

Dec. 1, 1953

J. CHAMBERLAIN

2,660,859

COMBINED FLAMEHOLDER AND TURNING VANE

Filed June 18, 1952

FIG. 1

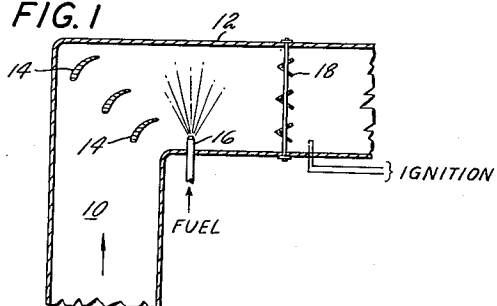


FIG. 2

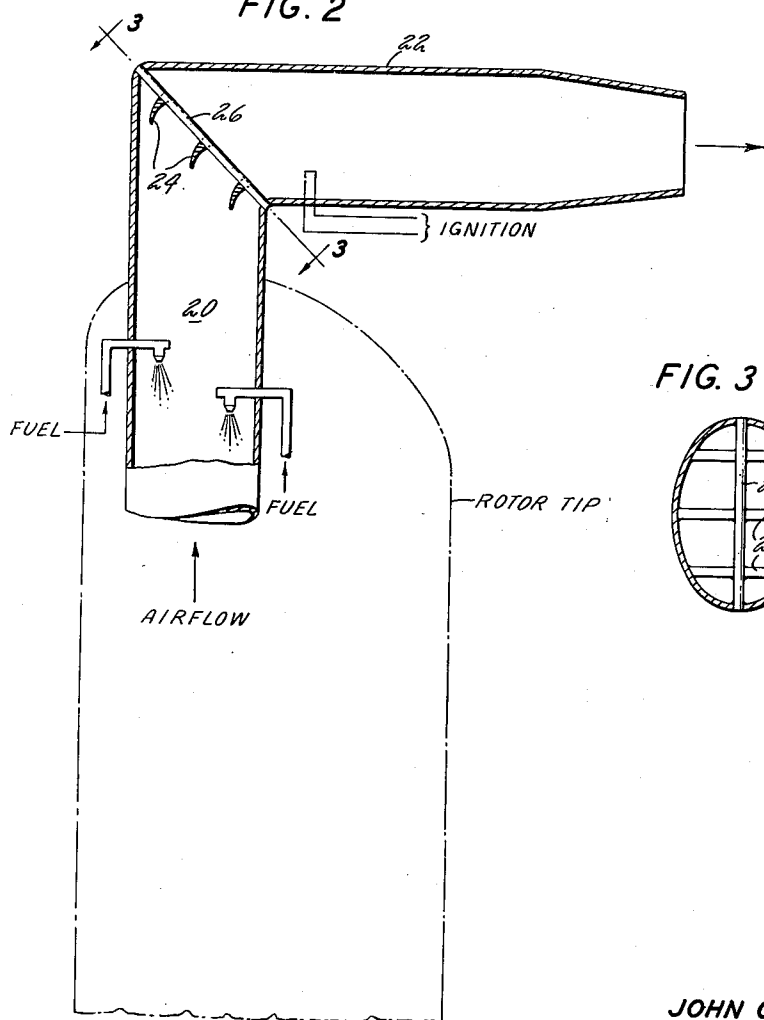
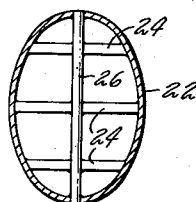


FIG. 3



INVENTOR
JOHN CHAMBERLAIN

By *Leonard F. Weikert*
ATTORNEY

UNITED STATES PATENT OFFICE

2,660,859

COMBINED FLAMEHOLDER AND TURNING VANE

John Chamberlain, Manchester, Conn., assignor
to United Aircraft Corporation, East Hartford,
Conn., a corporation of Delaware

Application June 18, 1952, Serial No. 294,144

4 Claims. (Cl. 60—39.72)

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This invention relates to improvements in combustion chambers and more particularly to combustion chambers having a turned duct immediately upstream thereof.

An object of this invention is to provide improved efficiency for burners or combustion chambers which are located immediately downstream of a turn in the duct which supplies fluid to the burner.

