

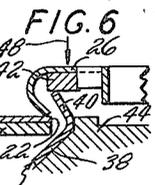
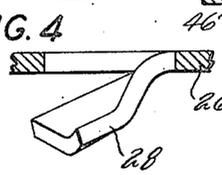
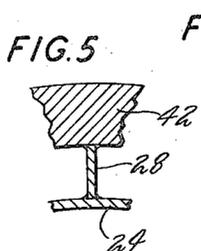
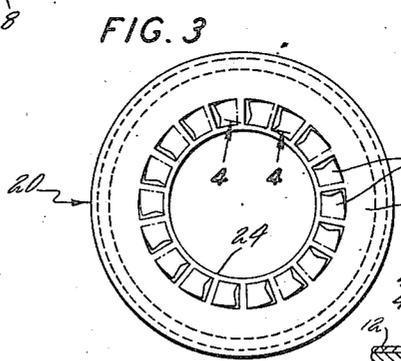
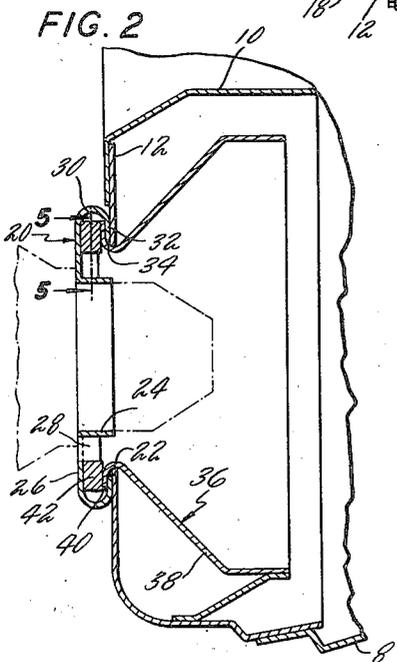
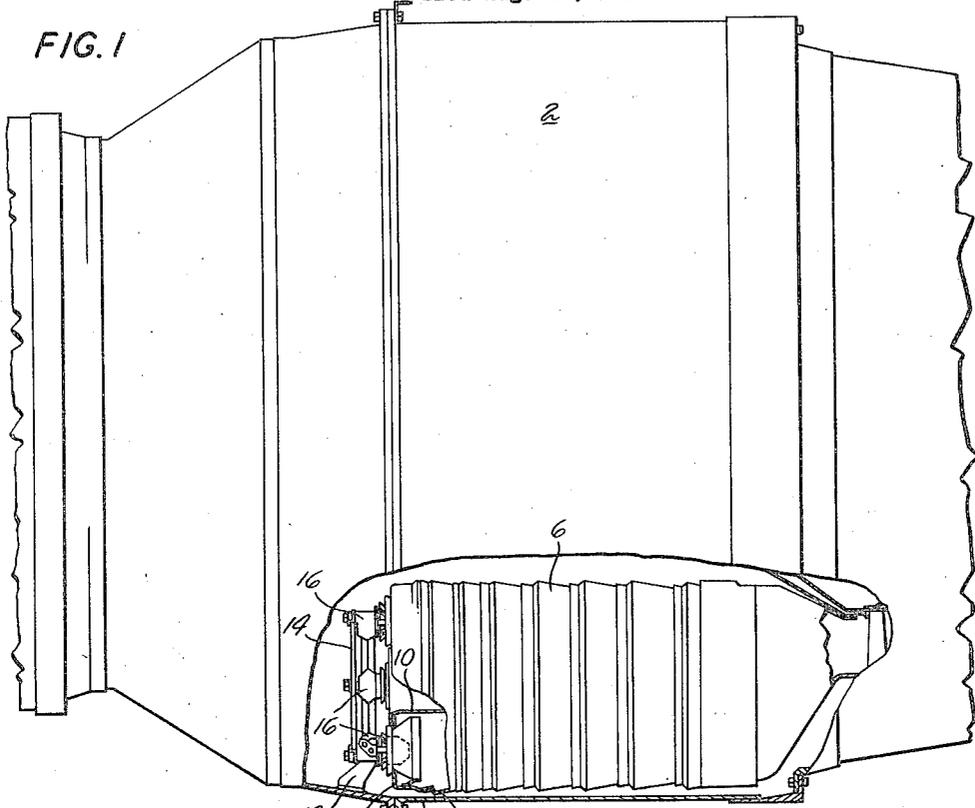
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L. F. WHEELER

2,800,768

BURNER CONSTRUCTION

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INVENTOR
LESLIE F. WHEELER
BY Charles Albersen
ATTORNEY

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BURNER CONSTRUCTION

Leslie F. Wheeler, Winchester Center, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware

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This invention relates to swirler vanes for the inlet to a combustion chamber flame tube and particularly to the manufacture of these vanes.

