

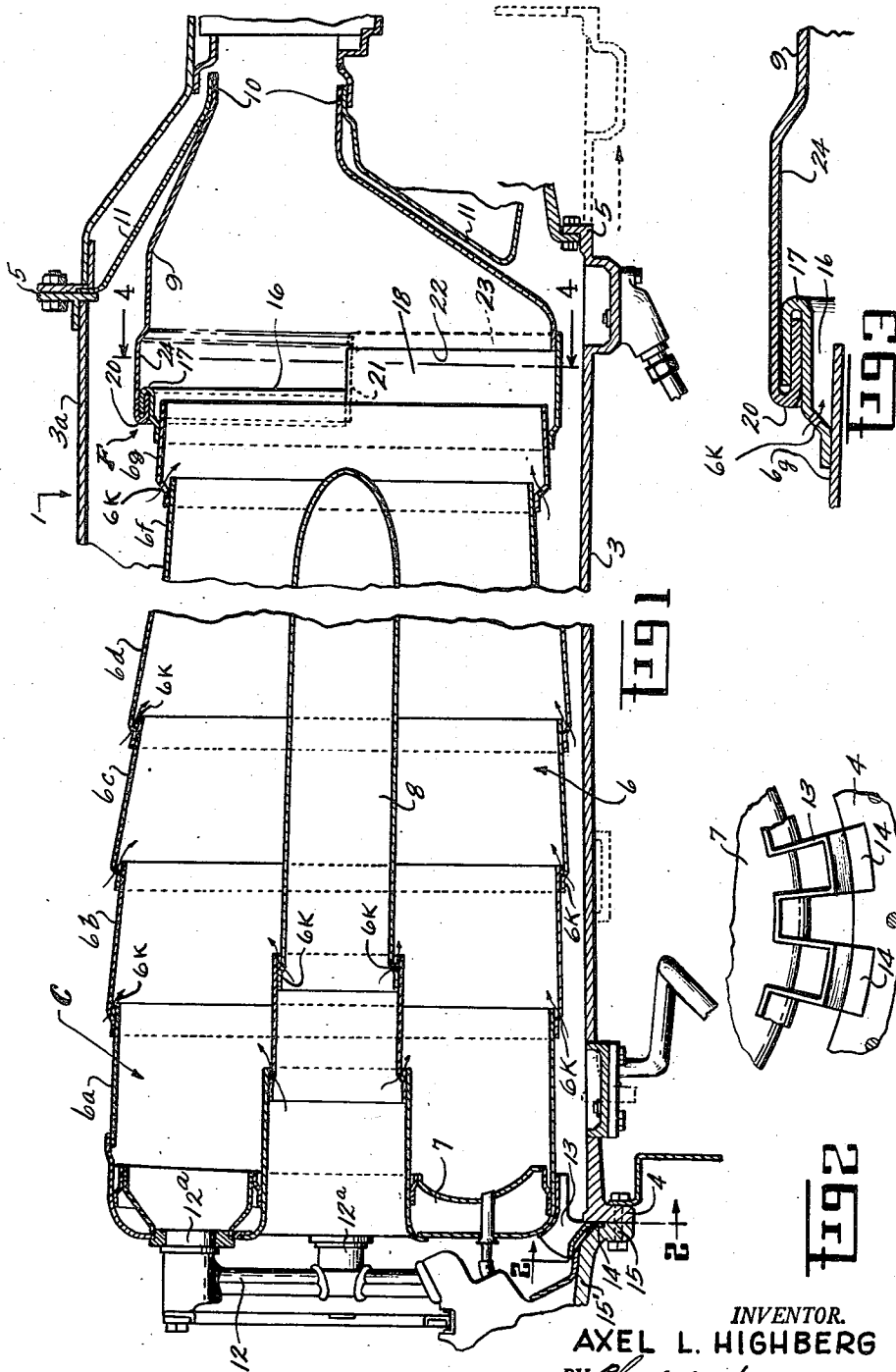
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REMOVABLE BURNER CANS

