Play of Selector Shaft

Place gauging yoke SK-A 206 over the right-hand casing, so that you can measure with a depth gauge right to the stop face for the selector shaft inside the casing. Note the value measured, remembering to allow for the thickness of the yoke = 15.8 mm (fig. 65).

Fig. 65
Image 65
Afb. 65

Place the yoke on the contact face of the left casing and measure distance to the ball bearing inner ring (stop face for selector shaft). Add the value read off = 41.5 mm to the one already noted (fig. 66).

Now measure selector shaft between the two stop faces = 56.7 mm.

Example:	
Right-hand casing	15.8 mm
Left-hand casing	+ 41.5 mm
	= 57.3 mm
Selector spindle	- 56.7 mm
	= 0.6 mm
Axial play	- 0.1 mm
	= 0.5 mm

Make up the difference of 0.5 mm with washers fitted between ball bearing and speedometer drive on engines of swinging fork machines, spacer ring on engines with telescopic fork, as on these the speedometer drive is taken from the front wheel hub (fig. 67).

Fig. 67
Image 67
Afb. 67

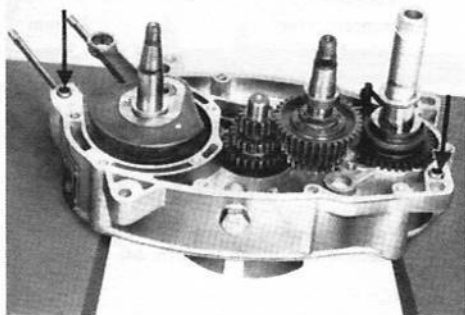


Fig. 68
Image 68
Afb. 68

Measure the selector gears in the manner described on page 36.

n) Mounting Crankcase

Fit 2 press-fit bushes, fit casing gasket, preferably also coat with compound, such as Teroson, Atmosit. Oil shafts and bearings and fit casing sections together (fig. 68).

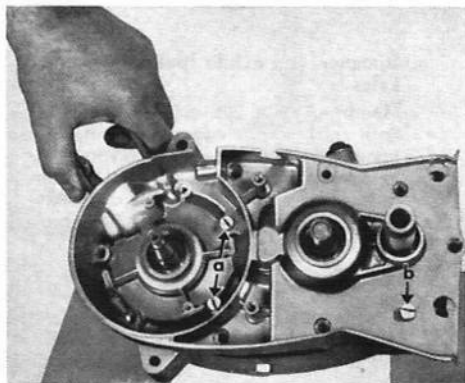


Fig. 69
Image 69
Afb. 69

Bolt casing sections together. From left 2 screws (a), M 6 x 35, magnetoside, 1 screw (b), M 6 x 65, under the kickstarter spindle (fig. 69).

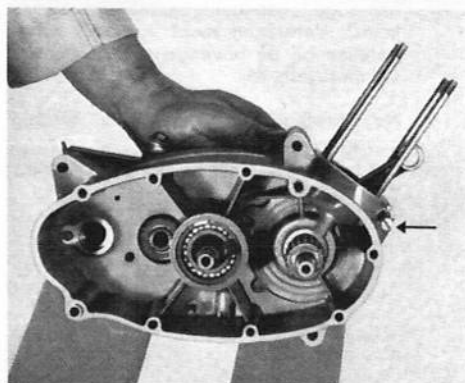


Fig. 70
Image 70
Afb. 70

1 screw, M 6 x 45 or M 6 x 50, (scooter) from the right side at the cylinder base, run down tightly (fig. 70).

o) Mounting Selector Spindle in Bearing of Left Casing

Fit 1 ring (made in your shop) of the following dimensions:

Height	6 mm
Outer dia.	36 mm
Inner dia.	31 mm

on to selector shaft, flush against the casing. Fit chain gear and tighten gear nut to shift shaft upwards and bring its collar all the way against the inner ring of the ball bearing.

Take off nut, chain gear and ring again (fig. 71).

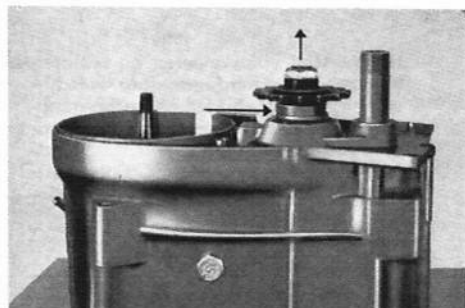


Fig. 71
Image 71
Afb. 71

On engines of type 266 and 278, you can fit the chain gear turned through 180° from its original mounting position. This makes the intermediate ring unnecessary.

p) Mounting Sealing Rings

Fit engine into service fixture SK-A 314 and clamp the whole assembly into the vice.

Fit sealing rings to left casing; fit sealing ring for crankshaft with punch MV-6-961.

Fit sealing ring for selector shaft with assembly socket sleeve SK-A 217 and drive it home by tapping with punch MV-6-734.

On engines of type 266 (manual and pedal gear change), use socket sleeve MV-6-960 together with punch MV-6-961.

Fit sealing ring for kickstarter spindle with punch MV-6-734, noting that chamfered side of ring must face casing (fig. 72).

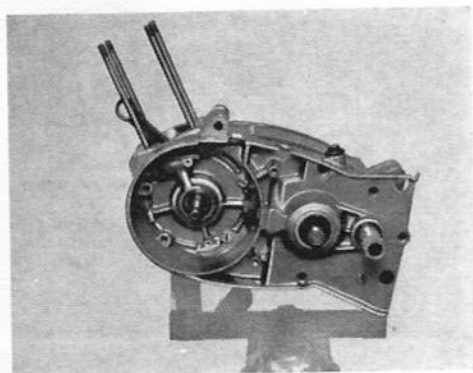


Fig. 72
Image 72
Afb. 72

q) Inspecting Connecting Rod

Fit gauging mandrel SK-A 304 (SK-A 303 on engines of type 282) into connecting rod ring. Turn crankshaft until mandrel lies against casing sealing face. The gap between mandrel and face must be the same on both sides. Gauge in turned-over position and compare results (fig. 73).