One feature of the invention is the construction of the swirler vanes from sheet material thereby eliminating the expensive machining operations for making these vanes.

Where the combustion chamber has a plurality of fuel nozzles in fixed relation to each other the swirler vanes which fit around each nozzle have been of necessity very accurately located within the end of the flame tube in order that the several sets of swirler vanes may receive the several spaced nozzles during assembly of the combustion chamber parts. One feature of the invention is an arrangement by which each set of swirler vanes has a freedom of movement laterally with respect to the flame tube to accommodate misalignment of the flame tube with the nozzle.

Another feature is the method of assembly of the swirler vanes on the end of the flame tube such that the assembly is completed in a single operation.

Other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which illustrate an embodiment of the invention.

Fig. 1 is an elevation of a combustion chamber with parts broken away to show one of the flame tubes.

Fig. 2 is a larger fragmentary sectional view through the swirler vanes and the end of the flame tube.

Fig. 3 is an end elevation of the swirler vanes of Fig. 2.

Fig. 4 is a fragmentary sectional view along the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary sectional view along the line 5—5 of Fig. 2.

Fig. 6 is a sectional assembly view of the initial shape of the swirler and holding ring on the cap.

The invention is shown in a combustion chamber 2 which is intended to be located between the compressor and turbine of a gas turbine power plant. A power plant embodying a combustion chamber of this general construction is disclosed in the Highberg Patent 2,674,090. As shown, the combustion chamber is in the form of an outer casing 4 which encloses a number of flame tubes 6 arranged in a ring just within the casing 4. Each flame tube 6 consists of an outer sleeve 8 and an inner sleeve 10 with an annular cap 12 forming an end wall across the space between the inner and outer sleeves.

A nozzle assembly 14 having a plurality of nozzles 16 is supported as by a bracket 18 from the outer casing 4. Each of the individual nozzles is adapted to fit within a swirler ring 20 mounted on the end cap 12, the latter having an opening 22 where each swirler ring is located.

In accordance with the invention, each swirler ring 20 as best shown in Figs. 2 and 3 has an inner sleeve portion 24, a central disc portion 26 extending outwardly from the sleeve 24 and having the individual swirler vanes 28 punched out therefrom as best disclosed in Fig. 3.

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The swirler ring also has an outer U-shaped portion 30 one leg of which is an extension of the disc 26 and the other leg of which is spaced from the disc 26 as best shown in Fig. 2. The portion 32 of the U which is spaced from the disc 26 is adapted to lie against the surface of cap 12 and has an opening 34 corresponding approximately in diameter to the opening 22 in the cap 12. In effect the outer edge of the disc is rebent to form the portion 32 of the U and thus constitutes the rebent edge of the disc.

The swirler ring is held in position on the cap 12 by a ring 36 located inside of the flame tube. This ring has a central section 38 the upstream end of which is slightly smaller than the opening 22 in the cap so that it extends therethrough. Outside of the cap 12, the ring 36 has an outwardly extending flange 40 which engages over the upstream side of the portion 32 of the swirler ring. The flange 40 serves to hold the swirler ring 20 in position on the surface of the cap 12 but since the opening 34 is somewhat larger than the opening 22 the ring 20 is free to move in a lateral direction with respect to the flame tube far enough to accommodate a misalignment of the several swirler rings with respect to the nozzle assembly.

In addition to the above parts the swirler assembly also includes a ring 42 located between the legs of the U-shaped portion 30 of the swirler ring 20 and attached as by brazing to the outer edges of the swirler vanes and preferably to the disc portion 26 of the swirler ring. At this same time brazing material may be placed between the sleeve portion 24 of the swirler ring and the vanes 28.

In assembly of the swirler ring and holding ring 26 on the cap 12 the parts are first formed approximately to the shapes shown in Fig. 6. In this Figure the cap is with its opening 22 therein receives the ring 36 the frusto-conical parts 38 of which rests upon a corresponding shaped die 44. At this time the outwardly extending flange 40 is only partially bent into the completed shape of Fig. 2 and at this time forms a reversely extending frusto-conical extension on the part 28. The outermost dimension of the flange 40 at this time is such that it can be passed through the opening 22 in the cap 12. The portion 32 of the swirler ring is also not bent completely to its finished parallel relation to the disc 26 but rather extends in somewhat acute angled relation to the disc portion 26 with the innermost dimension of the portion 32 such that it can be positioned over the flange 40. With these parts assembled as shown in Fig. 6 a downward pressure on the swirler ring in the direction of the arrow 46 will bend the portion 32 inwardly and the flanged portion 40 outwardly to bend the parts into the finished position of Fig. 2 leaving the swirler ring free to move in a radial direction as above described.