2,801,520

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

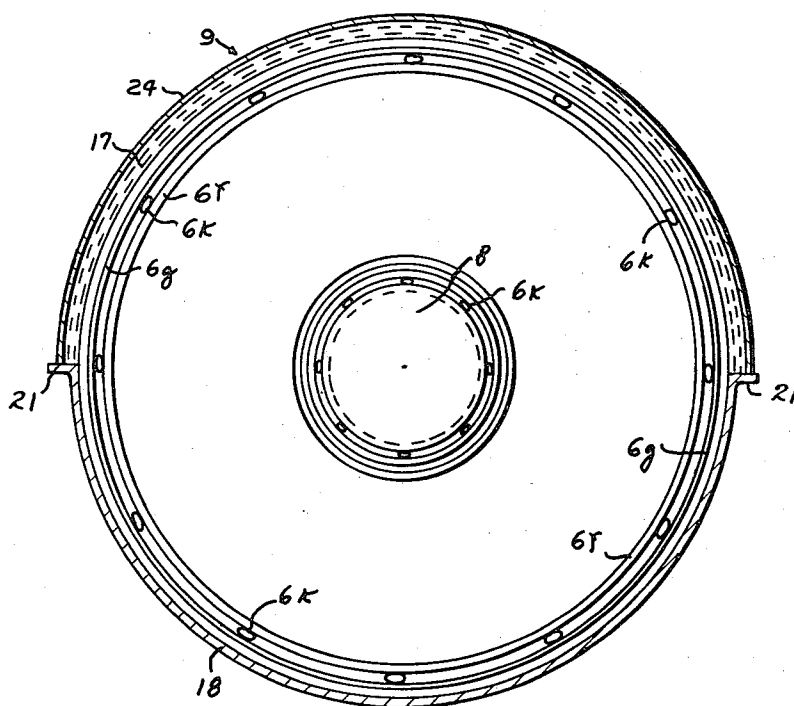


Fig-4

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REMOVABLE BURNER CANS

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8 Claims. (Cl. 60—39.69)

This invention relates to turbo-jet power plant propulsion devices or power plants, primarily for aircraft, and more particularly to an arrangement for removably connecting the combustion or burner can members of an annular series thereof to the transition pieces or member to the combustion chamber outlet, in which any burner can member can be removed radially out of the power plant without disturbing the other burner can members.

Another object of the invention is the provision of means whereby the transition pieces or combustion discharge cones of a combustion chamber gas turbine or turbo-jet engine are each interlocked at their front end to the rear end of one of the burner can members in such a manner that slight rearward disposition of any of the burner can members, when released at its forward end, will disengage the interlock, after which the burner can member can be moved radially outward, relative to the central axis of the turbine power plant, to dispose the interlocking connections out of interlocking alignment, to permit removal of any burner can without disturbing the rear transition piece or cone member or any of the other burner can members, also providing means whereby new burner cans are easily inserted by first disposing the burner can and transition piece complementary rebent flange interlocks in position for engagement by the insertion of the rear end of the burner can portion, which is formed with an outer semi-circular locking flange facing rearwardly, into the transition piece, with a rebent flange in rear of a similar semicircular complementary rebent inner flange on the interior of the forward end of the transition piece, then sliding the burner can forwardly to bring the complementary rebent semicircular flanges into interlocked relation, and securing the burner can member at its forward end in interlocked relation against rearward movement to maintain the burner can member and transition piece in interlocked relation during the operation of the power plant device.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawing in which like reference characters refer to like parts in the several figures.

Figure 1 is a somewhat diagrammatic radial longitudinal sectional view through a turbo-jet or gas turbine propulsion power plant for aircraft, parts being broken away and shown in section and foreshortened for convenience, only one combustion chamber and burner can member being shown for simplification, although the turbine includes an annular combustion chamber and transition pieces spaced therein around the longitudinal central axis of the turbine.

Figure 2 is a fragmentary sectional view taken about on line 2—2 of Figure 1, illustrating the spacer flanges for securing the forward end of the burner tube spaced within the combustion chamber inner and outer castings.

Figure 3 is an enlarged radial section through the rear end of the burner can member and transition piece or cone member taken through the cooperating complementary interlocking semi-circular rebent flanges on the

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forward end of the transition cone member burner and the rear end of the burner can member.

Figure 4 is a vertical section taken approximately on line 4—4 in Figure 1, looking in the direction of the arrows.

Referring to Figure 1, the reference numeral 1 denotes an annular combustion chamber generally of a turbo-jet or gas turbine propulsion power plant, parts not pertinent to the invention being broken away for simplicity or omitted in illustrating and describing the invention. The outer combustion chamber shell or cylinder 3 is flanged at its forward and rear end at 4 and 5 respectively.