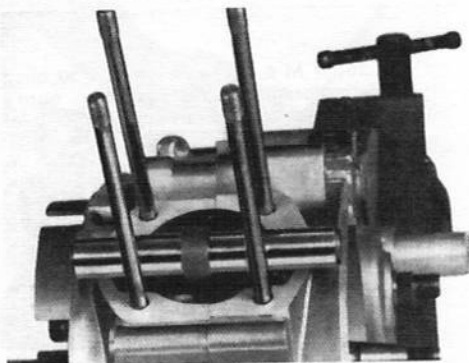


Fig. 73
Image 73
Afb. 73

This gauging operation refers to the remarks on page 32 (fig. 38).

Correct any deviations of the conrod by straightening with service tool MV-6-115 (fig. 74).

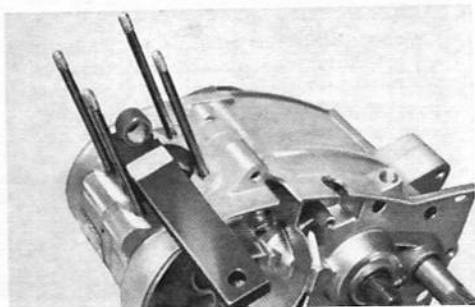


Fig. 74
Image 74
Afb. 74

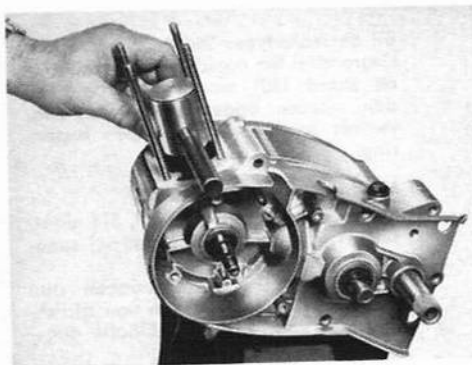


Fig. 75
Image 75
Afb. 75

r) Mounting Piston and Cylinder

Fit the piston; the mark "Auslass" (exhaust port) must face towards the exhaust. Introduce gudgeon pin with service tool SK-A 163, cover up crankcase, then fit retaining rings. Fit cylinder base gasket without sealing compound (fig. 75).

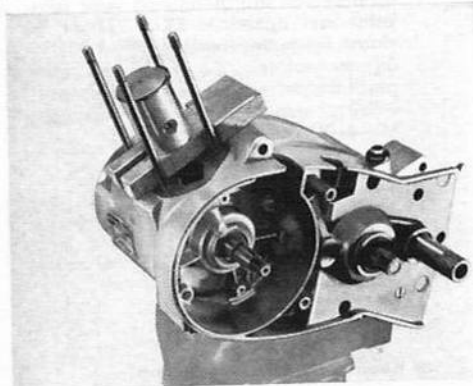


Fig. 76
Image 76
Afb. 76

Fit piston ring and support piston with a special fork tool, made in your workshop (fig. 76).

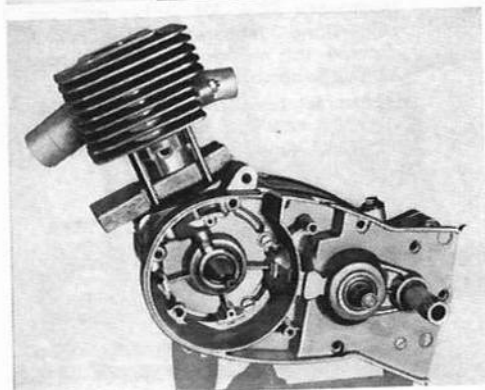


Fig. 77
Image 77
Afb. 77

Fit cylinder (introduce piston carefully and gently into cylinder to prevent fracture of piston ring).

Note: The locating pin in the piston ring groove must sit inside the ring joint. Fit cylinder head gasket and cylinder head. Fit 4 packing washers, then tighten the 4 nuts, M7, with 11-mm socket wrench, working always on diagonally opposite nuts in turn; torque 1.5 mkp/10.85 lb-ft. (fig. 77).

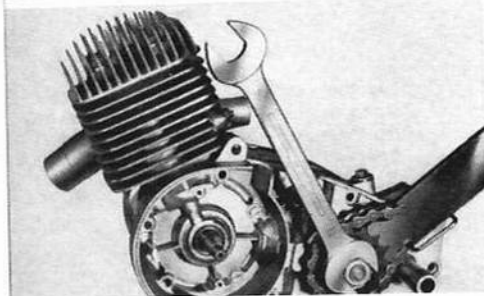


Fig. 78
Image 78
Afb. 78

s) Mounting Chain Sprocket

Fit the sprocket and secure with washer and hexagon nut; use the chain tool to hold assembly firmly in place. Running-down torque 5 mkp/36.25 lb-ft. Secure nut with tab washer (fig. 78).

