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EQUIPMENT

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WORKSHOP INSTRUCTIONS

WINDSCREEN WIPER

MODEL DR3

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WINDSCREEN WIPER

MODEL DR3

1. GENERAL

The Lucas windscreen wiper model DR3 is a two-speed, thermostatically protected, self-parking, cable rack unit. The cable rack comprises a flexible inner core of steel wire wound with a wire helix. The rack passes through protective tubing from an underbonnet mounted motor to a pair of scuttle mounted wheelboxes. A reciprocating motion is imparted to the rack by a crank in the wiper gearbox and transmitted to the wiper arm spindles by engagement of the rack with a gear in each wheelbox.

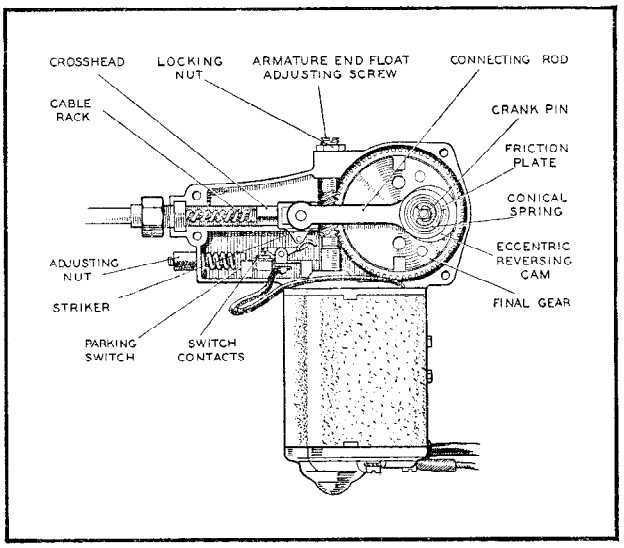

Fig. 1
Gearbox with cover removed

Other details of design include:

Two Speed Operation

The standard motor incorporates a field resistor which, in conjunction with a three-position (Park/Normal/High) rotary switch, enables a high speed of wiping to be selected during heavy rain. This alternative wiping speed should not be used in heavy snow or against a drying screen, i.e., when the load on the wiper motor is in excess of normal.

For certain special applications where only the 'Normal' wiping speed is required, the resistance winding is omitted from the field coil and a rotary on-off control switch is used.

Thermostatic Circuit Breaker

The motor also incorporates a quick-break circuit breaker sensitive to excess temperature and current which in the event of overloading, due perhaps to a damaged rack or packed snow on the screen, automatically protects the motor from overheating until normal conditions are restored. Both field and armature currents flow through the circuit breaker.

Self-Parking Mechanism

The gearbox contains a self-parking mechanism which automatically parks the wiper arms at the edge of the windscreen when the control switch is turned to the 'Park' position. The self-parking mechanism consists of an eccentric reversing cam in the connecting rod assembly, and a parking switch. When the control switch is turned to the 'Park' position, the direction of rotation of the motor armature is reversed. This causes the eccentric reversing cam to move the crosshead to its parking traverse. This can be either away from or nearer to the final gear depending on whether left hand or right hand parking is required. A striker carried by the crosshead then opens the parking switch, which cuts off the supply to the motor. The blades come to rest in the correct parking position irrespective of their position at the moment of turning the control switch to 'Park.'

2. MAINTENANCE

Efficient wiping is dependent upon having a clean windscreen and wiper blades in good condition. Use methylated spirits (denatured alcohol) to remove oil, tar spots and other stains from the windscreen. Silicone and wax-based polishes should not be used for this purpose.

Worn or perished wiper blades are readily removed for replacement. See para. 5 (a) for details.

At the same time lubricate the rubber grommet or washer around the wheelbox spindle with a few drops of glycerine.

The gearbox and cable rack are packed with grease during manufacture and need no further lubrication. When necessary, adjustments to the parking mechanism can be made by turning the knurled nut near the cable rack outlet. Turn the nut only one or two serrations at a time and test the effect of each setting before proceeding.

3. TEST DATA

Nominal voltage: 12 volts.

