

Chapter 3

BURNERS, DUPLEX 2, TYPE C.S.H. 42 AND C.S.H. 71 SERIES

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GENERAL

1. These instructions apply primarily to the type CSH42 and 71 series burners; they are applicable also to the superseded types CSH28, 37, 39 and 67. The types CSH37 and 39 are identical except that the sleeve of the latter is subjected to a de-embrittlement process, while the CSH37 differs from the CSH28 in that the former has a nickel plated sleeve. The CSH42 is similar to the type CSH39 but has a locking nut with wider slots. The CSH67 and 71 are alike except that the former has anti-carbon slots milled on the front face of the shroud. These types of burner are supplied without the holder as this is fitted by the engine manufacturer, consequently the unit is blanked off with a screwed-in plug and washer for transportation purposes.

2. The CSH42 burner is a duplex type unit having a common inlet for the primary and main fuel supplies, a relief type pressurizing valve permitting main flow, in addition to primary flow, above a pre-determined pressure to meet the requirements of the engine.

3. The importance of cleanliness during reconditioning cannot be over-emphasized. Care must be taken to avoid damaging components during handling or storage.

4. Parts that are interchangeable are listed in the replacements section (*para.* 32).

SPECIAL TOOLS

5. The following special tools are required:—

<i>Part No.</i>	<i>Nomenclature</i>
G.61125	Protractor, spray angle
T.157870	Punch, peening
T.166505	C-spanner, shroud
T.167265	Adapter, torque spanner
*T.200402	Fixture, dismantling and assembling.
*T.209679	
	*Alternative

CHECKS AND PRECAUTIONS BEFORE DISMANTLING

6. Consider any complaints of defects or malfunctioning. Visually inspect the burner and ensure that there is no damage necessitating rejection. Check that the

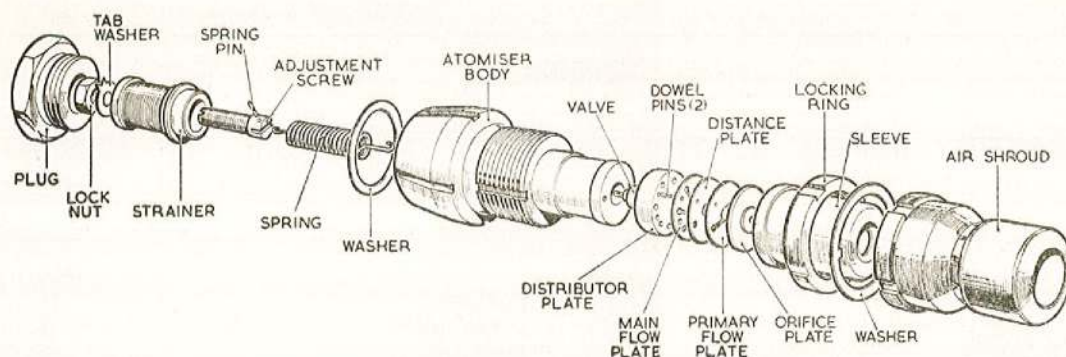


Fig. 1. Dismantled view of Duplex 2 type burner

rubber sealing cap is fitted over the burner outlet, and that the inlet passage is suitably blanked off (if the holder is fitted) or that the inlet plug is in position, with washer, in the burner inlet.

DISMANTLING

7. (1) Remove the rubber protective cap and the screwed plug and washer from the inlet and outlet connection, respectively.
- (2) Mount the burner in the fixture T.200402 or T.209679.
- (3) Carefully knock back the locking points of the lock washer using punch T.157870 and slacken the locking ring using the C-spanner T.166505.
- (4) Using the same spanner unscrew and remove the air shroud from the atomiser body.
- (5) Lift off the sleeve and carefully withdraw the orifice plate, primary flow plate, distance plate, main flow plate and distributor plate. Do not remove the dowel pins unless they are damaged or loose.
8. Remove the unit from the fixture, unlock and remove the tab-washer and lock-nut and screw in the adjustment screw sufficiently to enable the valve to be detached from the other end of the spring. Then remove the strainer complete with spring and adjustment screw.
9. Unscrew the locking ring from the burner holder. No further dismantling is necessary unless a new spring is required when the adjustment screw may be removed from the strainer to allow the withdrawal of the spring pin.

CLEANING

10. Cleaning is best carried out with the aid of a parawash machine; compressed air only must be used for drying. Carbon deposit may be removed from the atomiser parts by the careful insertion and rotation of a tufnol lapping stick powered by a small motor-driven collet, the parts being held in the hand.

INSPECTION

Length check

11. Using a vernier and suitable plug piece on the orifice plate, measure the length of the burner from the front face of the orifice plate to the rear face of the body at the fuel inlet end. This should be between 3.124 in. and 3.148 in. for the type CSH42 burner and 3.123 (+ 0.013 in. - 0.011 in.) for CSH71 burners.

Permissible wear

12. Ensure that the locating diameter of the air shroud is within the permissible worn dimensions given in Vol. 2, Part 2.

