Aug. 12, 1969 K. GREENWOOD 3,460,345

COMBUSTION APPARATUS FOR GAS TURBINE ENGINES

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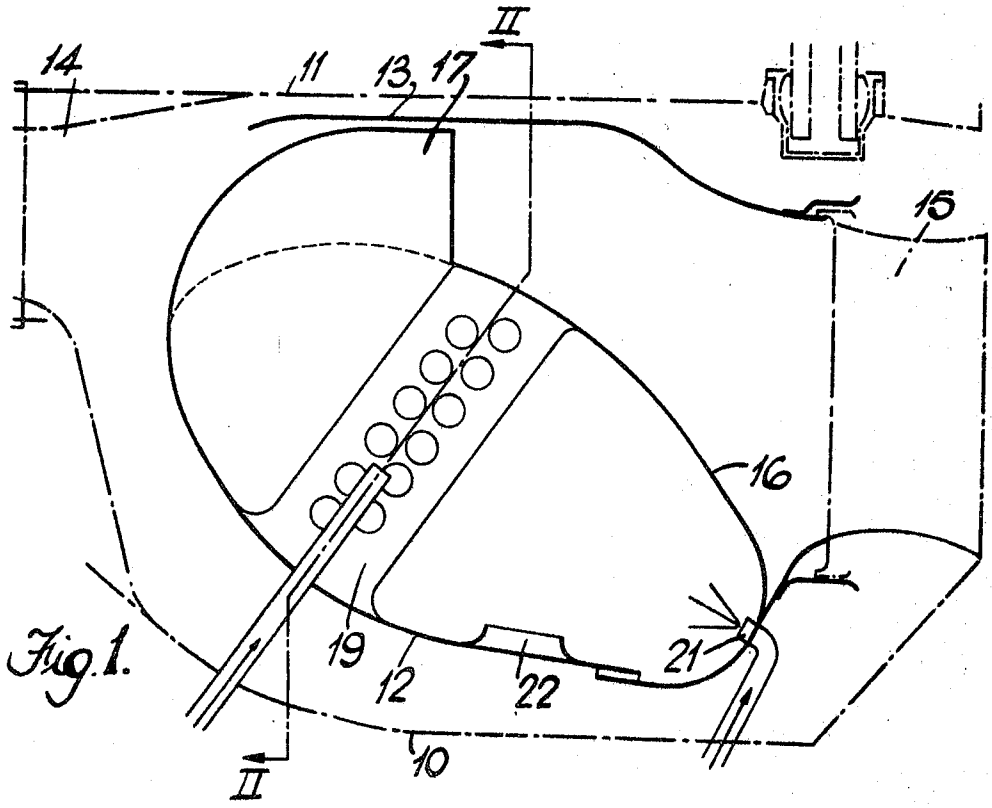

Fig. 1.

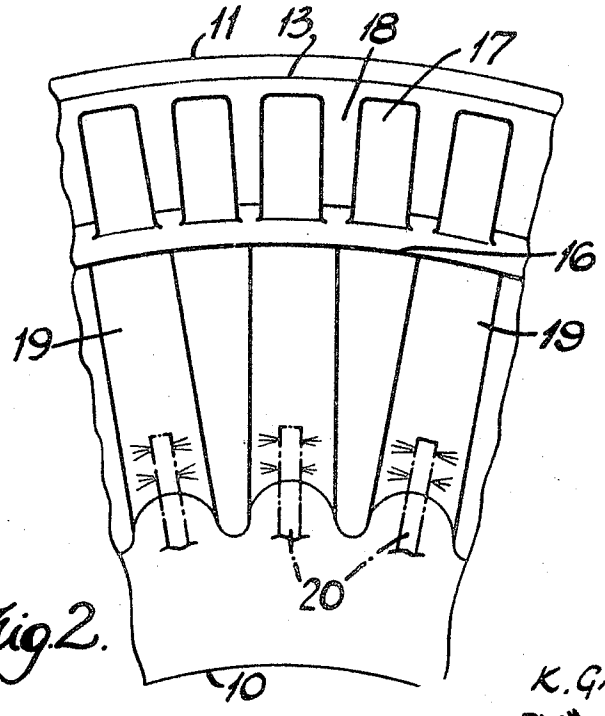

Fig. 2.