(*a*) Wiping Speed:
Normal: 45-50 cycles per minute. *
High: 60-70 cycles per minute. *

(*b*) Light Running Current:
Normal Speed: 2.7—3.4 amperes. *
High speed: 2.6 amperes (or less). *

(*c*) Stall Current: 15-17 amperes (motor cold) falling to 9-10 amperes (motor hot)

(*d*) Brush spring tension: 4.4-5.0 oz. (125-140 *g*.).

(*e*) Resistance between adjacent commutator segments: 0.29—0.35 ohm.

(*f*) Field resistance at 60°F. (15.5°C.): 8.0—9.5 ohms.

(*g*) Speed control resistance at 60°F. (15.5°C.): 8.5—9.5 ohms.

(*h*) Armature end float:
0.008 in.—0.012 in. (0.2 mm.—0.3 mm.).

(*i*) Maximum permissible force to move cable rack in tubing with motor, arms and blades disconnected: 6.0 lb. (2.72 kg.).

Note: Figures marked thus (*) above apply one minute after switching on.

4. SERVICING

(*a*) INCORRECT OPERATION

(*i*) *Faulty Control Switch*

If, on switching from 'Park' to 'Normal,' the wiper arms begin a downward stroke before operating in the normal manner, this indicates a fault in the control switch.

This defect can occur only when switch Model PRS5 is used. (Switch Model PRS7 has a different contact arrangement which eliminates the possibility of such a fault occurring). It is caused by spring contacts 'C' (Fig. 2), operated by a cam on the spindle, making contact before the other stud-type contacts have taken up their 'Normal' positions. The motor thus starts in a reverse direction and the striker on the crosshead travels past the parking switch in the gearbox. If this fault occurs, check the switch by substitution.

(*ii*) *Faulty Parking Switch*

If, on switching from 'Normal' to 'Park,' the wiper arms traverse beyond the 'Park' position and continue to wipe over the edge of the screen, the parking switch in the gearbox is failing to open.

To check the switch, remove the gearbox cover and operate the control switch. Switch off and observe whether or not the striker on the crosshead is opening the contacts on the self-parking switch. If necessary, bend the contact lever back into line with the striker. If the lever is damaged or does not pivot freely fit a new switch.

(*iii*) *Faulty Connecting Rod Assembly*

If, on switching from 'Normal' to 'Park' the wiper continues to operate, or, on switching from 'Park' to Normal' the wiper arms operate in the parking traverse, this indicates a fault in the eccentric reversing cam in the connecting rod assembly. For details of the correct operation see under *Self-Parking Mechanism* on page 1.

In this instance the wiper arm traverse remains unchanged when the motor armature changes direction of rotation.

To check, remove the gearbox cover and observe whether or not the effective length of the connecting rod alters when the motor is switched from 'Park' to 'Normal' or *vice versa*. If the length does not alter, remove connecting rod assembly for examination and, if necessary, fit a new assembly.

If the connecting rod assembly is satisfactory and control switch model PRS5 is used, switch contacts 'C' may be failing to open. Check the switch by substitution.

(*b*) FAILURE TO OPERATE OR POOR PERFORMANCE

If the wiper installation fails to operate or gives a poor performance the fault may be either mechanical or electrical and need not necessarily be in the motor. To locate the fault proceed to check the installation as follows:

(i) *Measuring Supply Voltage*

Using a first grade moving coil voltmeter, measure the voltage between the motor supply terminal (to which the green cable is connected) and a good earthing point. This should be 11.5 volts with the wiper working normally. If there is no reading, or the reading is low, check the battery, fuse, control switch (by substitution), cabling and connections.

If control switch model PRS5 is fitted, test for faulty spring contacts by connecting a length of cable between terminal number '4' on the switch and the red cable to the motor. If the motor will now work when the switch is turned to 'Normal' the contacts on the switch are faulty, and a new switch should be fitted.

(ii) *Measuring Light Running Current*

If the supply voltage at the motor is correct remove the gearbox cover and disconnect the cable rack.

To remove the cable rack it is necessary first to remove the connecting rod assembly which is carried on the final gear crank pin. Slip the circlip from the head of the crank pin, being careful to retain the conical spring and washer, and to note the order in which the parts are removed. Lift the connecting rod assembly from the gearbox to allow the crosshead and rack to be released.

