DISTRIBUTORS, MODELS 22D, 23D AND 25D

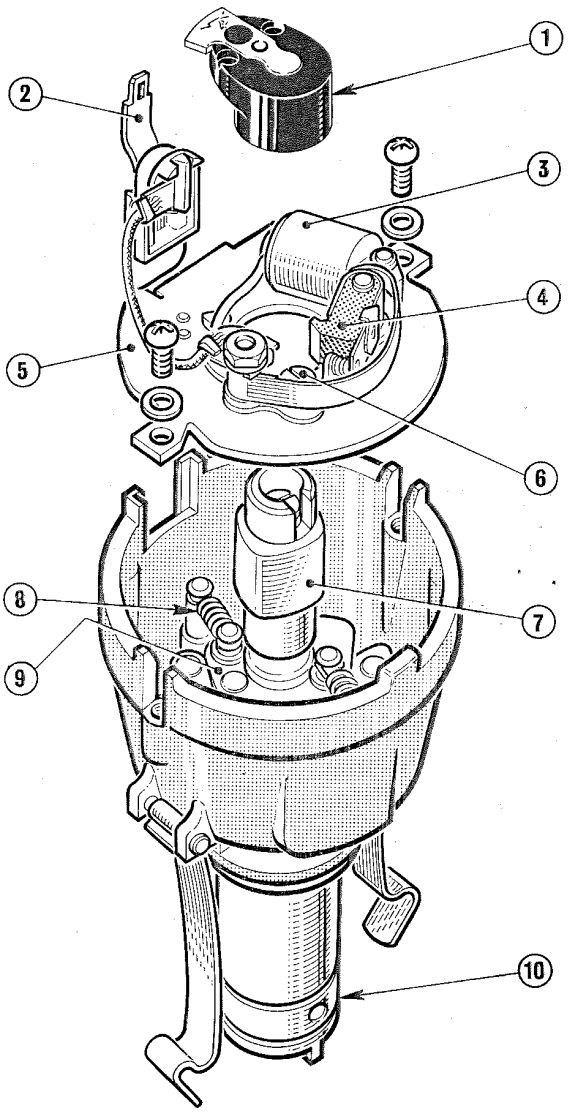


Fig. 1 Model 23D distributor, complete with conventional contact set

1 Rotor arm
2 L.T. terminal
3 Capacitor
4 Contact set
5 Contact breaker base plate
6 Fixed contact securing screw
7 Cam
8 Automatic advance control springs
9 Automatic advance mechanism
10 Drive dog and thrust washer

1. DESCRIPTION

The basic models are as follows:–

Model 25D – Incorporates centrifugal advance and vacuum advance/retard mechanisms. Micrometer adjustment is also included in the majority of units.

Model 23D – Has only centrifugal advance mechanism.

Model 22D – Similar to Model 25D but has longer body to permit the use of two bearing bushes. A mechanical tachometer drive take-off point is sometimes built into the body for certain applications.

This range of distributors incorporates many components which are directly interchangeable between the three basic models. Both 4- and 6-cylinder versions of each model are available, the number of cylinders being denoted by a suffix number in the model description, i.e. 25D4 or 22D6.

All models have aluminium bodies with bearing bushes and incorporate a rolling weight automatic advance mechanism.

The bearing bushes are oil-impregnated before assembly in the distributor and in service are lubricated automatically by oil-mist from the engine.