In the manufacture of the swirler the circular row of vanes 28 are pressed out of the disc into a position to form an acute angle with respect to the disc as shown in Figs. 3 and 4. The sleeve portion 20 is formed on the disc with the outer surface of the sleeve engaging with the adjacent side edge of each vane. The rebent edge 32 in the cylinder of the disc is formed to the angle shown in Fig. 6 and the ring 42 is placed against the underside of the disc and in engagement with the edges of the vanes opposite to the sleeve 40. The vanes are then brazed to the sleeve and to the ring and the swirler is then ready to be attached to the end of the flame tube in the manner above described.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. A flame tube having an opening in its upstream end

and a swirler ring in said opening, said ring including a central sleeve to receive a fuel nozzle, a disc extending out from one edge of said sleeve and having integral swirler vanes extending obliquely therefrom and arranged in a row around said sleeve and an outer annular portion having a U-shape in cross-section with one leg of the U being an extension of the disc, a flange arranged in spaced relation to the end of the tube and extending outwardly from said opening, the other leg of the U being positioned between the flange and the end of the flame tube.

2. A flame tube having an opening in its upstream end and a swirler ring in said opening, said ring including a central sleeve to receive a fuel nozzle, a disc extending out from one edge of said sleeve and having integral swirler vanes extending obliquely therefrom and arranged in a row around said sleeve and an outer annular portion having a U-shape in cross-section with one leg of the U being an extension of the disc, a flange arranged in spaced relation to the end of the tube and extending outwardly from said opening, the other leg of the U being positioned between the flange and the end of the flame tube, and a ring located to the laterally outward edges of the swirler vanes and positioned between the legs of the U.

3. A flame tube having an opening in its upstream end and a swirler ring in said opening, said ring including a central sleeve to receive a fuel nozzle, a disc extending out from one edge of said sleeve and having integral swirler vanes extending obliquely therefrom and arranged in a row around said sleeve and an outer annular portion having a U-shape in cross-section with one leg of the U being an extension of the disc, a flange arranged in spaced relation to the end of the tube and extending outwardly from said opening, the other leg of the U being positioned between the flange and the end of the flame tube, the inner dimension of said other leg being larger than the opening in said upstream end of the flame tube.

4. A swirler ring for the inlet end of a flame tube, including a central substantially cylindrical sleeve, a disc extending outwardly from one end of said sleeve, said disc having a plurality of swirler vanes integral therewith and extending at an acute angle to the plane of the disc, and an outer rebent annular portion at the periphery of and integral with said disc, said rebent portion extending in spaced parallel relation to the disc.

5. A swirler ring for the inlet end of a flame tube, said ring including a central substantially cylindrical sleeve, a disc extending outwardly from one end of said sleeve, said disc having a plurality of swirler vanes integral there-

with and extending at an acute angle to the plane of the disc with one edge of each vane in contact with said sleeve and an outer rebent annular portion integral with said disc, said rebent portion extending in spaced substantially parallel relation to the disc.

6. A swirler ring for the inlet end of a flame tube including a central substantially cylindrical sleeve, a disc extending outwardly from one end of said sleeve, said disc having a plurality of swirler vanes integral therewith and extending at an acute angle to the plane of the disc, a ring separate from and engaging with said disc, said ring surrounding the row of vanes and being in contact with the edges of said vanes opposite to said sleeve, said disc also having an outer rebent annular portion integral with the disc and extending around said ring.

7. A swirler ring for the inlet end of a flame tube including a central substantially cylindrical sleeve, a disc extending outwardly from one end of said sleeve, said disc having a plurality of swirler vanes integral therewith and extending at an acute angle to the plane of the disc, a ring separate from and engaging with said disc and surrounding the row of vanes, said ring being in contact with the edges of said vanes opposite to said sleeve, and an outer rebent annular portion integral with and extending in spaced substantially parallel relation to said disc.

8. A swirler ring for the inlet end of a flame tube including a central substantially cylindrical sleeve, a disc extending outwardly from one end of said sleeve, said disc having a plurality of swirler vanes integral therewith and extending at an acute angle to the plane of the disc, said disc projecting radially outward beyond said vanes, and a ring separate from and engaging with said disc and surrounding the row of vanes, said ring being in contact with the edges of said vanes opposite to said sleeve and with said disc, said ring and said sleeve being brazed to said vanes.

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