

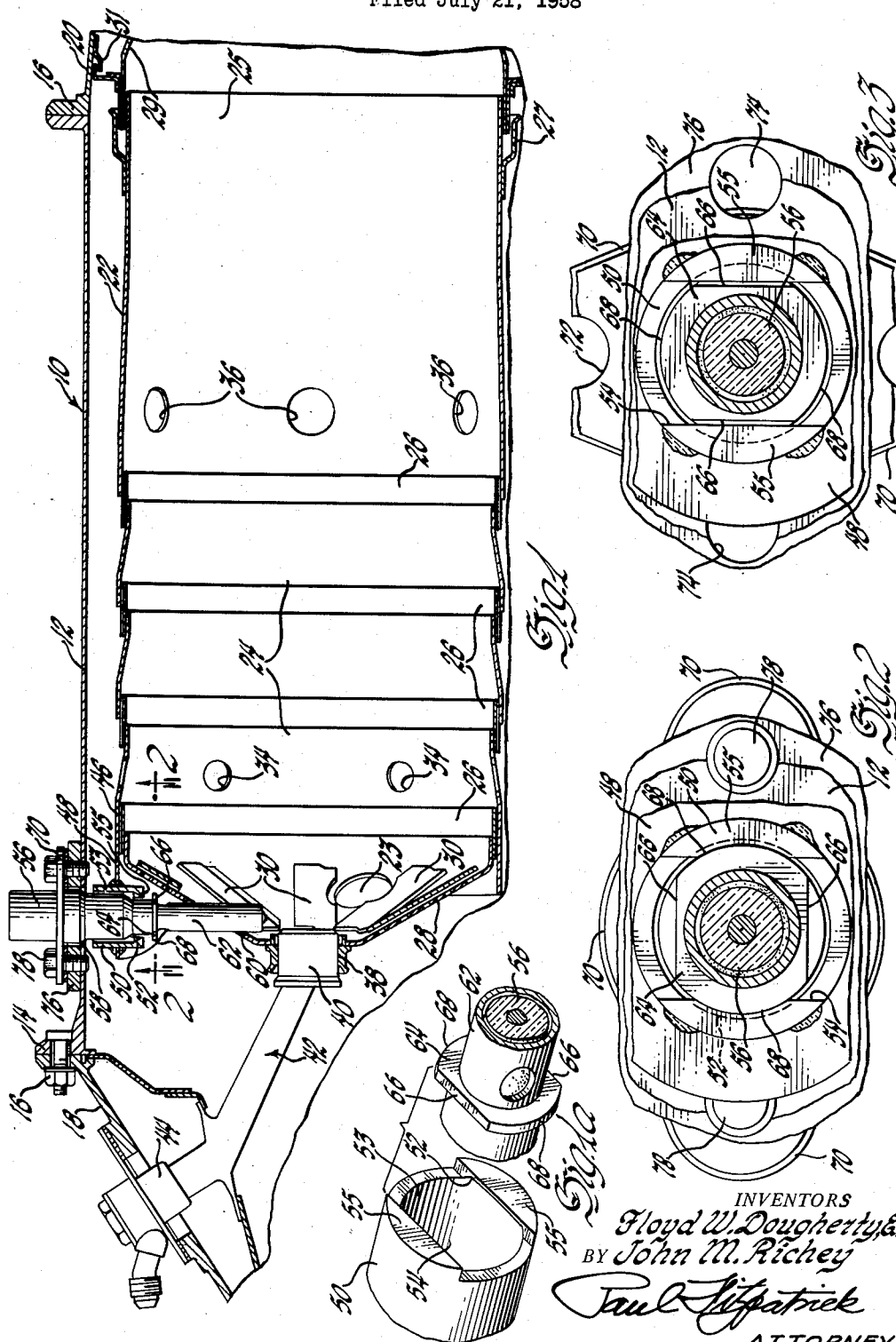
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COMBUSTION CAN SUPPORT

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COMBUSTION CAN SUPPORT

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This invention relates to a combustion can for a gas turbine engine.

More specifically, this invention relates to means for radially supporting and axially locating a combustion can with respect to the engine outer casing prior to the insertion therein of a fuel nozzle. In many gas turbine engines having a cannular combustion section, the cans are usually supported at the forward end by the fuel nozzle extending through the central aperture in the dome of the can with the rear section being suitably supported by strut means and other suitable fixtures connected to the engine casing. However, prior to the insertion of the nozzle in the can, no means is provided for maintaining the can in axial alignment or in radial position ready to receive the fuel nozzle. In order to maintain said cans ready for insertion of the fuel nozzle, this necessarily requires much stronger supporting means to the rear of the cans, which involves the use of more material rendering the can heavier, and resulting in a higher cost.

This invention is directed to a can supporting and locating means for supporting the forward end of the combustion can, as previously mentioned, prior to the insertion of the fuel nozzle, such a construction eliminating the usual supports at the rear of the can and thereby rendering the can lighter and cheaper to manufacture. With the elimination of the heavy supports at the rear of the can, expansion can take place at this point rather than at the front or dome section of the can.