Distributors, Models 22D, 23D and 25D

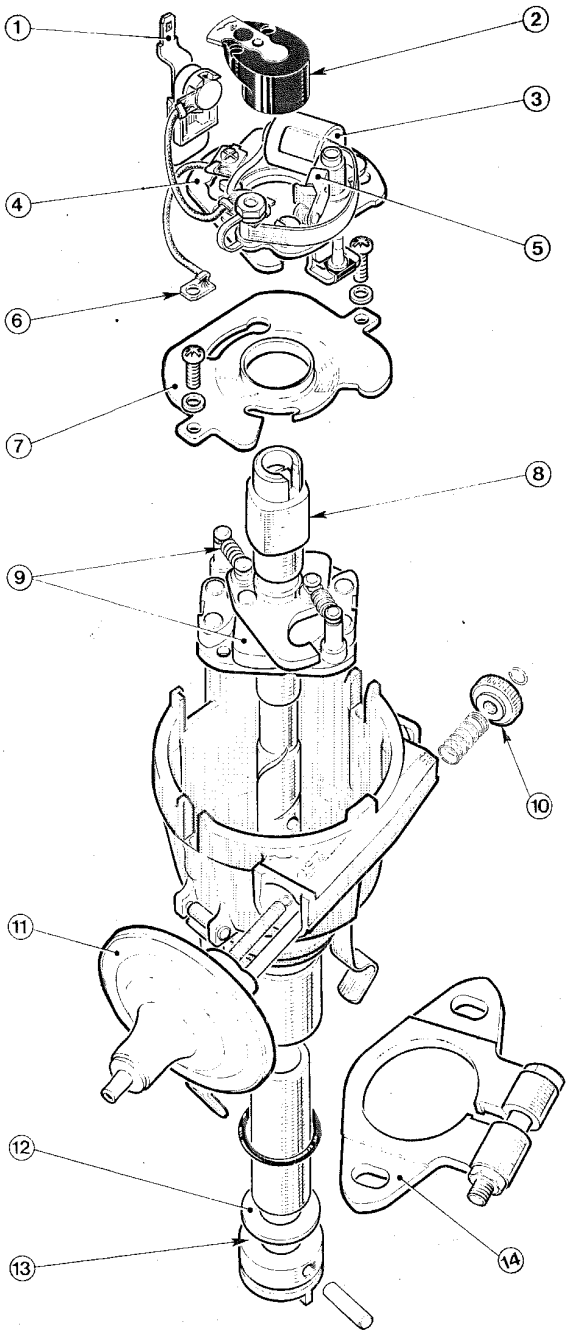
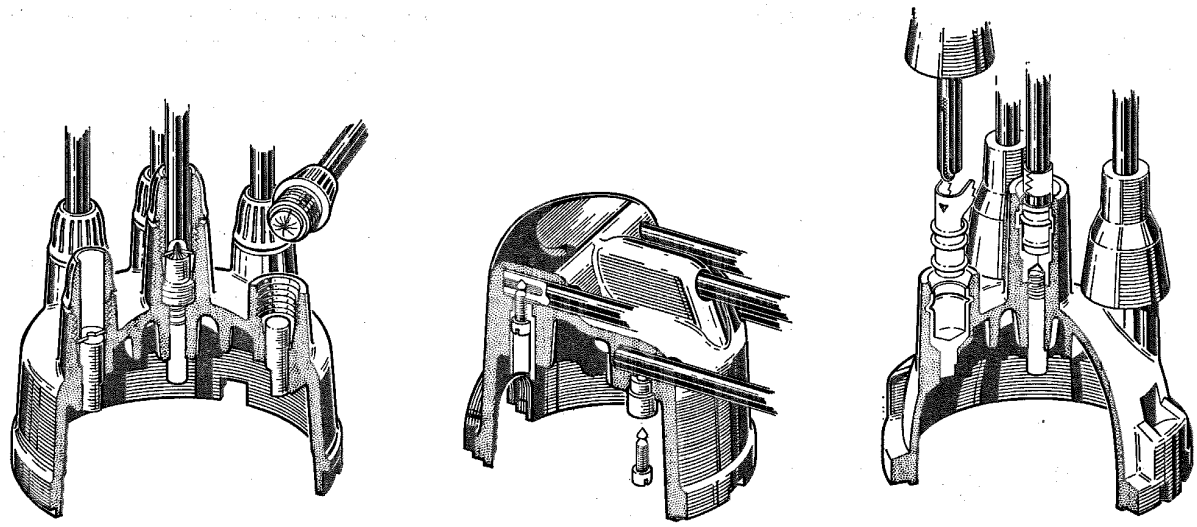


Fig. 2 Model 25D distributor, complete with one-piece contact set

1 L.T. terminal
2 Rotor arm
3 Capacitor
4 Contact breaker moving plate
5 Contact set
6 Contact breaker earth terminal
7 Contact breaker base plate
8 Cam
9 Automatic advance springs and weights
10 Micrometer adjustment nut
11 Vacuum unit
12 Thrust washer
13 Drive dog and pin
14 Securing plate

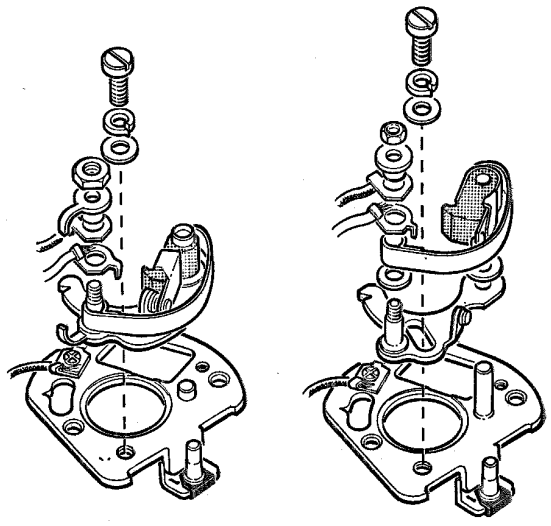


Vertical 'Screw-in' Horizontal Vertical 'Push-in'

Fig. 3 Typical distributor covers

Distributor Covers

Both horizontal and vertical outlet distributor covers are available. (Fig. 3). Earlier distributors with vertical outlet covers had conventional screw type terminals, which use knurled nuts to secure the H.T. cable in the chimney. Horizontal outlet versions had pointed screws, located inside the moulded cover as part of the electrode and these pierced the H.T. cable.



(a) Fig. 4 (b)

(a) One-piece contact set and contact breaker plate
(b) Conventional contact set and contact breaker plate

Later distributors have "push-in" type H.T. terminals and are confined to vertical outlet covers. These rely on a shaped connector which is crimped to the end of the H.T. lead to form a tight "push-in" fit in the chimney insert of the cover.