Redundant and consumable parts

13. Parts rendered redundant by the embodiment of modifications must be rejected during inspection; information concerning relative modifications must therefore be available.

14. The air shroud lock-washer must be rejected during dismantling irrespective of condition.

Surface damage

15. The standard of acceptance for surface damage may vary depending on the number of hours the burner is to be in use and the availability of spares. Where it is found

RESTRICTED

necessary to alter any accepted standards, instructions will be issued accordingly.

16. If there is any sign of flaking on a plated part, it must be renewed.

Air shroud

17. Carefully examine the air shroud for general condition. Ensure that the internal threads are satisfactory and that the edges of the locking slots are not cracked or broken. Ensure that all air holes are clean and free from sharp edges. The end flange of the shroud at the outlet must be free from distortion; ensure that the locating diameter of the shroud is free from fretting and corrosion.

Sleeve

18. Examine the sleeve for corrosion and cleanliness. The sealing face must be free from damage and distortion so that a good joint can be made at this seal.

Atomiser parts

19. The atomiser parts comprise the orifice plate, primary flow plate, distance plate, main flow plate and distributor plate; these are all located together by two dowel pins which terminate in blind holes in the inner faces of distributor plate and orifice plate.

20. Ensure that all atomiser details are clean and undamaged, that all holes are unobstructed, and that the dowel pins are sound.

Lock-washer

21. Discard the air shroud lock-washer irrespective of condition.

Locking ring

22. Carefully examine the inner threads of the locking ring for cleanliness and freedom from damage. Ensure that the ring is generally sound and that no cracks or damage exist along the edges of the locking slots.

Relief valve

23. Inspect the valve generally for condition, particularly its seating and the hole through which the spring is secured.

24. Visually inspect the spring for con-

dition and ensure that it is free from sharp edges or fractures.

25. Ascertain that the spring anchor pin is sound, as this is peened over after inserting through both the adjusting screw and spring.

26. Inspect the adjusting screw for condition, ensuring that the threads and screwdriver slots are undamaged.

27. Ascertain that the lock-nut is sound, and discard the tab-washer.

28. Ensure that the strainer is clean and serviceable.

Atomiser body

29. Examine the atomiser body for cleanliness and condition, ensuring that all holes are unobstructed and the threads undamaged.

ASSEMBLING THE BURNER

30. During the reassembling of the burner, only one set of component parts should be on the bench at a time. This will prevent the accidental inclusion of other burner components during rebuild and will also indicate shortages.

31. Ensure that all parts are thoroughly clean then proceed as follows:—

- (1) Screw the locking ring on to the atomiser body, with the chamfered face away from the burner outlet, and slide on a new locking washer.
- (2) Align the spring loop with the holes in the adjustment screw, insert the spring pin and peen over the ends. Fit the adjusting screw into the strainer, screw in a few turns and loosely assemble the tab-washer and locknut.
- (3) Assemble the strainer into the burner body, ensuring that it seats correctly, and allow the spring to pass through the body with the free loop protruding through the valve seating.
- (4) Engage the valve with the free loop of the spring and screw the adjusting screw outwards to take up the spring tension, ensuring at the same time that the valve is seating correctly.

- (5) Blank off the primary flow with a slave distributor plate (only one central drilling) and tighten the sleeve and shroud to the burner body.
- (6) Mount the unit on the test rig and check the seating of the valve; i.e., apply fuel at an inlet pressure of 70 lb. per sq. in. and ensure that there is no leakage past the valve.
- (7) Remove the shroud, sleeve and blanking plate and assemble the atomiser by placing the main flow plate, distance plate, primary plate and orifice plate on to the distributor plate, correctly aligning them on the two dowel pins.
- (8) Place the atomiser assembly on the body end and secure it in position with the sleeve and shroud, using a slight smear of graphite grease (XG-285) on the threads. Tighten the shroud to 75 lb. torque pressure using the special C-spanner and torque wrench with adapter T.167265.
- (9) Ascertain that the air metering gap between the orifice end of the shroud and the sleeve is as specified by using the appropriate gauge piano wire, i.e., 0.024 to 0.028 in. for CSH42, 0.026 to 0.034 in. for CSH67 and 0.025 to 0.031 in. for CSH 71. Do not lock the tab-washer at this stage.

REPLACEMENTS

32. New lock-washers must be fitted when assembling the burner.
33. The atomiser parts are supplied as a set and must not be changed individually.
34. The strainer is supplied as an assembly, while all other parts are separately interchangeable.
35. If the test results do not come within the specified limits, no attempt must be made to enlarge the holes or slots of the atomiser parts, but a complete replacement atomiser unit must be fitted.
36. In the event of flaking of the plating of any part, the defective part is to be rejected, and a replacement fitted, the defective part or parts being returned to the stores for replating.

RIG TESTS

37. The unit must undergo the following tests :—

- (1) Flow performance
- (2) Combined flow performance
- (3) Spray angle.
- (4) Flow distribution.
- (5) Leakage.