This invention consists of supporting the can upon the igniter plug by securing a ferrule to the forward end of the can to slidably receive the igniter plug therein, the plug having a locking lug on a portion below the ferrule to permit the ferrule to rest on the locking lug and support the can from the plug. The ferrule is tapered at one end and provided with a slot, with the locking lug having a shape such that rotation of the locking lug and plug to one position permits the withdrawal of the plug through the ferrule, while rotation of the lug to another position permits the ferrule to rest on the lug and support the can from the plug. The plug is then bolted to the engine casing.

Therefore, it is an object of this invention to provide a radially supporting and axial locating means for a combustion can to properly align and support the can preparatory to the insertion of the fuel nozzle therein.

Other features, advantages and objects will become apparent by reference to the detailed description of the invention and to the drawings showing the preferred embodiment of this invention, wherein:

FIGURE 1 is a cross-sectioned view of a portion of the combustion chamber of a gas turbine engine,

FIGURE 1a is an exploded perspective view of a detail,

FIGURE 2 is a bottom view of the igniter plug showing the locking lug and plug in one position of rotation, obtained by passing a plane through the plug and can as indicated by the lines 2—2 of FIGURE 1, and

FIGURE 3 is a view similar to FIGURE 2 but showing the locking lug and plug in a different position of rotation.

Referring now to the drawings and more particularly to FIGURE 1, there is shown therein a portion of the combustion section 10 of a gas turbine engine, the outer confines of the combustion section being defined by the annular outer engine case 12 connected by suitable flanges and bolt assemblies 14 and 16 to the outer engine case

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portions 18 and 20 defining respectively the diverging diffuser section and the forward part of the turbine case.

Suitably annularly positioned within the combustion section 10 are a number of combustion cans 22 circumferentially spaced from each other. While only one can 22 is shown, six or more cans are usually provided therein, said cans being interconnected by conventional crossover tubes (not shown) positioned within openings 23 for the propagation of the flame therebetween to ignite the fuel in the cans not provided with igniter plugs. As shown, each of the combustion cans 22 is generally cylindrical, having a plurality of ring-like sections 24 joined together by annular spacer members 26 corrugated (not shown) to provide the necessary flow of cooling air therebetween to cool the sheet metal can.

At its rearward portion 25, the can is provided with suitable annular sleeve-like means 27 for slidably receiving the forward portion 29 of the transition section (not shown), this portion of the transition section being supported at 31 by the outer engine case 20. Such a construction thus supports the rearward portion of the can 22 while permitting extension or retraction of the same under thermal expansion or contraction of the can and transition section.

At its forward end, the can is provided with a dome shaped end 28 suitably perforated as shown in the conventional manner for cooperation with a set of swirler blade members 30 provided for inducing vorticity in the incoming air. As seen, suitable primary air inlets 34 and air dilution openings 36 are provided. The dome end 28 of the can is suitably apertured centrally at 38 for receiving one end 40 of a conventional fuel nozzle 42 having its other end 44 suitably secured to the diffuser section engine casing 18 as shown. As shown, the fuel nozzle end 40 thus supports the forward end of the combustion can during normal operation of the engine.

The means for radially supporting and axially locating the combustion can with respect to the casing prior to insertion of the fuel nozzle in the opening in the dome will now be described. In previous installations, prior to the insertion of the nozzle in the combustion can dome 28, the combustion can would be cantilevered upon the rear support and fall down against the inner engine support, thereby possibly misaligning all of the cans and making it rather difficult and tedious to align each of the cans with respect to the separate nozzles. This invention eliminates this by providing a construction to be now described. Formed integrally therewith and projecting forwardly from the front end of each can 22 at its radial outermost portion 46 is a sheet metal plate-like portion 48 having a ferrule or hollow boss 50 welded thereto within an aperture provided in the plate. The ferrule 50 has a convergent taper 52 at its lower inside diameter, as seen in FIGURE 1, the tapered portion being slotted transversely of the longitudinal axis of the boss at 54 through the entire diameter of the boss.

An igniter plug 56 having the shape shown projects through an opening 58 in the outer engine case 12 and through an aperture 60 in the combustion can dome for igniting the fuel air mixture therein. While only one plug is shown, two or more may be provided for igniting the fuel in the cans, with the crossover tubes (not shown) propagating the flame to the other cans. In this case, the igniter plug is slidably received within the boss or ferrule 50 and is provided on its lower portion 62 between the ferrule and opening 60 with a lug or locking means 64 comprising support means for supporting the combustion can from the igniter plug.

By referring to FIGS. 1a, 2 and 3, it will be seen that the annular-like locking lug 64 is secured to and surrounds the igniter plug 56 and is provided on two sides with parallel flats 66, the distance or width between the flats

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66 being slightly smaller than the width of the slot 54 in taper 52 of boss 50. At substantially right angles to side portions 66, the locking lug is formed with arcuate sections of equal radii having arcuate edges 68, the diameter of said arcuate sections together being slightly less than the inside diameter of the unslotted untapered portion 53 of the boss 50, while being a larger diameter or width than the width of the slot 54. Suitably secured to the upper portion of the igniter plug 56 is a mounting plate 76 provided with suitable openings 72 for cooperation with similarly spaced openings 74 in a plate 76 fixed to the engine outer case 12. Suitable bolts 78 are provided for connecting the plate 70 to plate 76 to support the igniter plug thereon and fix it against rotation.