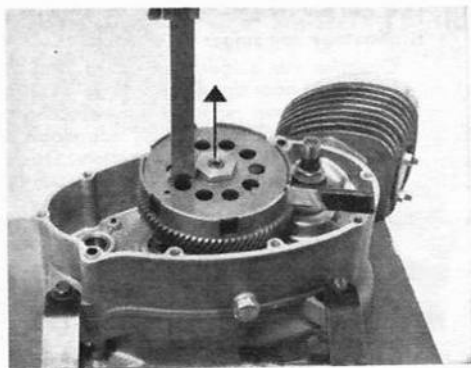


Fig. 79
Image 79
Afb. 79

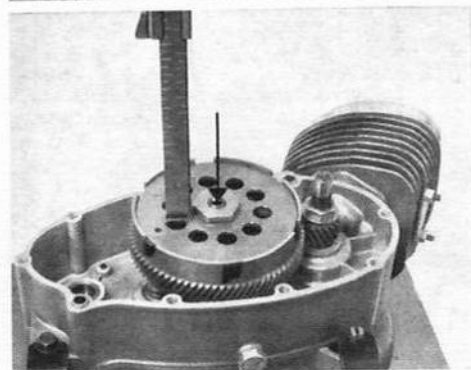


Fig. 80
Image 80
Afb. 80

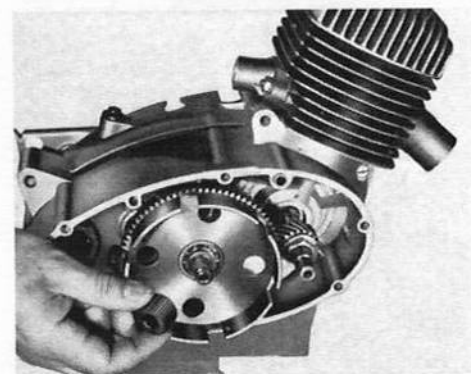


Fig. 81
Image 81
Afb. 81

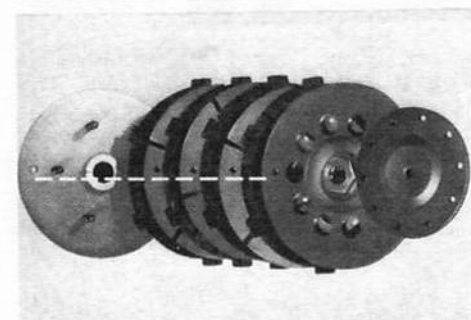


Fig. 82
Image 82
Afb. 82

t) Measuring Main Drive Shaft

Fit the clutch hub, cover plate and clutch nut. With a wooden spatula or other tool, shift the cover plate to the top position, then with the depth gauge, inserted through the marking bore, measure distance to the clutch gear, e.g. = 22.5 mm (fig. 79).

Take the tool away from the cover plate and press main drive shaft down all the way to the stop, then measure distance again, e.g. = 21.8 mm.

$$\begin{array}{r} \text{Example:} \quad 22.5 \text{ mm} \\ - 21.8 \text{ mm} \\ \hline = 0.7 \text{ mm} \end{array}$$

The values listed are only given as examples (fig. 80).

To obtain the required axial play of 0.1 mm, fit 0.6 mm packing washers between ball bearing in clutch gear and clutch shifter hub (fig. 81).

u) Mounting Clutch

Fit retaining washer, lining and outer steel plates, then fit cover plate.

To align bores for the spring sleeves correctly, the clutch shifter hub is marked with a reference line and all plates with internal splines have a special aligning bore. Underneath the reference bore on the cover plate, an arrow is additionally marked which must be in line with the mark on the hub.

Also note that the dished side of the upper steel plate must face the gear-box. Having placed the fourth plate in position, fit the cover plate so that the dished side again faces the gear-box.

Having fitted the cover plate, run down the nut, hold the assembly tightly with tool SK-A 297 and tighten nut firmly (fig. 73). Running-down torque 3.5 mkp/25.35 lb-ft.

Finally, secure nut with tab washer (fig. 82).

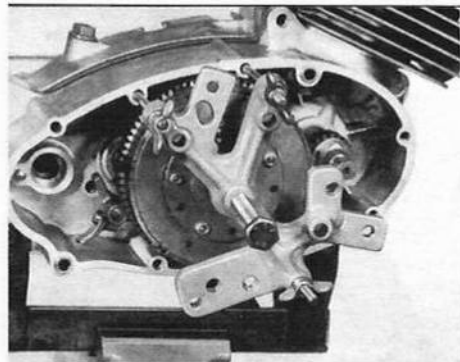


Fig. 83
Image 83
Afb. 83

Next, insert the spring sleeves, complete with clutch springs, fit special service tool SK-A 235 with 3 bolts SK-A 292 and insert thrust plate between clamping bolt of the tool and the clutch springs. Press springs together, and you can then fit and evenly tighten the five M 4 nuts. Take off the service tool, fit thrust pin with the required packing washers to the thrust plate (fig. 83).

v) Setting Clutch Tongue and Clutch

To obtain the largest possible re-setting range, the clutch dog or tongue must be set to the mushroom-shaped thrust pad. To do this, first coat the pad with chalk, then fit the clutch bell cover and operate the clutch lever on the housing. Take the bell cover off again, check whether the thrust pad contacts the tongue roughly at the centre. If it does not, re-set with the setscrew for the thrust plate on the bell cover, then secure the new setting.

Next, check the clutch lever play at the housing. It should be possible to move the lever from its rest position by hand about 2-3 mm at the hook for the clutch cable. If the play is too large or too small, correct by fitting or removing the appropriate number of washers under the thrust pad (fig. 84).

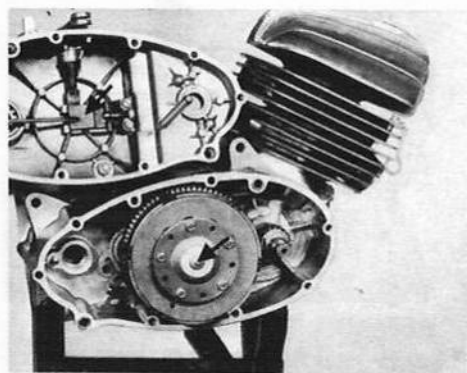


Fig. 84
Image 84
Afb. 84

The following notes, up to fig. 95, apply only to engines with pedal gear change.

w) Taking off and Mounting Pedal Gear Change Spindle

The assembly is shown in fig. 85.

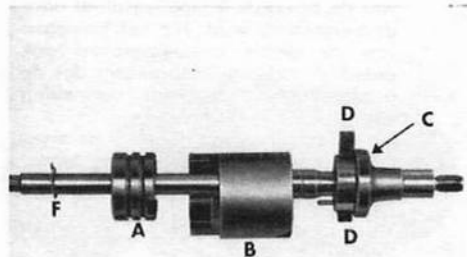


Fig. 85
Image 85
Afb. 85

Inside the pawl mount C are the two gear-change pawls D with spring. Selector drum B engages over the pawls; above the drum sits pawl deflector A with return spring. The whole assembly is held by snap ring F. In case of damage to the selector spindle, we supply the complete assembly for replacement, but the return spring is available as a separate repair part (fig. 85).