A primary object of this invention is to provide a combination turning vane and flameholder mechanism adjacent the upstream end of a burner of the type mentioned above.

These and other objects of this invention will become readily apparent from the following detail description of the accompanying drawing in which:

Fig. 1 is a partial cross section of an ordinary burner construction where the burner is preceded by a turned duct.

Fig. 2 is a partial cross section of a burner having the combination turning vanes and flameholders according to this invention; and

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 2.

Referring to Fig. 1, the normal construction for a turned duct combustion chamber is illustrated. Thus, the duct portion 10 is at an angle relative to the combustion chamber 12 so that it is the practice to utilize turning vanes 14 at the turn in the duct. Fuel is injected by means of nozzles 16 downstream of the turning vanes and the fuel-air mixture is ignited adjacent to the V-type flameholders 18. In view of the turbulence created by the turning vanes the airflow is usually not smooth so that it is possible for the flame to jump back and forth from the flameholder to the turning vanes or to hold in the wake of the turning vanes. As a result, inefficient burning is provided and a very unstable, overall condition exists.

As illustrated in Fig. 2, the present invention eliminates the problems pointed out above. Thus for a burner which might, for example, be utilized in the tip of a helicopter rotor blade, a passage 20 would be provided for conducting air under pressure to the burner. The burner portion 22 would communicate with the duct 20 and would be located at an angle relative thereto. At the junction of the two ducts a plurality of combined turning vane and flameholder members 24 are provided and these members span the duct running transversely of the axis of flow therethrough. A member 26 may be provided to rigidly support the turning vane flameholders 24.

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Ordinary turning vanes are likely to be subject to some flow separation and consequently cause burner roughness because burners of this type are generally very sensitive to unstable flow. Hence, the turning vanes 24 are of airfoil section at their upstream ends but their upper and lower surfaces diverge in a downstream direction. Hence, the space in the V formed by the turning vane flameholders forms a protected flameholding area.

In addition, the passage between adjacent vanes are convergent thereby increasing the flow velocity which tends to stabilize the flow around the corner. Furthermore, a construction of this type permits the flameholders to be located at the farthest possible upstream point. In addition, a construction of this type permits fuel to be injected in the duct 20 instead of in the combustion chamber 22.

A spark device for igniting the fuel-air mixture in the combustion chamber 22 may be provided as illustrated.

As a result of this invention it is apparent that an improved mechanism has been provided for combustion chambers which are preceded by a turned duct whereby smoother and more stable fluid flow is obtained with low pressure losses.

Although only one embodiment of this invention has been illustrated and described herein, it is apparent that various changes and modifications may be made in the construction and arrangement of the various parts without departing from the scope of this novel concept.

What it is desired to obtain by Letters Patent is:

1. In a burner comprising a duct through which a gas flows, said duct including two duct portions having their axes disposed at an angle to each other, a duct section forming a joint between said two duct portions, and at least one combined turning vane and flameholder in said section having its span running substantially transversely the axis of gas flow, said vane having upper and lower surfaces which diverge continuously in a downstream direction and means for injecting fuel upstream of said duct section and mechanism adjacent said section for igniting the gas fuel mixture whereby combustion takes place downstream of said section.

2. In a burner comprising a duct through which a combustion supporting gas flows, said duct including two duct portions having their axes disposed at an angle to each other, a duct section forming a joint for said two portions, said section adapted to have combustion taking place

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downstream thereof, and means for simultaneously turning the gas and stabilizing combustion downstream from said section comprising at least one vane having its span running transversely of the axis of flow in said section, said vane comprising a leading edge portion of substantially airfoil shape and a trailing edge portion forming a downstream continuation of said leading edge portion and comprising surfaces diverging in a downstream direction.

3. In a combustion chamber having a curved duct portion and adapted to have combustion take place downstream of said portion, means for injecting fuel upstream of said curved portion, and combined flow turning means and flameholding means in said curved portion comprising at least one vane having its span running transversely of the axis of flow, said vane having a streamlined cross section with the trailing portion thereof forming diverging surfaces.

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4. In a combination chamber according to claim 3 wherein said combined means comprise a plurality of vanes with the adjacent surfaces of the vanes forming curved converging passages.

JOHN CHAMBERLAIN.

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