The burner can indicated at 6 generally comprises a head portion 7 having a hollow cylindrical tubular center portion 8 extending axially through the burner can member 6 toward a transition piece combustion discharge cone member 9 which is secured at its rear end at 10 to a shell 11 which is fixed in relation.

The burner can forward end or head portion 7 is provided with conventional fuel supply nozzle openings and the fuel delivery means 12a which are connected to a header 12 in the usual conventional manner, not forming a part of the invention.

Secured to the exterior of the front end 7 of the burner can 6 is a bracket member 13 (shown in detail in Figure 2) having abutment flanges 14 adapted to be seated against the flange portion 4 of the outer shell 3 as shown, and held in place against forward movement by the flange 15 of the housing or closure casing 15' which is attached to the compressor casing (not shown).

The burner can member 6 is made up from a series of tapered annular rings or sleeves 6a, 6b, 6c, 6d to 6f and 6g, securely connected together and provided with the usual vent air inlet apertures or openings 6k, establishing communication between the annular space between the casing 3 and the inner shell 3a in the conventional manner.

The last or rearmost sleeve or ring 16 of the burner can member is secured to the rear end of the tapered sleeve or ring section 6g, and is of unconventional construction, being formed at its rear end with a substantially semi-circular, rebent on itself, outer flange 17 facing forwardly, extending around the radially outward half of the ring 16, with reference to the longitudinal axis "X" of the turbo-jet power plant. At the opposite ends of the semi-circular flange 17 the other or outer half of the burner can sleeve 16 projects longitudinally rearward to form an extension 18 rearwardly of the ends of the flanged portion, Figure 1. The forward end of the transition piece or cone 9 is also unconventional, in that the inner half of its circumferences, with respect to the central longitudinal axis "X" of the power plant, is formed with an inwardly extending rebent substantially semi-circular flange 20 opening rearwardly, the flange 20 being complementary to the flange 17 to provide a positive interlock through the two flanges 17 and 20 between the transition piece and the burner can member during the operation of the power plant to resist relative forward movement of the burner can member 6 relative to the transition cone 9.

The opposite ends of the extension 18 may be flanged outwardly (radially) at the opposite extremities of its rebent semi-circular flange 17 to provide substantially opposite narrow radial flanges 21.

The outer half of the transition piece 9, relative to the longitudinal axis "X" of the power plant, is cut away circumferentially between the rear ends of its flange 20 as indicated at 22, and the outer end portion or extension 18 of the burner can 6 is disposed in overlapping engagement with the outer surface portion of the transition piece 9 adjacent cut away portion 22, this overlap being

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indicated at 23 when the flanges 17 and 20 are fully inter-engaged as shown in Figure 1, this overlap 23 increasing as the burner can 6 is moved rearwardly to effect disengagement of the rebent complementary flanges 17 and 20.

The transition piece or cone 9 is formed with a semicircular enlarged portion 24 located rearwardly of its rebent flange 20 to permit the rearwardly shifting of the burner can for the disengagement of the complementary flanges 17 and 20, after which the burner can 6 can be removed laterally (radially outward relative to the central axis "X" of the power plant). Since the rebent flange 17 is now out of engagement with the complementary rebent flange 20 on the transition piece the burner can 6 is removable radially of the power plant without disturbing the other burner cans. The outer casing or shell 3 must however be removed axially rearward to permit the lateral removal of the burner cans 6 as indicated for repairs or replacement.

It should be noted that the flange 14 on the supporting bracket 13 together with the header 12 support the head of the burner can 6 in proper alignment with the transition piece and the flange 14 preventing rearward movement of the burner can tending to disengage the interlocking flanges 17 and 20, when the outer casing 3 is secured in position with its flange 4 in rear of the flange 14.