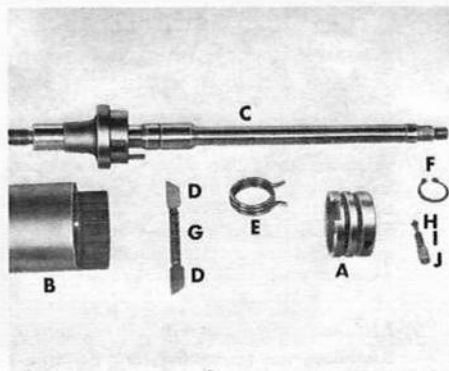


Fig. 86
Image 86
Afb. 86

The selector spindle comprises the following separate parts:

- A) Pawl deflector
 - B) Selector drum
 - C) Pedal selector spindle
 - D) Selector pawl
 - E) Return spring
 - F) Snap ring
 - G) Spring
 - H) Oval-head rivet
 - I) Compression spring
 - J) Stop pin
- (fig. 86).



Fig. 87
Image 87
Afb. 87

Clamp pedal selector spindle by the thread for the selector drum into a vice between a pair of soft-metal pads (fig. 87).

With support bolt SK-A 213, turn the drum until rivet (H), compression spring (I) and stop pin (J) can be taken off. Then remove the top snap ring.

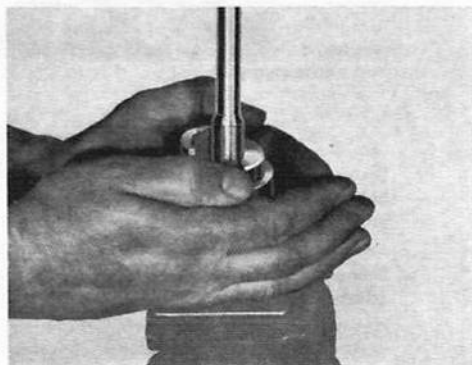


Fig. 88
Image 88
Afb. 88

Span the selector drum with your hands from underneath, so that as you lift it off together with the pawl deflector, you will prevent the pawls from dropping out under spring pressure (fig. 88).

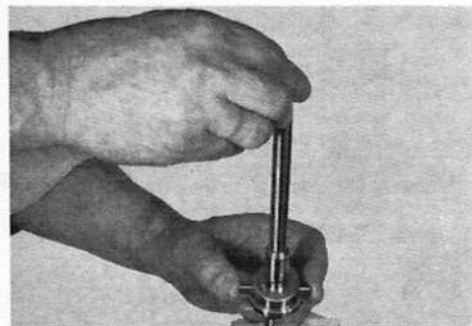


Fig. 89
Image 89
Afb. 89

Fit selector pawls and pawl springs into the groove on the selector spindle. Note that the large side faces on the tapered pawls should face the cylindrical pin in the pawl mount on the spindle (fig. 89).

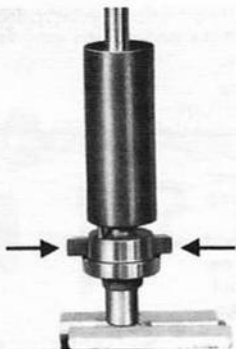


Fig. 90
Image 90
Afb. 90

To make assembly easier, slide sleeve SK-A 301 over the pawls to keep them pressed in while you work (fig. 90).

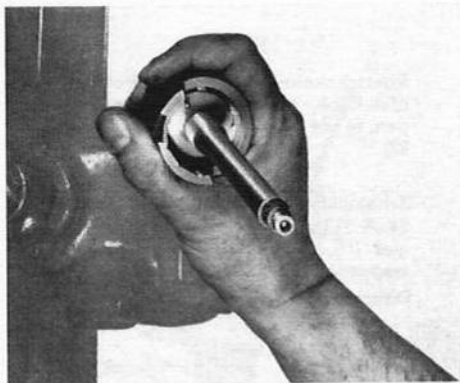


Fig. 91
Image 91
Afb. 91

Fit the selector drum on to the pedal selector spindle, pressing the pawls inwards as you do so. The collar with the recesses acting as internal stops must face the cylindrical pin on the spindle. Tilt the drum at a slight angle to make it easier to fit (fig. 91) or use the sleeve shown in fig. 90.



Fig. 92
Image 92
Afb. 92

To fit the return spring to the pawl deflector, insert it with its top stop into the lower recess and with the bottom stop into the top recess of the pawl deflector. The spring should be unloaded.

It is advisable to ease the spring into position with a pair of flat pliers to ensure that the stops enter the recesses far enough. Now turn the spring with a screw driver, pliers or similar tool. To make the fitting easier, you can use a second screw driver to press the spring against the recesses in the pawl deflector as you coil and ease it into position (fig. 92).

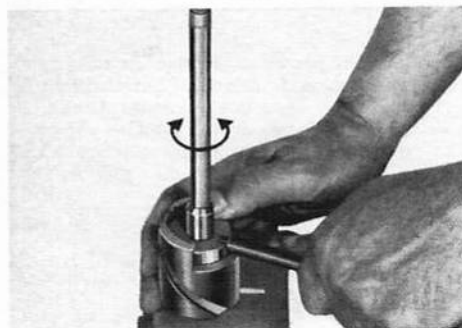


Fig. 93
Image 93
Afb. 93

Next, fit the pawl deflector, complete with return spring, to the pedal gear selector spindle. Note that the cylindrical pin in the pawl mount must be fitted through both arms of the return spring. To check correct assembly, fit assembly pin SK-A 213 into the recess of the pawl deflector, when you should be able to move the deflector to both sides under spring loading (fig. 93).

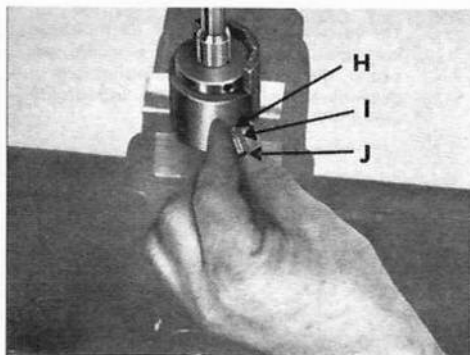


Fig. 94
Image 94
Afb. 94

Fit the snap ring into the groove on the spindle, then turn the pawl deflector to expose the side bore into which oval-head rivet (H), compression spring (I) and stop (J) are fitted.