Using a first grade moving coil ammeter connected in the wiper motor supply cable (the green cable to the wiper motor), measure the normal light running current. At the same time observe the speed of operation by counting the revolutions per minute of the final gear.

The light running current should not exceed 3.4 amperes at Normal speed (45—50 r.p.m.).

(iii) *Checking Cable Rack and Tubing*

If the light running current and speed are both correct then the fault must be mechanical. Hook a spring balance in the hole in the crosshead (into which the pin on the connecting rod is normally located) and withdraw the rack with the balance. The maximum permissible force to move the cable rack in its tubing is 6 lb. (2.72 kg.) with the wiper arms and blades disconnected.

Binding of the rack can be due to kinked or flattened tubing or to a faulty installation. When the rack is removed check the motor-to-first-wheelbox section of tubing by inserting a flexible mandrel gauge, sold specifically for checking wiper installations. The gauge is similar in appearance to the driving rack, but is 0.010" (0.25 mm.) larger in diameter and less flexible. It should move freely through the tube if there are no kinks or flat spots in the tubing. Renew badly kinked or flattened tubing. Any bends of less than 9" (22.9 cm.) radius must be reformed.

To check the intermediate section of tubing between the wheelboxes it is necessary to disconnect the tube since the gauge will not pass through the wheelboxes.

(iv) *Checking Wheelboxes*

When the cable rack is removed check the wheelbox spindles for binding. Renew seized