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COMBUSTION APPARATUS FOR GAS TURBINE ENGINES

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ABSTRACT OF THE DISCLOSURE

Combustion apparatus for a gas turbine engine comprising an annular air jacket, an annular flame tube in spaced relation within the air jacket, a shield within the flame tube extending obliquely across the flame tube from near the downstream end to the upstream end, the inner wall of the flame tube defining, with the shield a combustion zone, a plurality of spaced ducts extending from the combustion zone to the downstream end of the flame tube, a plurality of passages defined between the ducts, whereby dilution air can enter the flame tube to mix with air combustion products leaving the combustion zone from the ducts, and a plurality of vanes extending across the combustion zone through openings in which fuel and air can enter that zone.

This invention has for its object to provide combustion apparatus for gas turbine engines, in a convenient form.

According to the invention there is provided combustion apparatus for a gas turbine engine comprising an annular air jacket having inner and outer walls terminating at positions to define an inlet and an outlet, an annular flame tube having inner and outer walls spaced from those of the air jacket respectively, said flame tube walls defining an outlet at the downstream end, a shield within the flame tube extending substantially obliquely across it from a position near the downstream end to the upstream end, it being connected to the inner wall of the flame tube to define therewith a combustion zone, a plurality of spaced ducts communicating with the interior of the flame tube at the upstream end and extending within the outer wall of the flame tube towards the outlet, there being defined between adjacent ones of these ducts a plurality of passages communicating with the air jacket inlet whereby dilution air can enter the flame tube to mix with products of combustion leaving the combustion zone through the ducts, and there being a plurality of vanes extending across the combustion zone through openings in which fuel and air for combustion can enter the combustion zone.

An example of the invention is illustrated in the accompanying drawings in which FIGURE 1 is a lengthwise cross sectional view of combustion apparatus constructed in accordance with the invention and FIGURE 2 is a transverse cross sectional view on the line II—II in FIGURE 1.

In this example there is provided combustion apparatus for a gas turbine engine comprising an annular air jacket having inner and outer walls **10**, **11** within which is disposed, spaced from the walls **10**, **11**, an annular flame tube also having inner and outer walls **12**, **13**, the former being constructed of more than one part to permit the entry of air for cooling as shown.

The inner and outer walls **10**, **11** of the air jacket converge to form an inlet **14** at the upstream end and an

outlet at the other, and the downstream end of the flame tube converges to form an outlet **15** to a turbine (not shown). Extending substantially obliquely across the interior of the flame tube and extending from the upstream end to a position near the downstream end but offset from the outlet **15**, is a shield **16** defining with the inner wall **12** to which it is connected a combustion zone of generally toroidal form. Secured to the outside of this shield **16** and communicating with the interior thereof at the upstream end are a plurality of spaced ducts **17** which terminate at their outer edges at a position adjacent to but spaced from the outer wall **13** of the flame tube these ducts extending towards the flame tube outlet **15** as shown. Between adjacent ones of these duct **17** are defined passages **18** (refer to FIGURE 2) through which dilution air can enter to mix with products of combustion which leave the combustion zone through the ducts **17**.

Extending transversely across the combustion zone intermediate the upstream and downstream ends thereof, are a plurality of hollow vanes **19** having perforated sides, and disposed within each is a multiple fuel burner head **20** as seen in FIGURE 2. At the downstream end of the combustion zone are burner nozzles **21** for supplying further fuel to the combustion zone. Primary air for combustion enters this zone, from the space defined between the inner wall **12** of the flame tube and the inner air jacket wall **10**, through the vanes **19** where it becomes mixed with the fuel, and secondary air enters the chamber through a plurality of holes **22** in the inner wall **12**. The products of combustion leave the combustion zone through the ducts **17** and become mixed with dilution air entering through the passages **18**, and the mixed combustion products and dilution air then flow to the downstream end of the flame tube and out through the outlet **15**.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. Combustion apparatus for a gas turbine engine comprising an annular air jacket having inner and outer walls terminating at positions to define an inlet and a outlet, an annular flame tube having inner and outer walls spaced from those of the air jacket respectively, said flame tube walls defining an outlet at the downstream end, a shield within the flame tube extending substantially obliquely across it from a position near the downstream end to the upstream end, it being connected to the inner wall of the flame tube near the downstream end to define therewith a combustion zone, a plurality of spaced ducts communicating with the interior of the flame tube at the upstream end and extending within the outer wall of the flame tube towards the outlet, there being defined between adjacent ones of these ducts a plurality of passages communicating with the air jacket inlet whereby dilution air can enter the flame tube to mix with products of combustion leaving the combustion zone through the ducts, and there being a plurality of hollow vanes extending across the combustion zone through openings in the inner flame tube wall and through which fuel and air for combustion can enter the combustion zone.

No references cited.

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