Having fitted these parts in the sequence listed, turn the deflector again until the stop pin engages in the recesses providing the internal stops for the selector drum. To mount the pedal selector spindle, set the transmission to 2nd gear (fig. 94).

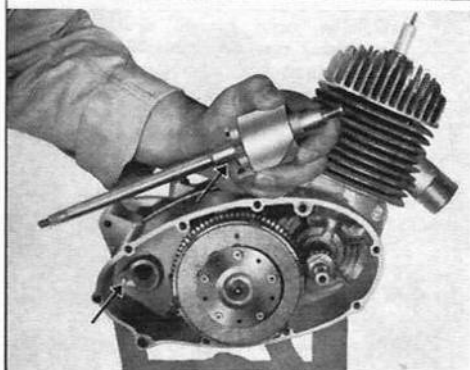


Fig. 95
Image 95
Afb. 95

Fit the pedal gear change spindle into its bearing on the kickstarter spindle. Note that the taper groove on the selector drum engages with the mating piece on the selector slide, while the recess on the pawl deflector engages over the pin on the right-hand casing. This pin should not project by more than 7.5 mm from the level face of the housing. Oil all moving parts (fig. 95).

x) Mounting Clutch Bell Cover

Insert two press-fit bushes into the right casing, fit the gasket, preferably also coat the joint faces with sealing compound, then fit clutch bell housing cover. Introduce one bolt, M 6 x 45, from the right under the pedal gear change spindle and run it down firmly (fig. 96).

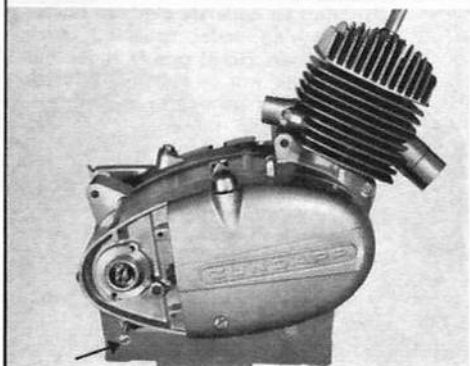


Fig. 96
Image 96
Afb. 96

On the left-hand side, fit the following screws (* screw with cable clip to be fitted only after base plate has been mounted) (fig. 97).

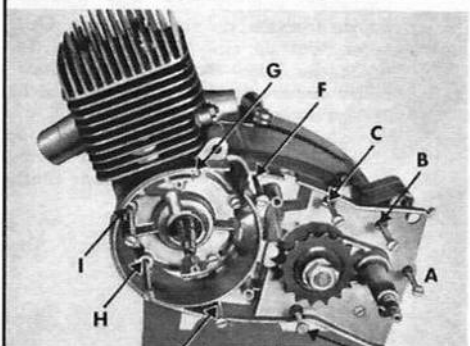


Fig. 97
Image 97
Afb. 97

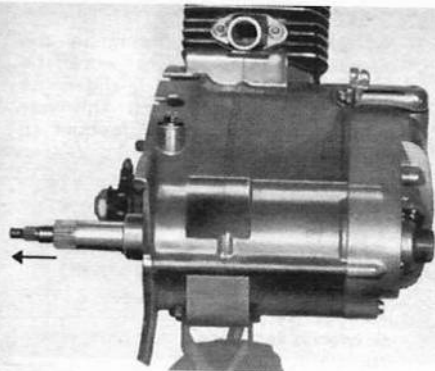


Fig. 98
Image 98
Afb. 98

y) Setting Pedal Gear Change Spindle

The spindle must be fitted with slight play. Before setting it, engage 2nd gear.

Then press spindle lightly to the left (seen in direction of travel) all the way to the stop. Screw on the setting dome, running it down until it lightly contracts the face of the casing, but without altering the axial location of the spindle (fig. 98).

Now, draw the spindle to the right and turn the setting dome further all the way against the casing, counting the quarter turns as you go. Then turn the dome back by half the number of quarter turns counted and fix it to the casing with the screws provided (fig. 99).

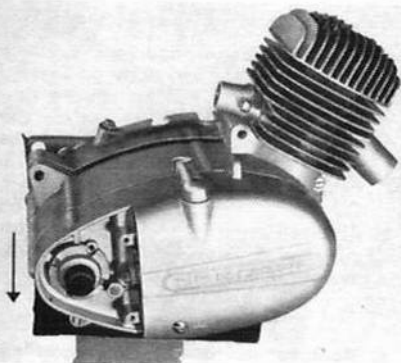


Fig. 99
Image 99 z)
Afb. 99

Mounting Cover over Clutch and Gear Selector Assembly (Connector Cap)

Fit the cover and secure with the two countersunk fillisterhead screws, M 5 x 20 (fig. 100). Check that the return spring in the release lever is sufficiently tensioned for its job.



Fig. 100
Image 100
Afb. 100

a1) Mounting Ignition System and Setting Ignition Timing

Mounting ignition system

Fit baseplate and run down screws M4x16, lightly only, since these have to be slackened again when setting the timing.

Then slide cable with rubber grommet into the opening provided on the casing, remembering the ignition cable clip. Fit Woodruff key into its slot on the crankshaft, then slide on the flywheel magneto. The taper must be free from grease.

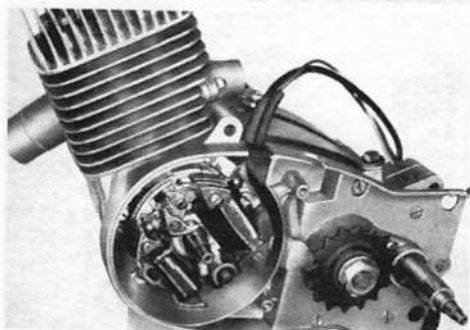


Fig. 101
Image 101
Afb. 101

Note: Take care not to push the key out of its slot again. Run down fixing nut and firmly tighten it with socket key, holding the flywheel in position with service tool SK-A 297; running-down torque 3.5 mkp/25.35 lb.-ft. (fig. 101).