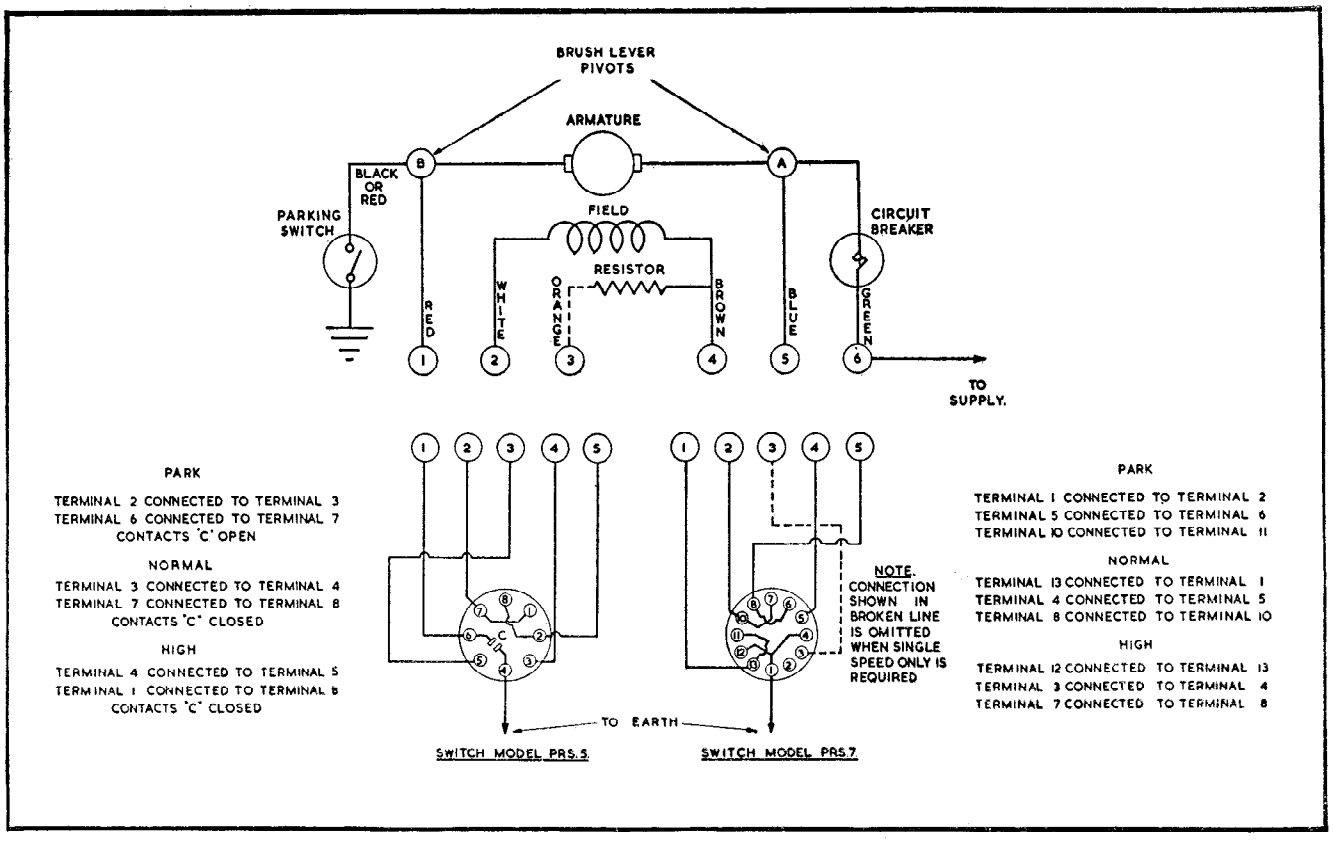

Fig. 2
Internal connections of motor and wiring of alternative switches

wheelboxes. Check the wheelbox alignment. When replacing the tubing note that the flared ends of the intermediate tubing should be located in the inner wide slots of the wheelbox clamp plates, but the end of the motor-to-first-wheelbox tubing should be located in the outer narrow slot.

(v) *Checking Motor and Gearbox*

If the motor does not run or the light running current and speed are not correct, refer to the appropriate section below:

Motor takes no current

Check the continuity of the thermostatic circuit breaker by connecting together the green and blue motor cables and switching on the motor. If the motor runs the circuit breaker is faulty and should be renewed. If the motor does not run and the circuit between terminals 5 and 6 in Fig. 2 is continuous, suspect an open circuit inside the motor and dismantle for detailed examination.

Motor runs intermittently

Check the thermostatic circuit breaker as described in Para. 4 (*d*) and when the motor is dismantled check for loose internal connections.

Motor takes low current

The fault is probably in the brushgear or commutator.

Remove the two through bolts from the commutator end bracket and remove the end bracket. Examine the brushgear and commutator, and check the brush spring tension. See Para. 3 (*d*).

Renew the tension spring if the tension is incorrect. Brush levers must move freely on their pivots. Free stiff levers by moving them backwards and forwards by hand.

Examine the commutator; if it is dirty clean it with a petrol-moistened cloth or, if necessary, polish it with a strip of very fine ('00' gauge) emery cloth.

Motor takes high current

Check the armature end float. The armature end float adjusting screw should be set to allow armature end play of 0.008"—0.012" (0.2 mm.—0.3 mm.) or $\frac{1}{4}$ of a turn clear of the armature thrust pad.

When the motor is dismantled check the field coil and armature for short-circuited windings. Resistance values are given in Para. 3 (e) and (*f*). If either the field coil or the armature is faulty it must be renewed.

Pieces of carbon short-circuiting adjacent segments of the commutator will cause excessive current consumption; these can be removed by cleaning the commutator and brushgear.

(c) DISMANTLING

(i) *Gearbox*

To remove the gearbox cover withdraw the four hexagonal-headed screws. Remove the circlip from the crank pin on the final gear, being careful to retain the washer and conical spring and to note the order in which the parts are removed. Remove the connecting rod assembly; this allows the crosshead and rack to be released. Then remove the circlip and washer from the final gear shaft located underneath the gearbox unit. Remove any burr from the circlip groove before lifting out the final gear.

(ii) *Motor*

Remove the two through bolts located one each side of the bearing housing. Separate the yoke and commutator end bracket, taking care not to damage the switch cable grommet. The brushgear can be removed by lifting it clear of the commutator and withdrawing it as a unit. At this point take care to note the particular side occupied by each brush so that each may be replaced in its original setting on the commutator.