Contact Breaker Assemblies

The contact point gap setting is standard throughout the range and should be within the limits 0·014″ – 0·016″ (0·35 mm – 0·40 mm).

Originally all these distributors had conventional contact sets, comprising fibre heel, insulating bushes and washers (Fig. 4b).

Later distributors have a modified contact breaker assembly incorporating a one-piece contact set. The contact breaker heel pivots on its own hollow pivot post which is positioned over a short locating stud on the contact breaker base plate.

Fig. 4a illustrates a modified base plate and contact breaker assembly. As the moving contact is smaller than the fixed contact, alignment is established when the moving contact has its diameter completely within that of the fixed contact. The two contacts need not be concentric. Insulation of the steel terminal post is provided by two nylon bushes joined together by a short link.

Vacuum Units

The characteristics of vacuum units are set during manufacture and cannot be adjusted in service. The complete vacuum unit must be replaced if a fault develops.

The performance details of a vacuum unit are marked on the casing using a code number. The figures in such a code, i.e. 3/24/12, stand for:-

(a) (b) (c)

(a) Vacuum in inches of mercury (″Hg) at which the unit commences to function.

(b) Vacuum (″Hg) at which maximum advance (retard) occurs.

(c) Maximum advance (retard) in degrees.

Full details of individual test figures for these codes are given in Publication No. SB222, Test Data Manual, Section 6, against the appropriate code number.

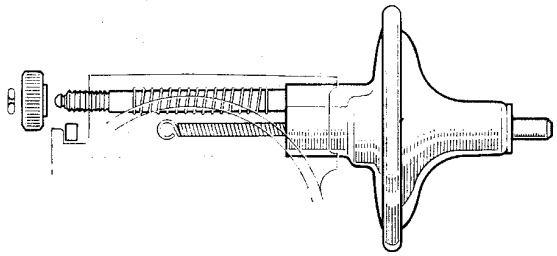


Fig. 5 Typical vacuum unit (advance type)

(i) **Typical Advance Unit**

The normal advance type units afford additional advance when the engine speed is high and lightly loaded.

(ii) **Retard Type Unit**

Certain engines incorporate an emission control system to limit obnoxious fumes from the exhaust. A retard vacuum unit is used to control the engine speed when the emission control system operates, during idling and over-run conditions.

Retard type units have an 'R' incorporated in the code marking, e.g. 4/8/5R.

Two versions of the retard only vacuum unit are used:-

(a) A typical advance unit mounted on the opposite side of the distributor to its normal position so that the C.B. moving plate is pulled in the direction of rotation.

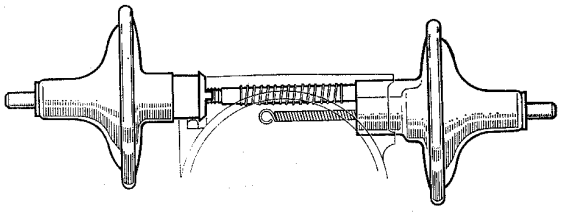


Fig. 6 Twin vacuum units (double-acting)

(b) The retard section of a single capsule double-acting unit (see sec. iv). In such cases the outlet from the advance side is sealed.

(iii) **Twin Vacuum Units (Double-Acting)**

Some emission controlled engines require two vacuum units. A retard unit is mounted on the opposite side of the distributor body to the advance unit, Fig. 6. The two vacuum units are linked by a rod mechanism and then connected to the contact breaker moving base plate.

(iv) **Typical Single Capsule, Double-Acting Vacuum Unit**

The double-acting vacuum unit incorporates both advance and retard characteristics, Fig. 7. Both codes are stamped on the casing.

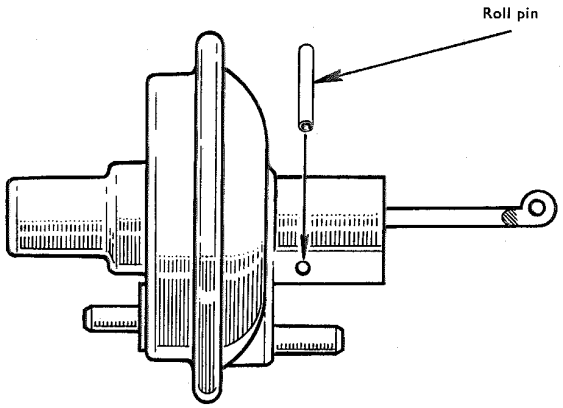


Fig. 7 Single capsule, double-acting vacuum unit

2. ROUTINE MAINTENANCE

Normal maintenance consists of general cleaning, contact breaker inspection, checking and adjusting contact gap setting and lubrication at regular intervals.

(a) Contact breaker adjustment — after first 500 miles (800 km)

When a new vehicle or replacement contact set has completed the first 500 miles (800 km), check that the contact gap is within the limits 0·014″ - 0·016″ (0·35 mm - 0·40 mm).

(i) With the distributor cover and rotor arm removed, rotate the engine until the contacts are fully open, i.e. when the operating heel is on the highest part of the cam lobe.