The dotted lines in Figure 1 show the outer combustion chamber shell 3 partly removed to release the flange 14. After the shell 3 is fully removed the burner can 6 can be shifted rearwardly to disengage the interlocking flanges 17 and 20 and radially removed easily and conveniently without disturbing any of the other cans or the inner wall 3a of the combustion chamber. The can is replaceable by a reversal of the aforesaid process. The replacement can is inserted radially toward the central axis to dispose the semicircular flange 17 inside of and rearwardly of the semicircular flange 20 with the rear semicircular extension 18 overlapping the exterior surface of the outer half of the transition piece 9, with the semicircular complementary flanges 17 and 21 in alignment for interlocking engagement. Pulling the burner can axially forward causes the rebent complementary flanges to interengage as shown in Figure 3, thus limiting further forward movement of the burner can 6 in the transition piece or cone 9, with the unflanged semicircular portions 18 and 22 of the can 6 and cone 9 in overlapped relation as indicated at 23, the flange 14 of supporting bracket 13 being in position to abut the shoulder or flange 15. When the outer sleeve or wall of the combustion chamber 3 is replaced and bolted fast the flange 4 thereof engages the flange 15, securing the burner can. The header or nozzle assembly 12 is securely mounted on the part 15', which is in turn attached to the compressor casing.

When the burner can 6 is moved rearwardly for disengagement and removal, the nozzles 12a are therefore withdrawn from suitable openings therefor in the head 7. In the replacement of the burner cans, the nozzles 12a of the header 12 are slipped into the nozzle openings in the burner can heads 7 as the burner cans are moved forwardly to establish the interlocks.

While the foregoing description and accompanying drawing show and describe one embodiment of the invention, it is understood that minor changes in the details of construction, combination, and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the following claims.

It is claimed that:

1. In a turbojet gas turbine power plant, an annular combustion chamber therein surrounding the longitudinal axis of the power plant, transition combustion discharge cone members fixed to said chamber, each having a discharge opening at its rear end, said cone members each having an annular forward end rebent inwardly and then rearwardly on itself throughout substantially one-half the periphery of said forward end to provide an internal

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rebent semicircular burner can complementary interlocking flange thereon facing rearwardly, a burner can member positioned within said chamber in spaced relation to the inner wall thereof, having a rebent flange at the rear end extending outwardly and forwardly throughout substantially one-half the outer surface of the rear end of the burner can to form a complementary interlocking rebent flange for the aforesaid semicircular rebent flange facing forwardly, for interlocking engagement with the said semicircular rearwardly facing rebent flange, said burner can having a semicircular extension projecting rearwardly between the opposite ends of the semicircular flange thereon in juxtaposed overlapping relation to the outer surface of the front end of the transition cone member between the opposite ends of the semicircular flange thereon throughout substantially half of the periphery thereof, whereby rearward movement of the burner can disengages the semicircular complementary rebent flanges from each other, whereby the burner can is displaceable radially from the power plant without disturbing any of the other burner cans.

2. Apparatus as claimed in claim 1 in which the burner can is provided with a closed forward end, a supporting bracket projecting outwardly from the said forward end radially of the central axis of the power plant, an abutment adjacent the forward end of the combustion chamber in the path of the rearward axial movement of the burner can, whereby upon removal of said abutment the burner can is then free to be moved rearwardly to disengage the aforesaid complementary interengaging semicircular rebent flanges from each other, to free the burner can from interengagement with the cone member for lateral removal from the combustion chamber.

3. In a gas turbine power plant having a central axis, a combustion chamber therefor located at one side of said axis, a combustion discharge cone member fixed in said chamber at the rear end thereof, having a combustion discharge opening at its rear end, said cone member diverging forwardly and terminating in an annular forward end, rebent rearwardly on itself throughout substantially half of said forward end to provide a rebent on itself burner can interlocking flange facing rearwardly, a burner can positioned within said chamber in spaced relation to the inner surface thereof, said burner can having an annular rear end portion substantially conforming to the size and shape of the forward end of said cone member, a rebent on itself complementary interlocking flange for the aforesaid rebent flange on the exterior of the rear end of the burner can and facing forwardly throughout substantially half of the periphery of the rear end of the said burner can, said last mentioned rebent flange being complementary to the first mentioned rebent flange and disposed in interengaging alignment thereto and for interlocking engagement therewith to secure said burner can within the combustion chamber against forward movement thereof relative to said cone member, said burner can and cone member having substantially half of their respective rear and forward peripheral portions opposite their respective rebent flanges, and between the opposite ends of the respective rebent complementary flanges, disposed in juxtaposed overlapping relation when the rear end of the burner can is disposed in the forward end of the cone member with said flanges in said alignment.