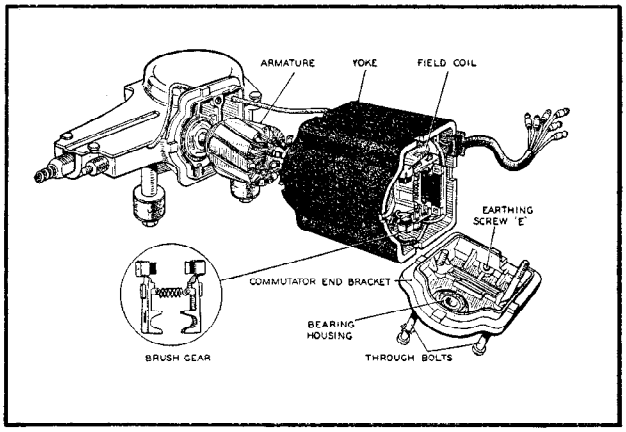

Fig. 3
Motor semi-dismantled

Access to the armature and field coils is gained by unsoldering the parking switch cable at the switch and withdrawing the yoke. Withdraw the armature and worm gear from its bearings in the gearbox.

Examine all the gear teeth for signs of damage or wear and, if necessary, fit a new armature or final gear.

(*d*) CHECKING AND RENEWING CIRCUIT BREAKER, FIELD COIL AND BEARINGS

(i) *Circuit Breaker*

To check the performance, detach the circuit breaker from the motor yoke and immerse it in oil. When the oil temperature is raised the circuit breaker should operate between 275°F. and 302°F. (135°—150°C.).

Circuit breakers are not adjustable and if faulty must be renewed.

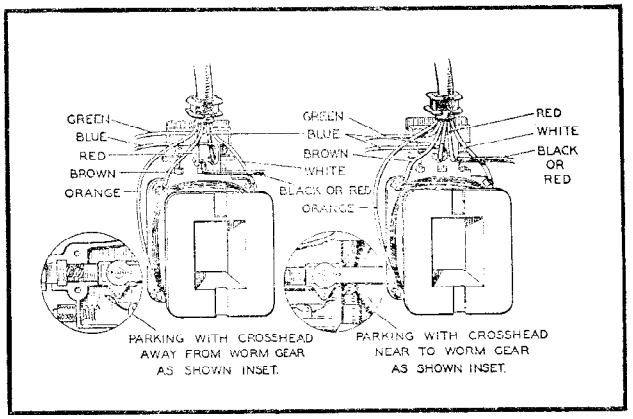

Fig. 4
Field coil connections

(ii) *Field Coil*

If, after checking the field coil and (two speed motors only) the series resistance wire wound around it, a fault is found in the windings fit a new field coil assembly.

Unsolder the wires from the circuit breaker taking care not to overheat the unit.

Withdraw the two screws securing the pole piece to the yoke. Mark these screws so that they can be replaced in their original holes. Before removing the pole piece mark it so that it can be replaced in its original position in the yoke. The field coil and pole piece can now be separated.

Replacement field coils are supplied without cables. It is necessary, therefore, to unsolder the cables from the old field coil assembly and resolder them to the new coil.

The wiring arrangement is determined by the parking position of the cable rack crosshead with relation to the worm drive in the gearbox. Before commencing to change the coil, note this position so that the appropriate diagram in Fig. 4 can be followed.

Important

Do not overheat the terminals when soldering. Overheating will cause the nylon former to soften and distort.

(iii) *Bearings*

The worm drive thrust bearing is easily removed when the armature shaft is removed from the gearbox, but it should not need renewing during the normal service life of the wiper.

The self-aligning bearings in the commutator end bracket and gearbox are not replaceable and if they become excessively worn or loose the complete bracket or gearbox casting must be replaced.