(ii) A feeler gauge 0·015″ (0·38 mm) thick should be a sliding fit between the contact surfaces. (Any trace of piling must be removed, otherwise a false setting will be obtained, see para (b)). If the gap is incorrect, slacken the screw securing the fixed contact plate and adjust its position until the gauge can be inserted as a sliding fit. A screwdriver blade should be inserted between

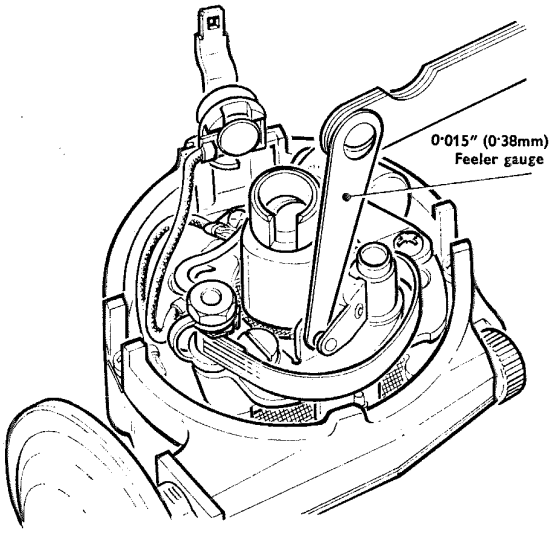


Fig. 8 Setting the contact point gap

the recess at the end of the fixed contact plate and the base plate and used as a lever to adjust the setting. When the gap is correct, tighten the securing screw and recheck the gap on each cam lobe.

(b) Cleaning and lubrication every 6,000 miles (5,650 km)

Thoroughly clean the distributor cover, inside and outside with a clean dry cloth, paying particular attention to the spaces between the metal electrodes. Check that the electrodes are not excessively eroded and that there are no signs of tracking. Ensure that the small carbon brush in the centre of the cover is unbroken and moves freely in its holder.

Examine the contact breaker. The contact points must be free from grease and oil. If the points are burned, blackened or rough (badly pitted and piled) they should either be replaced or cleaned with a fine carborundum stone or emery cloth and then wiped with a petrol-moistened cloth to ensure they are absolutely clean and free from carborundum deposits etc.

Cleaning is made easier by removing the contact breaker assembly. Disconnect the connections from the L.T. terminal post. Slacken and take out the screw securing the fixed contact plate. Remove the contact point assembly.

Before refitting the assembly (for sequence see Fig. 4) lubricate as follows:–

(i) Lightly smear the cam with Retinax 'A' or equivalent grease.

(ii) Inject one or two drops of clean engine oil (SAE.30) through an aperture in the contact breaker base plate to lubricate the auto-advance mechanism.

(iii) Lift off the rotor arm and apply a few drops of clean engine oil (SAE.30) to the top of the exposed screw to lubricate the cam bearing. It is not necessary to remove the screw since there is a clearance for the passage of oil.

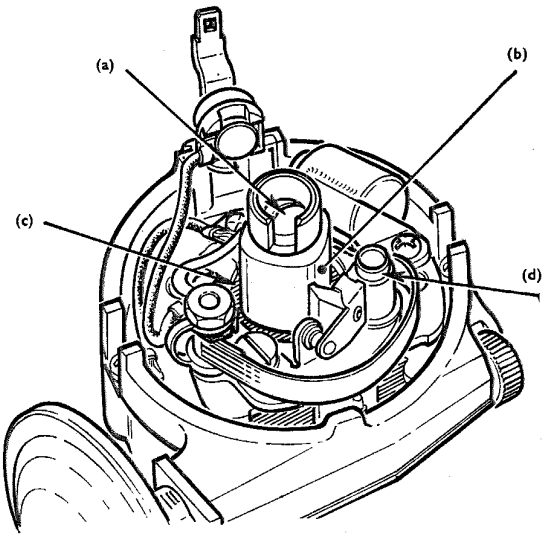


Fig. 9 Lubricating the distributor

(a) Apply 2 or 3 drops of clean engine oil
(b) Lightly smear cam with Retinax 'A' or equivalent grease
(c) Add several drops of clean engine oil
(d) One-piece contact set—lightly smear outside of hollow pivot post with Retinax 'A' or equivalent grease

(iv) **Earlier contact set.** Apply 1 drop of clean engine oil (SAE.30) to the top of the pivot post on the contact breaker base plate.

One-piece contact set. Lightly smear the outside of the hollow pivot post with Retinax 'A' or equivalent grease.

Note: *Take care to prevent oil or grease contaminating the contact points. All surplus must be wiped away immediately.*

After reassembly, set the contact gap within the limits 0·014″ – 0·016″ (0·35 mm – 0·40 mm), except in the case of a new contact set. The limits are then extended to 0·019″ (0·48 mm) to allow for bedding in of the new contact breaker heel. For method of adjustment see para. 2(a).