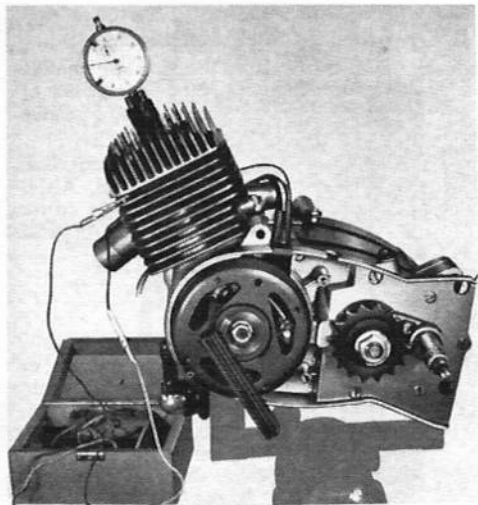


Fig. 102
Image 102
Afb. 102

For specified ignition timing, see technical data of the operating manual for each type of engine.

Setting ignition timing

Set contact breaker gap to 0.35–0.45 mm, then, with a dial gauge or similar instrument, determine top dead centre (SK-A 315).

Next, turn flywheel magneto back in opposite direction to engine rotation until piston has reached the position matching the specified ignition point. Check the setting with a standard ignition tester. It is advisable to carry out a second check of the timing after baseplate screws have been tightened (fig. 102).

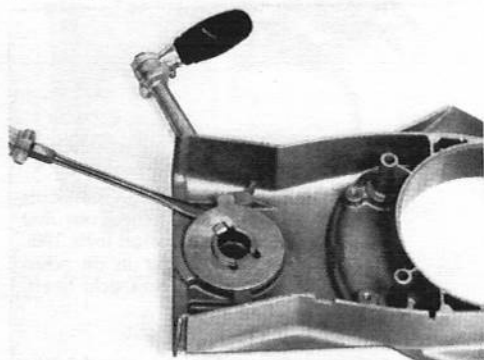


Fig. 103
Image 103
Afb. 103

a2) Taking off and Mounting Kickstarter Spring and Sleeve

Take off snap ring, lift cover plate on one side at the stop nose. Gripping the kickstarter pedal lever firmly, you can now release the kickstarter spring from load (fig. 103).

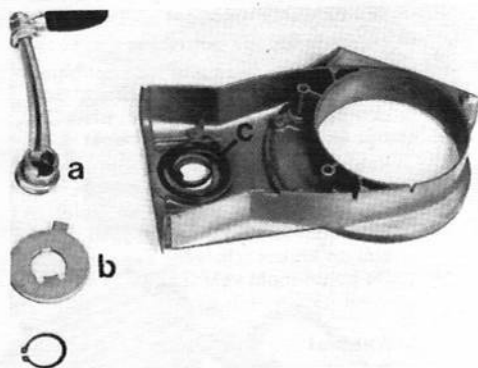


Fig. 104
Image 104
Afb. 104

Take off lever, complete with sleeve and sealing ring (a) from below, lift cover plate with stop (b) up and off. The kickstarter spring (c) can now be replaced (fig. 104).

Assembly of kickstarter

If the left-hand casing cover had been completely dismantled, first fit starter spring in such a way that, seen towards the inside of the cover, the spring can be tensioned anti-clockwise. Grease the spring well. Then introduce the small stop nose of the cover plate into the inner spring loop, and fit the sleeve of the kickstarter pedal lever, facing up.

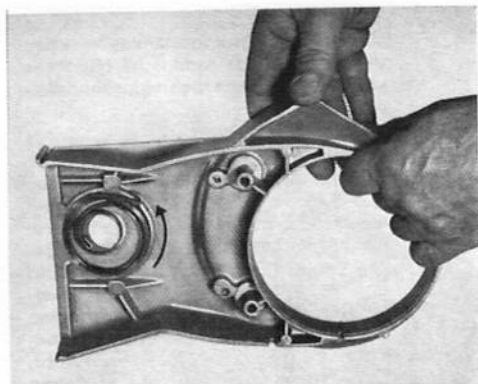


Fig. 105
Image 105
Afb. 105

through the plate from the other side (remember checkplate between casing cover and sleeve) so that it engages in the larger shoulder. Hold the casing cover with one hand, then pre-tension kickstarter spring by turning kickstarter pedal lever through about 1 revolution, until the stop nose lies just in front of the top stop on the casing. Finally, fit the snap ring (fig. 105).

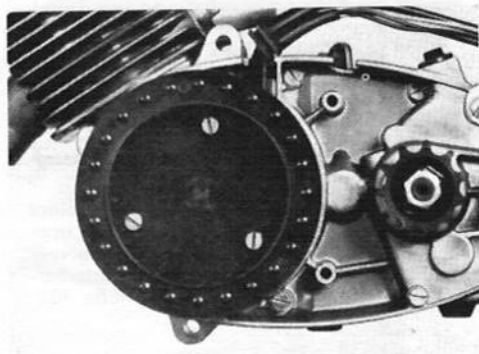


Fig. 106
Image 106
Afb. 106

a3) Mounting Fan, Left Casing Cover with Kickstarter and Fan Casing

Fit and bolt fan to flywheel magneto with 3 cylindrical screws, M 6 x 12 (fig. 106).

On engines with pedal start, slide the intermediate gear on the kickstarter spindle before fitting the left-hand casing.

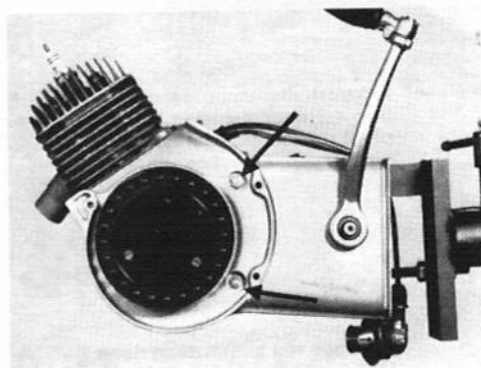


Fig. 107
Image 107
Afb. 107

The following can only be carried out after engine has been fitted into frame:

Fit casing cover on left and bolt down with two hexagon bolts, M 6 x 35 (fig. 107).

On air-cooled engines, fit 2 cylindrical bolts, M 6 x 55.

