

Chapter 3

DUPLE BURNER

Types BA.22062, BA.46976, BA.33781 and BA.78881

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INTRODUCTION

1. To ensure suitable combustion characteristics at all fuel flows, the Duple burner is designed with two swirl atomizers, a main and a primary, each of which emits a separate spray of atomized fuel. The small primary orifice maintains an atomized fuel spray at very low fuel flows, thus facilitating combustion at low r.p.m., with consequent improvement in starting, and in relighting at altitude. The main fuel circuit is inoperative until the pressure in the fuel system has risen sufficiently to ensure efficient atomization at the higher flows through the main orifice. With this arrangement the main orifice can be made large enough to satisfy the maximum fuel demand at a lower maximum pressure, thus reducing stresses in the high pressure system.

2. The operation of the burner in relation to the complete fuel system is described in the relevant engine Air Publication.

DESCRIPTION

3. The complete burner assembly, illustrated in fig. 1 and 2, consists of a support ring for the flame tube snout and a burner head mounted centrally on the support ring.

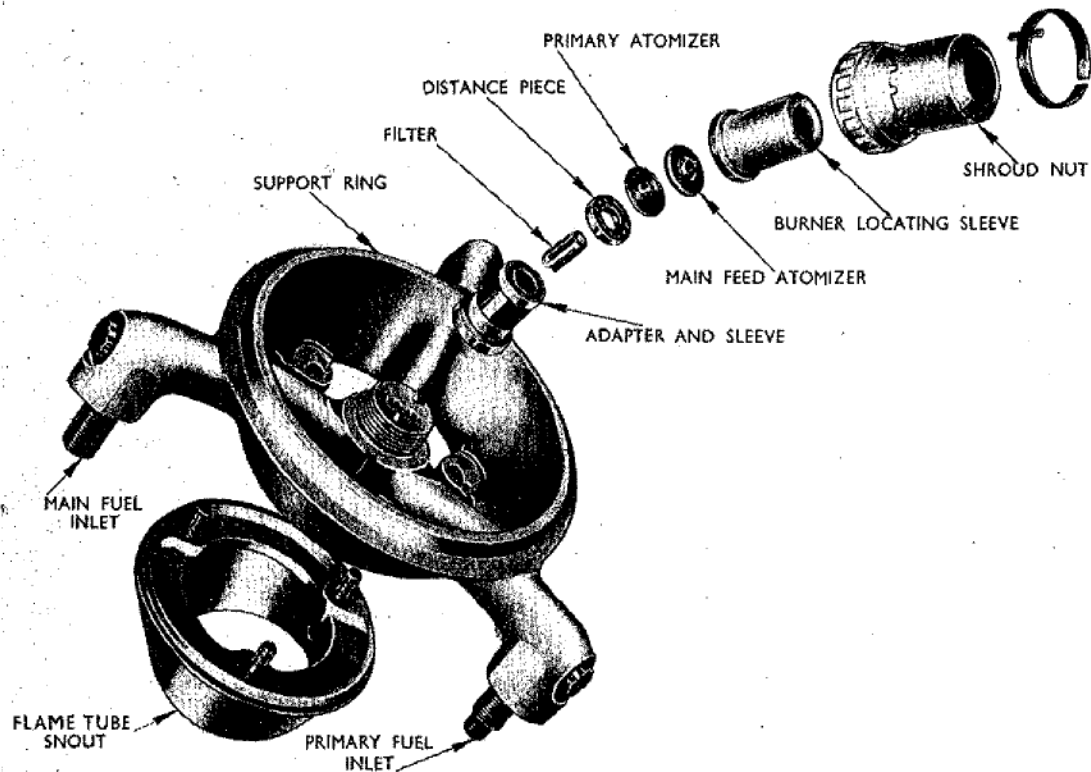
Support ring

4. The support ring is a light alloy casting designed to position the burner head in the combustion assembly and to direct fuel from external connections to the burner head.

5. The primary and main fuel inlet unions and a short blank adapter are fitted to the outer end of the support ring radial arms. These constitute three equidistant mounting points, but the relative positions of the main and primary connections depend on the installed position of the burner. The main and primary inlet unions are of different sizes, to prevent incorrect connections of the fuel feed pipes.

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Fig. 1. Exploded view of burner

6. Drillings through the radial arms on which the main and primary unions are mounted provide fuel feed passages to the burner head; the third arm is drilled to a limited depth in order to minimize uneven expansion of the support ring.

7. Two small dowels fitted in the face of the centre boss ensure correct alignment of the main and primary fuel feeds to the adapter and sleeve assembly of the burner head. An external thread on the boss accommodates the burner shroud which secures the burner parts to the boss. Axial slots formed on the periphery of the boss and situated between each radial arm provide alternative positions for the tab of the shroud locking ring.

8. A spigot recess and three drillings in the support ring flange are for fitting a flame tube snout and an external spigot on the other side of the flange is provided to locate the flame tube, so ensuring concentricity of the spray with the flame tube.

Burner head

9. The burner head houses the primary and main fuel atomizers, which perform the function of metering and atomizing the fuel.

10. The burner adapter and sleeve contain drillings which direct the primary and main fuel flows from the support ring to their respective atomizers. Primary fuel is directed into the centre bore of the adapter and passes along the slots and across the threads of a filter to further slots leading to the primary atomizer. Main fuel is directed into the annular space formed by the sleeve on the adapter, through holes in the distance piece and then through a row of fine drillings in the primary atomizer flange to the main atomizer. The drillings in the primary atomizer flange and the threads on the filter serve to protect the main and primary atomizer passages respectively from obstruction by small particles which may be in the fuel.

11. The primary and main atomizers are a close fit in the bore of the locating sleeve.

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The shroud fits over the locating sleeve and screws on to the thread formed on the support ring boss, so retaining the burner head.

12. The primary and main atomizer orifices are concentric; the primary atomizer being positioned to emit a separate spray through the centre of the main orifice. This primary spray assists atomization of the main spray at low burner pressures when flow is commencing through the burner main orifice.

13. Accurate mating of all contact faces prevents fuel leakage between the primary and main flows, and both discharge orifices are produced to very close limits.

14. Tangential drillings in the primary atomizer and tangential passages formed between the two atomizers control the inlet flow to the nozzles and also impart swirl to the fuel as it enters the conical swirl chambers. This swirl causes the fuel to atomize into very minute droplets on leaving the discharge orifices. The spray angles of the primary and main atomizers are controlled by the dimensions of the swirl chambers together with the size of the discharge orifices.

15. Air is supplied through a ring of holes in the shroud to the annular space formed

between the shroud and the locating sleeve. The shroud air has a significant effect on the spray angle and combustion process, and it minimizes carbon formation on the burner head caused by rich burning in the stagnant area around the apexes of the fuel spray.

16. The shroud is locked in position by a spring locking ring, the tabs of which engage in the spanner slots in the shroud and in the slots machined in the support ring centre boss. The number of slots in the shroud and in the boss allow positioning of the locking ring on a vernier principle.

INSTALLATION

17. Installation of the burners is as described in A.P.4321 series.

SERVICING

18. No attempt should be made to rectify an unserviceable burner as any interference will alter the flow characteristics.

STORAGE

19. Before storing, the burners must be flushed through with oil OM-11 or OX-275, a protective cover fitted over the end of the shroud to protect the atomizers, and blanking caps fitted to the unions.

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