3. DESIGN DATA

(a) **4-cylinder units:–**

Firing angles: 0°, 90°, 180°, 270° ± 1°
Dwell angle: 60° ± 3°
Open period: 30° ± 3°

6-cylinder units:–

Firing angles: 0°, 60°, 120°, 180°, 240°, 300° ± 1°
Dwell angle: 35° ± 3°
Open period: 25° ± 3°

(b) Contact breaker point gap: 0·014″ – 0·016″ (0·35 mm – 0·40 mm).

(c) Contact breaker spring tension, measured at contacts: 18 – 24 ozf. (5 – 6·6 Newtons)

(d) Capacitor: 0·18 – 0·23 microfarad.

(e) Automatic timing controls: Refer to Section 5 of Publication No. SB222 against the appropriate distributor Service No. for test details of the automatic advance and vacuum timing control mechanisms.

(f) Securing plate:

Maximum tightening torque –
Trapped nut and rotating bolt –
30 lbf/in. (5·25 k N/m).
Trapped bolt and rotating nut –
50 lbf/in. (8·76 k N/m).

4. SERVICING — FAULT DIAGNOSIS

Before testing the ignition system, ensure the battery is in good condition and at least 70% charged. Check the specific gravity of the electrolyte in each cell with a hydrometer. If the individual cell readings vary by more than 40 points (0.040), the battery is suspect and should be removed for testing by a Lucas battery agent.

State of charge	S.G. readings corrected to 15°C (60°F)	
	Climates normally below 25°C (77°F)	Climates normally above 25°C (77°F)
Fully charged	1.270 – 1.290	1.210 – 1.230
70% charged	1.230 – 1.250	1.170 – 1.190
Discharged	1.100 – 1.120	1.050 – 1.070

Electrolyte Temperature Correction

For every 10°C (18°F) *below* 15°C (60°F) *subtract* 0.007.
For every 10°C (18°F) *above* 15°C (60°F) *add* 0.007.

(a) Testing in position to locate cause of uneven firing

Run the engine at a fast idling speed. If possible, short circuit each plug in turn between the plug terminal and cylinder block or alternatively lift off each plug connector in turn. Short circuiting the plug or removing the connector of the defective cylinder will not cause an appreciable change in the running note.

When the suspect cylinder has been located, stop the engine and remove the H.T. cable from the sparking plug terminal. Restart the engine and hold the cable end about 0·25″ (6 mm) from a clean unpainted part of the engine. If the sparking at the end of the lead is strong and regular, the sparking plug should be removed, cleaned and adjusted or a replacement fitted. If, however, there is no spark or the sparking is weak and irregular, examine the H.T. cable and connections to the plug and distributor cover. Renew the cable if the insulation is cracked, perished or the cable end connector is damaged.

Clean and examine the distributor cover. Check that the carbon brush moves freely. If a replacement brush is required, the correct type must be used. If there is any evidence of tracking (indicated by a thin burnt line between two or more electrodes or between one of the electrodes and earth), a replacement cover must be fitted.

If the fault still persists, proceed with further checks to the following:–

Contact points – see Section 2, paras a and b.
Capacitor – see Section 4, para b, (vii).
Shaft side-play – see Section 5, para d.
All wiring connections.

(b) Testing in position to locate cause of ignition failure

Note: *COIL CONNECTIONS – Coils marked '+' and '—' have the '—' terminal connected to the distributor contact breaker on a negative earth system, and to the ignition switch on a positive earth system. (Meter connections shown are for negative earth systems).*

(i) Supply to the ignition coil

Connect voltmeter between a good earth and the feed or 'SW' terminal of the coil, Fig. 10. With the contact points closed, switch on the ignition. Battery voltage should be registered or in the case of a ballasted ignition system approximately 6V for a 12V system.

Zero reading indicates an open circuit between the battery and the coil.

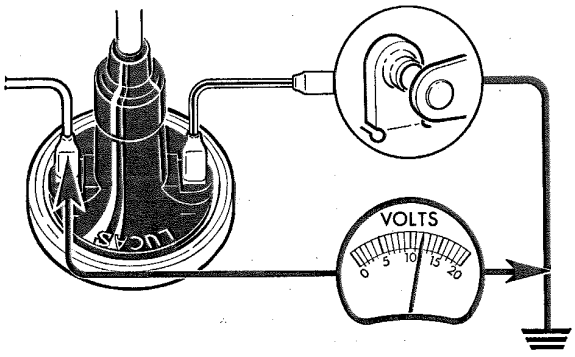


Fig. 10 Checking the supply voltage at the coil (contact points closed)

(ii) Coil primary winding

Connect voltmeter between a good earth and distributor side or 'CB' terminal of the coil, Fig. 11. Battery voltage should be registered when the ignition is switched on and the contact points are open.

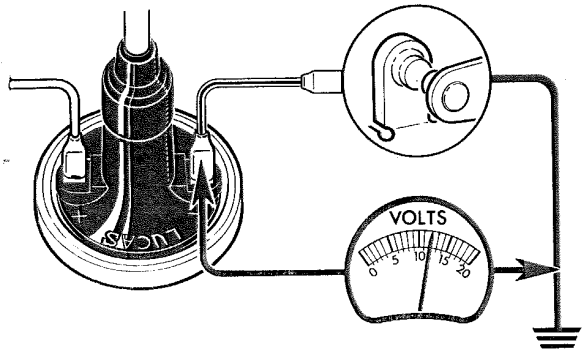


Fig. 11 Checking the primary winding (contact points open)

If satisfactory proceed to para (iv).