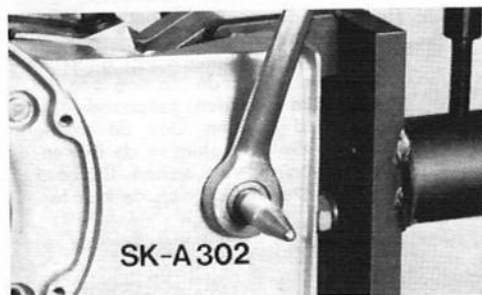


Fig. 108
Image 108
Afb. 108

Fit sealing ring of kickstarter spindle, using sleeve SK-A 302 (fig. 108).

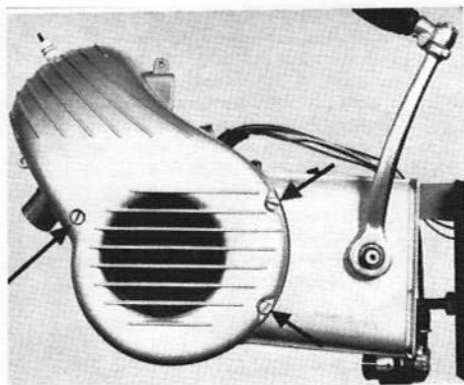


Fig. 109
Image 109
Afb. 109

Mount fan casing, bolting it to the left casing cover with 3 cylindrical screws, M 6 x 45 (fig. 109).

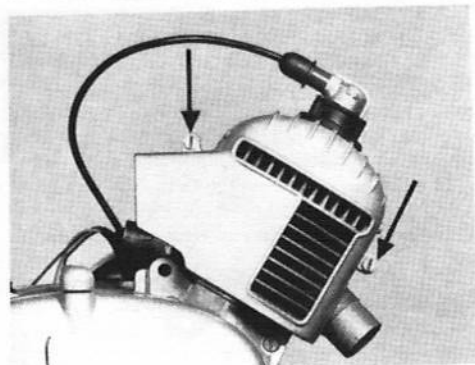


Fig. 110
Image 110
Afb. 110

Bolt on fan cap with 2 cylindrical screws, M 5 x 14.

Note: Check that the 2 rubber buffers are fitted inside the fan cap (fig. 110).

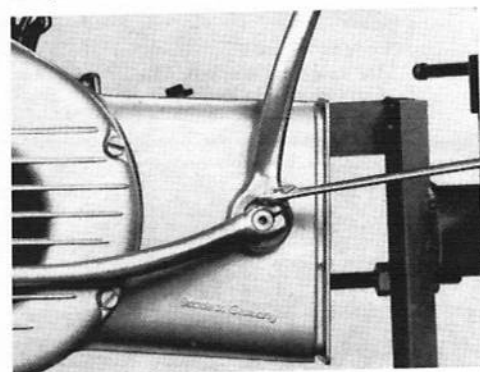


Fig. 111
Image 111
Afb. 111

Fix gear change pedal with the screw, DIN 933, M6 x 16 (fig. 111).

Refill gearbox with oil.

4. BING Carburettors

Operation

The carburettor is designed to supply the engine with the correctly proportioned and thoroughly mixed fuel/air mixture to match any load.

The mixture is prepared in one idling and one main jet system.

The idling jet system supplies the engine at the lower speed stages. It consists of the idling fuel jet, the idling air jet and the air adjuster screw. If the air inlet is partially throttled with the adjuster screw, the idling mixture becomes richer, if more air is admitted the mixture becomes leaner. Carburettors on small engines have no separate idling jet system; instead the needle jet system provides the mixtures at all stages.

As engine speed increases, the main jet system comes into action, consisting of main jet, mixing chamber insert or fixed atomiser and needle jet. The exchangeable main jet sits in the nozzle block screwed from below – or from the side on inclined-jet carburettor designs – into the carburettor housing. On carburettors with fixed atomisers, the main jet is screwed to the lower end of the needle jet. As the main jet system comes into action, the fuel flows via the main jet to the needle jet. The outlet bore of the needle jet is located in the mixing chamber where the preliminary mixing of fuel and air takes place. Here, little fuel/air bubbles form which are then mixed with the main air flow stream and drawn into the engine combustion chamber.

A tapered needle, fixed to the throttle slide controls the available needle jet cross section. Operation of the throttle slide drives the needle further into the jet, thus narrowing the free cross section between needle jet bore and needle, or, vice versa, draws the needle further out and thus increases the cross section.

The needle shank has several grooves, so that the needle can be set in relation to the throttle slide. If the setting is altered so as to drive the needle deeper into the bore, the engine is supplied with a leaner mixture. If the needle is set higher on the throttle slide, the available flow cross section increases and, consequently, the mixture becomes richer. The needle setting will only influence fuel consumption under throttle control. With the throttle fully open, fuel consumption is exclusively governed by the main jet.

Fitting Carburettors

Carburettors must be mounted with special care. They must be positioned accurately vertical and fitted flush and precisely on their connecting socket. The slots of the clamping connecting fitting must on no account admit secondary intake air, otherwise a steady, quiet idling speed cannot be set. Where connecting flanges are provided, use only gaskets in perfect condition and tighten nuts evenly. Fix Bowden cable sleeves without any sharp bend or kinks. Check that throttle slide opens and closes all the way as you operate either lever or twist grip. On carburettors with starter jets, the Bowden cable hooked to the starter piston should have a little play to ensure that the piston provides a reliable seal.

Carburettor Maintenance

From time to time, the carburettor should be rinsed out with petrol and thoroughly cleaned. While this is done, check that all parts are in perfect condition. Replace worn float needles, needle jets and jet needles, as well as throttle slides, since these govern engine performance and fuel consumption. On carburettors with separate starter jet assembly, test that starter piston has tight seal. The filter element should be blown out to clean it or replaced at regular intervals.

Where a screwed hose union is fitted, take this off, draw out the filter element and clean it, slacken the connector nut and take off float cap. On carburettors with side-mounted float housing, slacken the two screws on the cover, take off the cover, then take float from housing.