4. In a turbo-jet gas turbine power plant having a central axis, a combustion chamber therein having a longitudinal axis, a combustion discharge transition cone member fixed at its rear end in said chamber and diverging forwardly, terminating in an annular forward portion, rebent inwardly and rearwardly on itself to form a rebent flange and facing rearwardly around substantially one-half of the interior of the said forward portion, the opposite half of the last mentioned forward portion being cut away between the opposite ends of said internal rebent flange to provide a substantially semicircular non-flanged portion, a burner can member positioned within

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said combustion chamber in spaced relation to the inner surface of said chamber having an annular rear end opening into said cone member, a rebent complemental flange for the aforesaid complemental rebent flange, formed on the interior of the rear end of said can member and facing forwardly for cooperative interlocking engagement with the aforesaid complemental rearwardly facing rebent flange extending around substantially half of said rear surface of the can portion, a semicircular extension projecting rearwardly around substantially the other half of the can member beyond the rebent flanges thereon, disposed for juxtaposed overlapping engagement with the outer surface of the cone member adjacent said cutaway portion, throughout substantially the half of the can member opposite the complemental flanges aforementioned on the can and cone members.

5. Apparatus as claimed in claim 4 in which the complemental rebent flanges on the cone and the can members are disposed around the respective inner and outer surfaces thereof throughout substantially the inner half the peripheries of said surfaces relative to the central axis of the power plant, and the overlapping portions extend substantially around the outer half of the can and cone members, relative to said central axis.

6. Apparatus as claimed in claim 5 in which the said juxtaposed overlapping portion of the can member extension extends around the outer surface of the cone member adjacent the said cutaway portion, substantially between the opposite ends of the complemental flanges, throughout the half of the annular surfaces of the can and cone members which face away from the central axis of the power plant, whereby the can member is shiftable rearwardly in the cone member to disengage the interengaging complemental rebent flanges and then displaceable outwardly relative to the said central axis of the power plant to displace the flanges out of cooperating alignment with each other, for subsequent removal of the can from said combustion chamber in a plane through the said central axis and the longitudinal axis of the combustion chamber.

7. A removable burner can for combustion chambers of gas turbine power plants comprising a transition combustion discharge cone having a discharge opening at its rear end, and diverging outwardly from said opening toward its forward end, terminating in a circular portion adjacent said forward end, a semicircular extension projecting forwardly from substantially one-half of said forward end, a semicircular rebent on itself flange around the inner surface of said semicircular extension and facing rearwardly, a substantially cylindrical burner can, adapted for removable positioning within the combustion chamber, having a closed front end and a rear end opening into the front end of said cone member, said burner can rear end having a cylindrical extremity conforming substantially to the size and shape of the front

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end of said cone member and said cone member extension, said can member having a complemental semicircular rebent flange around substantially half of the outer surface thereof and opening rearwardly for complemental interlocking engagement with the semicircular rebent outer flange on the cone member extension, said can member having a semicircular cutaway portion between the opposite ends of the rebent interlocking complemental flange thereon, with the inner surface thereof adjacent said cutaway portion, disposed in juxtaposed overlapping relation to the exterior surface of the said semicylindrical end portion of said cone member opposite said semicylindrical extension thereon, whereby the rear end of said can member is insertable laterally into the front end of the cone member to dispose the complemental rebent semicircular flanges in alignment for interlocking engagement, with the interior of the rear end of the semicircular portion of the can member extension, in juxtaposed overlapping relation to the exterior surface of the cone member adjacent the cutaway portion thereof, whereby subsequent movement of the can member forwardly disposes the semicircular rebent complemental flanges in interlocking engagement to prevent further forward movement of the can member relative to the cone member.

8. In a removable burner can construction for turbo-jet engine power plants having a combustion chamber, a transition cone member fixed relative to said chamber having a discharge opening at its rear end and flaring forwardly, terminating in a cylindrical forward end portion, a removable burner can member for said chamber having a cylindrical rear end portion discharging into said cone member, said burner can member and cone member cylindrical portions having complemental interengaging semicircular flanges thereon for interlocking engagement with each other in a direction parallel to the longitudinal axis of the burner can member and located between the burner can and cone members adjacent the respective cylindrical rear and forward end portions thereof, extending around substantially one-half of the circumference of said portions with the other half of the circumference of said portions non-flanged and disposed in juxtaposed overlapping relation, with the inner surface of the can member overlapping the outer surface of the cone member throughout the non-flange portion.

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