If a zero reading is obtained it indicates either:–

(a) Open circuit of coil primary winding.

(b) Short circuit to earth in the coil to distributor L.T. lead or in the distributor.

To locate the cause of failure, disconnect the lead from the coil 'CB' terminal. Leave voltmeter still connected to the coil 'CB' terminal and the ignition on, check voltmeter reading:–

Zero – Faulty coil (open circuit primary winding.

Battery voltage – Coil satisfactory, but there is an earth fault in the coil to distributor lead or in the distributor. To check the lead, reconnect it to the coil and disconnect at the distributor. Connect the voltmeter between the free end of the lead and earth. If the lead is satisfactory, battery voltage will be registered and the fault must therefore lie within the distributor, proceed to para (iii). A zero reading indicates short to earth in the lead which must be rectified. Proceed to para (v), if further testing of the system is required.

(iii) Distributor earth

If testing indicates a short circuit to earth in the distributor, check:–

(1) the contact points are opening correctly. Conventional contact sets require an insulating washer under the moving contact;

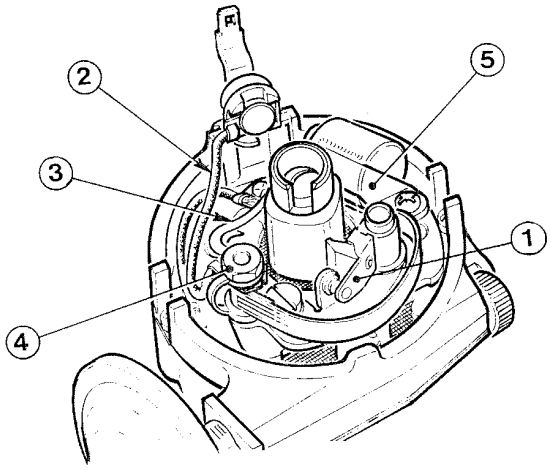


Fig. 12 Checking for distributor earths

(2) the flexible lead connecting the distributor L.T. terminal to the moving contact (terminal post);

(3) the capacitor lead connected to the terminal post;

(4) the terminal post connections are assembled correctly, see Fig. 4;

(5) the capacitor is not short circuited by removing the capacitor from its mounting position.

(iv) Coil to distributor L.T. lead

Connect voltmeter between a good earth and distributor L.T. terminal. With the ignition on and the contact points still open, check the voltmeter reading.

Battery voltage – L.T. lead is satisfactory.

Zero – Broken or open circuit lead (assuming the correct result was obtained in para (iii).

(v) Check contact points

Connect voltmeter between a good earth and distributor L.T. terminal. With the ignition and contact points closed, voltmeter reading should be zero, see Fig. 13.

If the voltmeter registers a voltage:–

(a) Contact points may not be closing.

(b) Contact points may be dirty or oily.

(c) A bad earth connection may be indicated, i.e. a broken flexible earth lead or a poor connection between the distributor body and the engine block.

(d) Ensure the flexible lead between the distributor L.T. terminal and the terminal post is not broken.

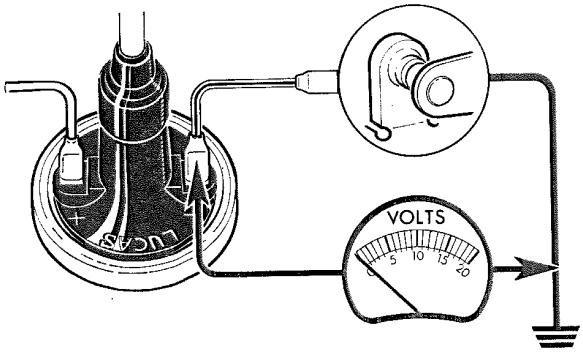


Fig. 13 Checking contact points (contact points closed)

(vi) Check H.T. spark to distributor

Remove H.T. lead from centre terminal of distributor cover and connect free end to 3-point gap, or hold end termination approximately 0·25″ (6 mm) away from a clean unpainted part of the engine. The earth side of the 3-point gap must be connected to a good earth on the engine. Ensure contacts are closed, switch on the ignition and when the contacts are flicked open, a strong H.T. spark should be obtained across the gap.

If a strong spark is obtained each time the contacts are flicked open, the ignition coil and capacitor are serviceable. A spark will still be obtained even if the capacitor is open-circuit, but it will be weaker than normal. To check, proceed to para (vii).

However, if a spark is not obtained, the ignition coil secondary winding is probably defective and the ignition coil should be replaced.

(vii) Checking the capacitor

The capacitor is checked by substitution. The original capacitor must be disconnected and a test capacitor connected between the distributor L.T. terminal and a good earth. A strong H.T. spark should now be obtained when the contacts are flicked open with the ignition switched on.