The float should drop by its own weight from its suspension on to the bottom of the float cap, so that it can readily be lifted out. The float needle can then be removed after taking off the spring-loaded retaining clip. On some versions, the float lies loosely in the cap. The forked part which prevents the float needle from dropping out can be taken off after its fixing pin has been drawn off. Do not bend the fork piece and check that it lies horizontally in its top position.

Never use a sharp, hard tool to clean the needle seat or the jet bores, but merely rinse them out carefully, then blow them out to remove all liquid. Do not tighten the locknut too hard but run it down by hand only. Use only the original sealing rings for the float cap seal. Before fitting the fuel hose, first allow a little fuel to run through it to drive out all the air and prevent the formation of bubbles and an airlock in the system.

Special Hints

1. The carburettor is one of the most delicate parts of the engine. Handle all parts with great care, run down all threaded connections lightly, never use force to fit parts of the float into position.
2. Do not use hard, sharp tools to clean the jets. **On no account, enlarge nozzle bores with a reamer or by any other means.**
3. Fit only Original BING spare parts to ensure trouble-free operation and a long service life.
4. In all your spare part orders, quote part No. accurately and in full. If the number is not known, quote the carburettor type code, stamped into the casing, or send old part as a sample.
5. BING carburettors will give excellent service at all times, provided standard good-quality branded fuels are used, carburettors are kept clean and only Original BING spare parts are used.

Carburettor Setting

Manufacturers of carburettors work out the most suitable design and select the jet sizes in close collaboration with the engine makers. They also specify the setting which tests have shown to give best performance and maximum economy. It is, therefore, inadvisable to depart from their specifications.

Idling

Idling speed should always be set or regulated while the engine is warm. With the adjuster screw, close the throttle slide until the engine just ticks over slowly and steadily. On carburettors without separate idling speed system, the needle jet assembly supplies the amount of fuel required for idling speed. Carburettors with separate idling speed system work as follows: The air adjuster screw controls the ratio of the fuel/air mixture supplied by the idling speed system. By turning the adjuster clockwise the mixture becomes richer, by turning anti-clockwise, it becomes leaner. The setting is correct when the engine ticks over quietly and evenly. As soon as it does, do not alter the air adjuster setting again, since this also governs the lower and medium speed range, so that any further adjustment might increase fuel consumption.

When the throttle is slowly opened out, the engine should steadily rev up. It should neither splutter nor should the speed drop back again at any throttle setting. If the engine splutters or speed rises in surges, or if black fumes escape from the exhaust silencer, the mixture has been made too rich. If the engine coughs or cuts out for brief moments, if a blue flame blows back from the carburettor, or if the engine is difficult to start, the mixture has been set too lean.

Driving Speed Range

In order to determine the most suitable main jet for a carburettor, first take the machine on a straight, level road and find out its maximum speed by the speedometer or with a stop watch. Generally, the main jet which will produce the highest speed on a level road will be the most suitable for any machine. But if on long continuous runs at full throttle the engine starts knocking due to overheating, select the next larger jet size.

In the medium speed range, carry out fine settings between two needle jet sizes by means of the needle. By setting the needle higher, the mixture will become richer and vice versa.

Note that needle position only affects the mixture ratio in the lower and medium speed ranges, not for driving at full throttle. If the carburettor is correctly set, the insulator of the spark plug will show an even brown combustion coating. A spark plug coated with black coking residues or wet to the touch is a sure sign that the mixture is too rich, a white insulator shows that it is too lean.

Always remember that only correct carburettor setting guarantees maximum running economy.

Starter Systems

To start a cold engine needs a specially enriched fuel mixture. To supply this, carburettors are fitted with either a starter slide or with a plunger ('to tickle the float').

Starter Air Slide

With these designs, the engine is started from cold as follows: Close throttle slide all the way, and with the pressure pin and knob, press the starter slide down. As you start, pull out throttle about one-third to one-half of the way to a clearly perceptible stop. Once the engine has come to life, leave the throttle in this intermediate position, until the engine has run itself warm. Then open throttle all the way, and this will also raise the starter slide to its end position where it engages. If on starting you inadvertently pull out the throttle too far so that the slide overrides the stop and takes the pin and knob with it, press the starter knob once more.

Plunger

This little pin on top of the float chamber is accessible from outside. Press it ('tickle the float') to raise the level of the fuel in the carburettor and so enrich the mixture for cold starting. Press it only until fuel runs over at the carburettor.

5. Troubles, and their Causes

1. Engine will not start

Cause: Fuel tap not opened, starter aid not operated when starting from cold, jets clogged, carburettor flooded (engine drowned). Ignition not switched on, spark plug defective, spark too weak. Spark (electrode) gap on plug too large, spark plug short-circuited by dirt, water or oil.

2. Engine chokes back on starting

Cause: Ignition timing set too early.

3. Engine starts badly

Cause: Mixture too lean (operate starting aid), idling jet clogged. Spark plug dirty or oily, spark gap too large or too small (weak spark). Water in fuel.

4. Engine starts, but stops again after short run

Cause: Carburettor empty, because fuel tap remained closed.

5. Engine starts, but stops on throttling up

Cause: Main jet or fuel line clogged, engine still too cold, carburettor badly adjusted.

6. Engine starts, but carburettor "spits back" on throttling up (coughs and sneezes)

Cause: engine very cold, fuel mixture too lean, jet too small or clogged. Carburettor badly adjusted (poor transitions), too many late firings, air enters at carburettor union.

7. Engine starts, but runs irregularly and splutters on throttling up

Cause: Mixture too rich (fit smaller jets, alter needle setting of throttle slide) air filter dirty, float overflows. Ignition cuts out, spark plug oily or coked up.

8. Engine runs properly, but exhaust backfires

Cause: Ignition cuts out. Mixture too lean.

9. Engine knocks or pinks

Cause: Too many early firings, glowing coke deposits or parts of overheated spark plug produce faulty ignition. Main jet too small.

10. Engine does not pull or does not give full performance

Cause: Mixture too lean or too rich, too few early firings. Exhaust clogged, piston leaks, intake or exhaust ports clogged by coking deposits. Air filter dirty.

11. Float overflows

Cause: Foreign body carried in fuel to float needle seat, obstructing needle operation. Float leaks, float needle closes too late.