The first four tests may be effected on the burner test rig, type R.76; but a high-pressure rig is necessary for the leakage test. The fuel used throughout these tests is to be AVTUR. The temperature of the fuel must be between 20 deg. C. and 21 deg. C., and its specific gravity between 0.801 and 0.806.

Master burners

38. To correct the test rig for error due to line pressure drop, viscosity changes and temperature, master burners have been introduced for each calibration point. These are the subject of the following notes :—

- (1) Duplex 2 burners are calibrated to flowmeters which have been corrected by the master-burner flow at the pressure specified at each calibration point. Pressure gauge readings are unsuitable owing to the effect of increased or decreased burner pressures on the valve.
- (2) Where the fuel temperature is in excess of the requirements, temperature correction curves for each particular flowmeter are to be used in conjunction with the master burner.
- (3) A typical correction curve fig. 2 shows flowmeter variation with temperature for a particular flowmeter. A similar curve must be made available for the particular flowmeter in use.
- (4) The master burners are identical in construction to the burners to be calibrated but do not include the valve or adjusting spring. Identification is provided by the letter M and the output marked on the body.
- (5) Calibration of the master burner is carried out using AVTUR at a temperature of 20 deg. C. Maintenance of the masters should include periodical checking for accuracy at the calibration points specified in the appendix.
- (6) A suitable T-piece connection must be provided on the rig so that the true burner pressure is recorded and no external losses are included.

APPENDIX 1

CALIBRATION CODE

Burner CSH42

Note . . .

The values quoted must be rigidly adhered to. Reference should be made to the applicable para. in the chapter.

Flow performance (Refer to para. 39)

1.

Inlet pressure (lb. per sq. in.)	Calibration limits Flow (g.p.h.)		
	Minimum	Nominal	Maximum
49	4.77	4.9	5.03
	± 0.13 G.P.H. F.N. 0.7 on nominal flow		
600	62.7	63.7	64.7
	± 1 G.P.H. F.N. 2.6 on nominal flow		

2. Visual inspection of spray at 200 lb. per sq. in. (Refer to para. 41).

Combined flow performance and valve settings

3. (1) Fuel inlet pressure 125 lb. per sq. in. Flow between 14 and 15 g.p.h.
(2) Fuel inlet pressure 150 lb. per sq. in. Flow between 20 and 22 g.p.h.

(3) Adjust the fuel inlet pressure to the burner to 49, 125, 150 and 600 lb. per sq. in. respectively and record the corresponding flows. (Refer to para. 42).

4. Valve setting flows in each set of 10 burners must not vary by more than 4 per cent. between burners at flows in (1) and (2) above. (Refer to para. 43).

Spray angle

5. (1) Pilot angle at 90 lb. per sq. in. must not exceed 115 deg.
(2) Combined angle at 600 lb. per sq. in. must be between 88 and 92 deg. (Refer to para. 46).

Flow distribution (Refer to para. 49)

6. Fuel pressure adjusted to 45 lb. per sq. in. when readings through pilot passages are to be 75 c.c. upper limit and 50 c.c. lower limit.

7. Fuel pressure adjusted to 200 lb. per sq. in. when readings through combined pilot and main passages are to be 75 c.c. upper limit and 56 c.c. lower limit.

Leakage test

8. Inlet pressure 2,000 lb. per sq. in. for 4 min. (Refer to para. 52).

APPENDIX 2

CALIBRATION CODE

Burners CSH 67 and 71

Atomiser flow No. FN. 3.4/0.9/94 degrees

Note . . .

The values quoted must be rigidly adhered to. Reference should be made to the applicable para. in the chapter.

Flow performance (Refer to para. 39)

1. (1) Primary flow at 49 lb. per sq. in. to be 6.2 to 6.4 g.p.h.
- (2) Combined flow at 600 lb. per sq. in. to be 82.0 to 84.5 g.p.h.
2. Visual inspection of spray at 200 lb. per sq. in. (Refer to para. 41).

Combined flow performance and valve settings (Refer to para. 42)

3. (1) Flow at 125 lb. per sq. in. to be 16 to 17 g.p.h.
- (2) Flow at 150 lb. per sq. in. to be 24.5 to 26.5 g.p.h.
4. Valve setting flows in each set of 10 burners, must not vary by more than 4 per

cent. between burners at flows in (1) and (2) above. (Refer to para. 43).

Spray angle

5. (1) Pilot angle at 49 lb. per sq. in. not to exceed 115 deg.
- (2) Combined angle at 400 lb. per sq. in. to be between 92 and 96 deg. (Refer to para. 46).

Flow distribution (Refer to para. 49)

6. Fuel pressure adjusted to 45 lb. per sq. in. when readings through pilot passages are to be 75 c.c. upper limit and 50 c.c. lower limit.
7. Fuel pressure adjusted to 200 lb. per sq. in. when readings through combined pilot and main passages are to be 75 c.c. upper limit and 56 c.c. lower limit.

Leakage test

8. Inlet pressure 2,000 lb. per sq. in. for 4 min. (Refer to para. 52).



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