If the spark obtained is stronger than in the previous test, the capacitor should be replaced.

(viii) Check distributor rotor arm

Connect an H.T. lead in the coil chimney and hold the free end 0·125″ (3 mm) from the rotor arm electrode. With the ignition on, contacts are flicked open. If a strong spark is produced, the rotor arm is shorted to earth via the cam head and should be replaced.

(The H.T. spark referred to should not be confused with the faint sparking due to electrostatic charge and leakage.)

5. SERVICING — DISMANTLING

Spring back the clips and remove the distributor cover.

If a driving gear or dog is fitted to the shaft and has to be removed, note the relative positions between it and the rotor arm electrode. A gear should be marked to ensure correct re-assembly whereas a dog normally has offset tongues which should lie to the left of the centre-line when they are in line with the rotor arm electrode, see Fig. 14.

Lift the rotor arm off the cam.

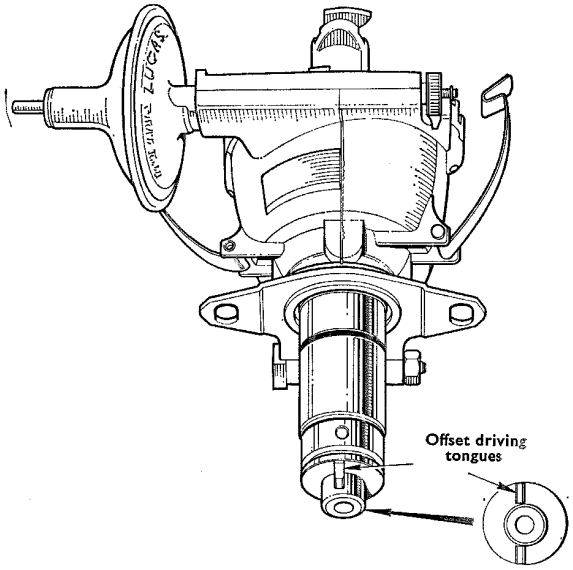


Fig. 14 Typical drive arrangement

When the distributor is fitted with a vacuum unit, the link connecting the vacuum unit to the contact breaker moving plate should be lifted off the tapered post. Remove the two screws at the edge of the contact breaker base plate to allow the contact breaker assembly and the L.T. terminal to be lifted clear.

Knock out the securing pin and remove the thrust washer, dog or gear. If the distributor is fitted with a mechanical tachometer take-off point, remove the two screws securing the tachometer gear cover and gasket and withdraw the gear from its housing. The complete shaft assembly, with the cam and automatic advance mechanism can then be separated from the body.

To remove a micrometer adjustment and vacuum unit, take off the circlip on the end of the micrometer screw thread and turn the adjustment nut until it is off its thread. Take care not to lose the ratchet and coil spring located under the micrometer nut. The vacuum unit can then be removed. In the case of twin vacuum units the small spring clip which retains the additional or retard vacuum unit must first be removed to allow the additional

unit to be screwed off the end of the inter-connecting rod while the other unit is held against its spring pressure to the body of the distributor (Fig. 6). If a single capsule double-acting vacuum unit is fitted, the roll pin (Fig. 7) should be knocked out and the vacuum unit then withdrawn from the distributor body.

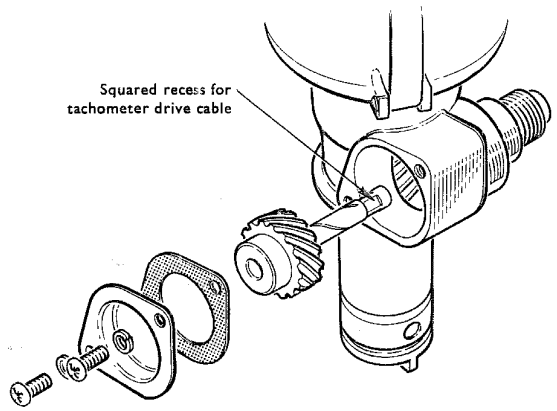


Fig. 15 Typical tachometer 'take-off' attachment

(a) Contact breaker assembly

To dismantle the contact breaker completely remove the nut, insulation piece(s) and connections from the pillar on which the contact breaker spring is anchored. Lift off the spring and insulating washers beneath it.

Remove the screw securing the fixed contact plate together with the plain and spring washers, and take off the plate.

Slacken and remove the self-tapping screw to free the capacitor.

The contact breaker plate assemblies of 22D and 25D distributors can be further dismantled by turning the moving plate clockwise and pulling to release it from the base plate.

(b) Replacement contacts

If the contacts are so badly worn that replacement is necessary, they must be renewed as a pair and not individually.

(c) Shaft and action plate

The dismantling and re-assembling of the automatic advance mechanism must be carried out carefully to avoid damaging the springs, which would alter the characteristics.

Carefully remove the springs. Slacken and withdraw the screw inside the cam and lift off the cam. Before removing the weights, note the position of the cam slots. Note also that a distance collar is fitted on the shaft underneath the action plate.