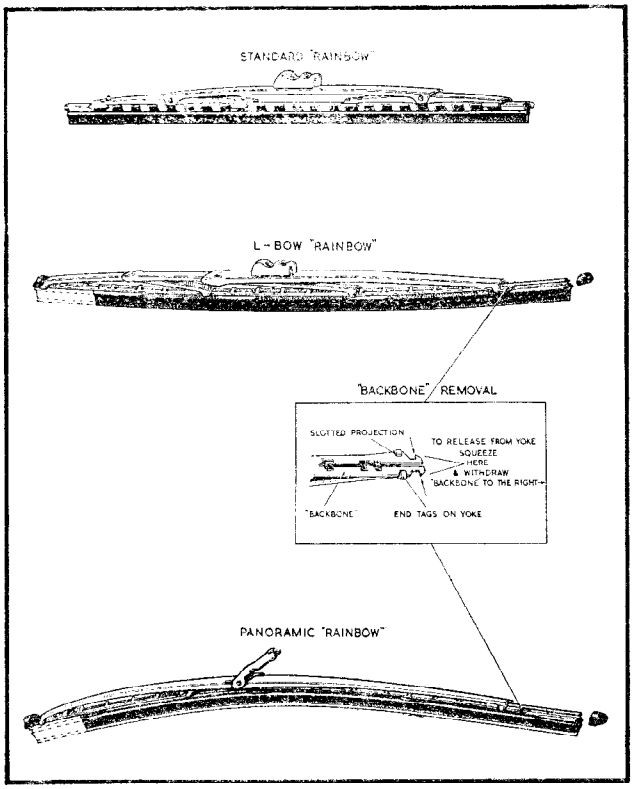

Fig. 5
Comparison of 'Rainbow' blades

(e) REASSEMBLY

Reassembly is a reversal of the procedure described above for dismantling. When reassembling, use the following lubricants as recommended:

(i) *Oiline BBB*
Lubricate sparingly the armature bearing pads and journals; eccentric reversing cam (in the connecting rod assembly).
Lubricate liberally the worm drive thrust bearing.

(ii) *Ragosine Listate*
Grease liberally the crosshead; guide channel; connecting rod assembly; crank pin; worm drive; cable rack and gearboxes.

When reassembling the connecting rod assembly on the final gear crank pin, ensure that a plain steel washer is placed under the connecting rod.

5. FITTING AND ADJUSTING WIPER ARMS

(*a*) FITTING A NEW WIPING ELEMENT TO A 'RAINBOW' BLADE, AS USED ON CURVED SCREENS

Handle new elements with care. Keep the rubber clean and free from oil or petrol and avoid distortion of the metal 'backbone'.

(i) To replace a defective element on a standard 'Rainbow' blade proceed as described below: Press down the locking pin and slide the old element in the direction shown in Fig. 6 (*a*) to free it from the body of the blade.

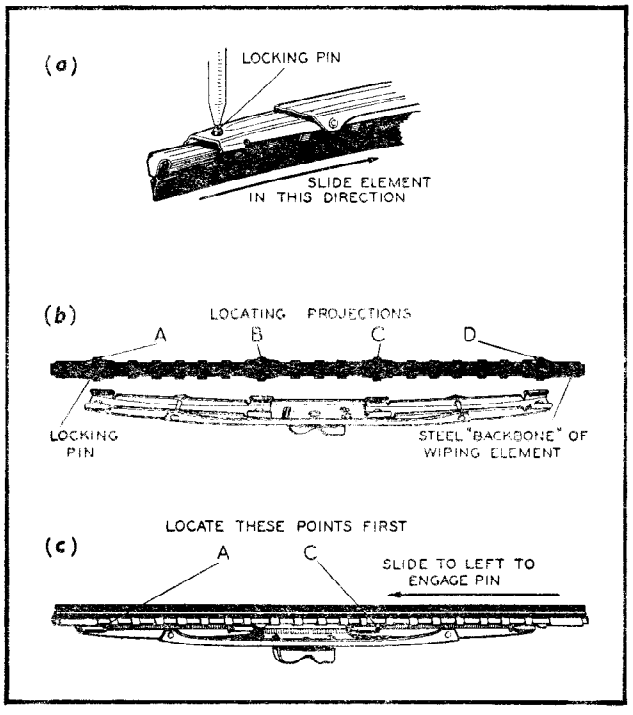

Fig. 6
Dismantling standard 'Rainbow' blade

There are four pairs of locating projections on the 'backbone' of the new wiping element as shown in Fig. 6 (*b*). When fitting, first locate the element projections 'A' and 'C'. Then guide projections 'B' and 'D' into position and slide the element to the left, as shown in Fig. 6 (*c*) until the locking pin is heard to snap into position.

(ii) To replace a defective element on L-Bow and Panoramic 'Rainbow' blades proceed as described below:

Pull the plastic caps from the blade ends and withdraw the rubber blade.

The steel 'backbone' is locked in position by a slotted projection which engages with one of the end tags on the yoke. Release and withdraw the 'backbone' by squeezing together the sides of the locked end, as shown in Fig. 5.

Fit the new 'backbone', blade and plastic caps, reversing the procedure for removal.