The method of assembly for supporting the combustion can in the combustion section 10 will be seen clearly by referring to FIGURES 2 and 3. The can 22 is placed within the combustion section 10 with the rear portion 25 engaged with the forward portion 29 of the transition section. Prior to insertion of the fuel nozzle 42 in the dome opening 38 of the can, the igniter plug 56 is rotated to the position shown in FIGURE 3 to align the two flats 66 of the locking lug with the slot 54. The igniter plug 56 may then be inserted through the opening 58 in the outer engine case 12, through the tapered opening in the boss 50 and into the opening 60 in the dome. Rotation of the igniter plug assembly 90° to the position shown in FIGURE 2 will then position the arcuate edges 68 of the locking lug in alignment with the unslotted portion 55 of the tapered end of the boss 50 so that the boss and therefore the combustion can may rest upon the locking lug to be supported thereby preparatory to insertion of the fuel nozzle in the combustion can dome. With the plug assembly rotated to the FIGURE 2 position, the openings in the plate 70 are aligned with the openings in plate 76 and casing 12, and the bolts 78 may then be inserted therein and secured to the engine case to secure the plug assembly and locking lug in its operative position. The combustion can is thus radially supported ready for connection with the fuel nozzle, and is axially located with reference to the diffuser and transition sections. Any future axial thermal expansion will then be taken up by the rearward portion 25 of the combustion can.

Insertion of the fuel nozzle 42 into the aperture 38 of the can will then raise the can by a slight amount, for example, $\frac{3}{16}$ inch, thus raising the boss 50 out of contact with the lug 64. The boss 50 is thus mounted for a limited radial movement on the plug by the tapered portion 52 being confined between the locking lug 64 on one side, and the shoulder on the enlarged portion of the plug on the other side. In the event that the fuel nozzle should become dislodged for some unknown reason, the boss 50 would then again rest upon the lug 64 preventing free movement of the can.

From the foregoing it will be seen that this invention provides a light-weight and effective means of supporting the forward section of a combustion can prior to the insertion therein of the fuel nozzle, the support preventing the cans from falling out of position. With this construction, the normally heavy holding structure supporting the rear end of the cans is eliminated resulting in a simpler and cheaper structure.

As indicated previously, two or more igniter plugs are usually used to ignite the fuel in the cans, with the cans being interconnected by crossover tubes for propagating the flame to the other cans. Since the cans are of the same construction, "dummy" igniter plugs are placed in the igniter plug openings in the cans not equipped with "live" igniter plugs. These dummy plugs are of the same

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size and shape as the "live" plugs but do not have electrodes or any electrical connection thereto. It will be seen therefore, that each of the dummy plugs will also be provided with a locking lug for cooperation with the combustion can boss to radially support and axially align the can in the same manner as described in connection with the cans having "live" igniter plugs.

While the drawings and specification illustrate and describe the preferred embodiment of this invention, it will be obvious to those skilled in the art that many modifications can be made without departing from the scope of the invention.

We claim:

1. In combination in a turbomachine, a casing defining a combustion chamber, a combustion can in said chamber for the burning of fuel therein, said casing and can each having an opening therein for receiving therethrough opposite ends of a fuel igniter plug, a fuel igniter plug insertable through said openings and rotatable to a plurality of positions, means removably securing one end of said plug to said casing, and other means slidably mounting said can on said plug for a limited movement with respect to said plug, said other means including ferrule means secured to said can receiving said igniter plug therethrough in the assembled positions of said plug and can, said ferrule means having portions of different internal diameters, said plug having a plurality of spaced portions thereon of greater diameter than the diameter of one of said ferrule means portions, said plug portions overlapping said one of said ferrule means portions in one rotative position of said plug confining said ferrule means for a limited sliding movement between said plug portions.

2. In combination in a turbomachine, a casing defining a combustion chamber, a combustion can in said chamber for the burning of fuel therein, said casing and can each having an opening therein for receiving therethrough opposite ends of a fuel igniter plug, a fuel igniter plug insertable through said openings and rotatable to a plurality of positions, means removably securing one end of said plug to said casing, and other means slidably mounting said can on said plug for a limited movement with respect to said plug, said other means including ferrule means secured to said can receiving said igniter plug therethrough in the assembled positions of said plug and can, said ferrule means having circumferential portions of different internal diameters, said plug having a plurality of spaced portions thereon of greater diameter than the diameter of one of said ferrule means portions, said plug portions overlapping said one of said ferrule means portions in one rotative position of said plug confining said ferrule means for a limited sliding movement between said plug portions, one of said plug portions comprising an elongated partially arcuate member having a diameter along its major axis greater than and a width along its minor axis less than the said one ferrule means portion diameter, rotation of said plug to another position withdrawing said one of said plug portions from overlapping said one of said ferrule means portions permitting separation of said can and plug.

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