(d) Bearings

If the bearings are worn to such an extent that excessive side play of the shaft is evident, the complete distributor must be replaced.

6. SERVICING — RE-ASSEMBLY

The following instructions assume that complete dismantling has been undertaken.

(a) Before re-assembling the automatic advance mechanism to the shaft and action plate, the top section of the shaft (cam spindle), the top of the action plate, the cam foot weight pivots and all working surfaces of the weights and action cams should be smeared with Rocol MP (Molypad) lubricant. Assemble the mechanism and fit the cam securing screw.

Ensure the springs are not stretched or damaged during re-assembly.

(b) Ensure the distance collar is in position and then liberally smear the distributor shaft with Rocol MP (Molypad) before insertion into the bearing.

It is important to ascertain that the shaft is free to rotate without binding.

(c) If the distributor has a manual tachometer take-off point, insert a liberal quantity of Rocol 30863 Molybdenum grease into the gear housing. Refit the gear and secure the gasket and gear cover in position.

(d) If the distributor is fitted with a vacuum unit and micrometer adjustment (models 22D and 25D), ensure the ratchet for the milled adjustment nut is in position. Slide the vacuum unit into its housing and refit the spring, milled adjusting nut and securing circlip.

All other vacuum units should be fitted using a reversal of the dismantling procedure.

(e) Re-assemble the contact breaker assembly.

Where applicable, i.e. 22D and 25D distributors, lightly smear all the base plate bearing surfaces with Rocol MP (Molypad) lubricant. Assemble the base and moving plates together using a reversal of the dismantling procedure.

Before fitting the contact set ensure the moving contact pivot post has been lightly smeared with Retinax 'A' or equivalent grease. The fixed contact securing screw should only be loosely fastened at this stage.

Fit the capacitor and assemble the terminal post connections as shown in Fig. 4.

(f) Refit the complete contact breaker assembly into the distributor body and engage the link from the vacuum unit (if fitted) and slide the terminal block into its slot. Insert and tighten the two base plate securing screws. On models 22D and 25D one of these screws also secures the free end of the contact breaker earthing cable.

(g) Lightly smear the cam with Retinax 'A' or equivalent grease.

Note: *Take care to prevent oil or grease contaminating the contact points. All surplus must be wiped away immediately.*

(h) Set the contact point gap within the limits 0·014″ – 0·016″ (0·35 mm – 0·40 mm) or for a new contact set 0·019″ (0·48 mm) maximum, and tighten the fixed contact securing screw. Check the gap for each cam lobe.

(i) Refit the rotor arm, locating the moulded projection in the rotor arm with the keyway in the shaft, and push fully home.

(j) Refit the thrust washer and drive dog or gear to the shaft. The tongues of the dog must lie to the left of the centre-line of the shaft when they are in line with the rotor arm electrode, (Fig. 14).

Note: *A new shaft can be drilled using the hole in the dog or gear as a guide, (Fig. 16). Drill size* $\frac{3}{16}$″ *(0·1575″) (4·76 mm).*

If the distributor shaft has a fibre thrust washer, a 0·002″ (0·05 mm) feeler gauge should be inserted as a temporary spacer between the dog and the thrust washer. (This is to ensure correct distributor shaft end float.) Maximum permissible end float is 0·005″ (0·13 mm). Whilst drilling, the shaft and action plate must be pushed down from the cam end. The dog must also be held firmly compressing the thrust washer and feeler gauge against the shank. Fit the pin and caulk over the holes to retain the pin.

If a brass thrust washer is used, the 0·002″ (0·05 mm) gauge is not required. The brass washer is fitted with the raised "pips" facing the dog. When the pin is fitted, the driving end of the shaft must be sharply tapped with a mallet to flatten the three pips on the washer and ensure the correct amount of end float.

(k) Refit the moulded cover.

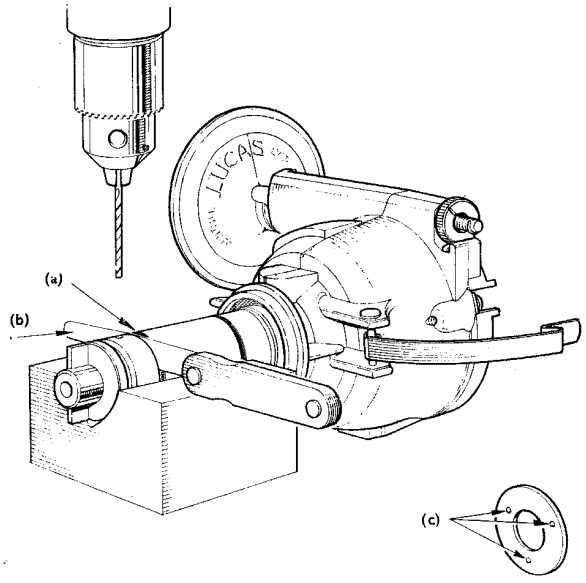


Fig. 16 Drilling the shaft

(a) Fibre washer (b) 0·002″ (0·05mm) Gauge (c) Raised pips