(*b*) FITTING BLADE TO WIPER ARM

With Panoramic 'Rainbow' blades the fastening is a plug-in fitment as shown in Fig. 7(a).

When the attachment is of the type shown in Fig. 7(b), pull the wiper arm away from the windscreen and insert the curved 'wrist' of the arm into the slotted spring fastening of the blade. Swivel the two components into engagement.

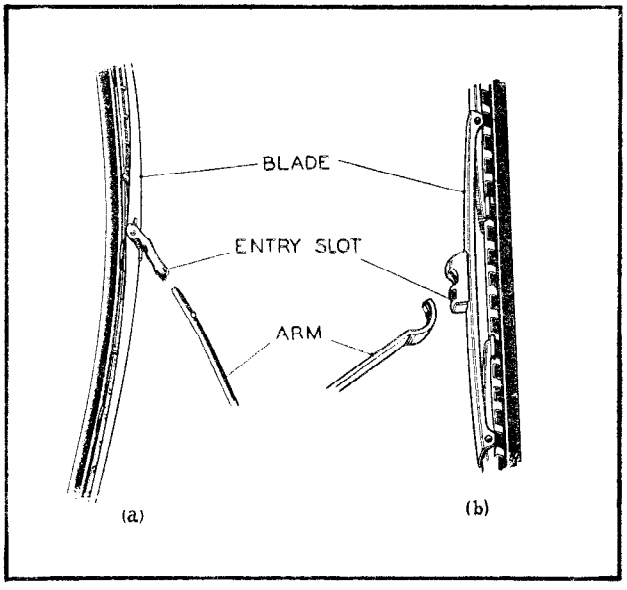

Fig. 7
Plug-in and 'wrist-action' blade-to-arm attachments

(c) FITTING WIPER ARM TO DRIVING SPINDLE

First ensure that the wiper spindles are in the correct parking position by switching on the ignition and turning the wiper control switch to 'Normal' and then to 'Park'.

To fit the arms, press the headpieces on to the spindles at the required parking angle until the retaining clip snaps over the end of the spindle drum.

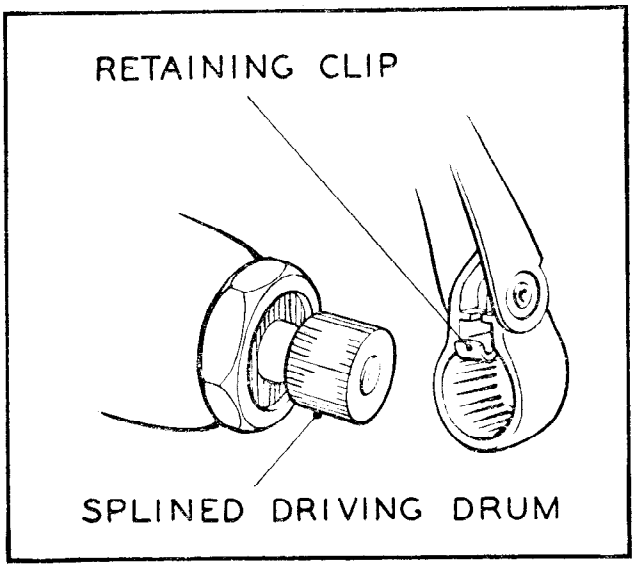

Fig. 8
Assembling arm to spindle

(d) TESTING

Switch on the ignition and turn the wiper switch to 'Normal'. The two wiped areas should be approximately symmetrical on the screen.

Turn the wiper switch to 'Park'. The arms should now come to rest in the correct parking position.

(e) ADJUSTING

To adjust the position of the wiped area it is necessary to alter the position of the arms relative to the spindles. Do not attempt to turn the arms whilst in position.

To re-position the arms press back the retaining clip in the headpieces with a suitable screwdriver and withdraw the arms from the splined driving spindles. The angular pitch of the splines is 5 degrees. Refit in the desired position.

The above adjustment may affect the self-parking position. If so, it may be corrected by turning the knurled adjusting nut as described in Para. 2.

6. REVERSING PARKING POSITION

To reverse the parking position of the wiper arms it is necessary to interchange the connections to the supply terminals on the brush lever pivots. Also, reverse the position of the parking switch in the gearbox.

Details of the wiring and switch positions are given in Figs. 2 and 4.