

Nov. 7, 1967

L. J. FROST

3,351,319

COMPRESSOR AND FAN EXIT GUIDE VANE ASSEMBLY

Filed Sept. 1, 1966

FIG. 1

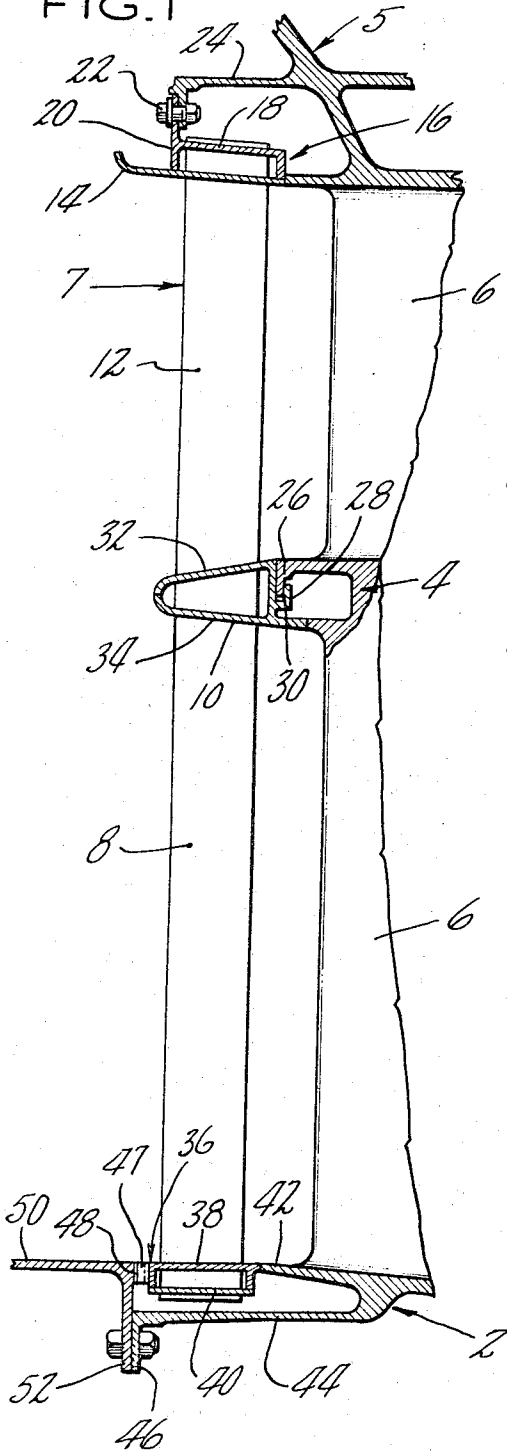
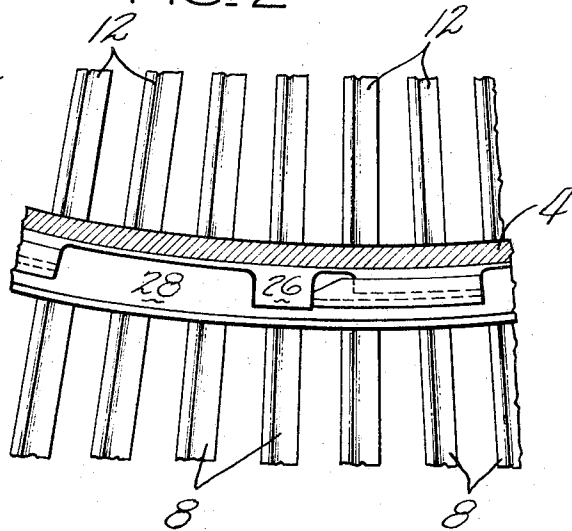


FIG. 2



INVENTOR
LEWIS J. FROST
BY *Charles A. Hansen*
ATTORNEY

1

3,351,319

COMPRESSOR AND FAN EXIT GUIDE VANE ASSEMBLY

Lewis J. Frost, Vernon, Conn., assignor to United Aircraft Corporation, East Hartford, Conn., a corporation of Delaware

Filed Sept. 1, 1966, Ser. No. 576,758

3 Claims. (Cl. 253-78)

ABSTRACT OF THE DISCLOSURE

A turbofan engine construction wherein a row or rows of vanes, their shrouds and flow splitter may be attached to an engine casing as a unitary assembly.

This invention relates to a fan type of gas turbine engine and particularly to an arrangement for positioning the splitter and the adjacent stator vanes and fan exit guide vanes within the engine.

In the assembly of this portion of the fan engine, it is conventional to support the compressor stator immediately downstream of the last fan stage from the compressor case which case also supports the splitter vane. It is also desirable at this location to maintain the desired radial position of the splitter assembly with respect to the outer fan case. To this extent one feature of the invention is a unitary assembly of the fan exit guide vanes, the splitter and the compressor stator vanes for positioning within the engine as a unit.

Another feature of the invention is an arrangement by which to securely hold the splitter and its attachment to the remainder of the compressor case since it is difficult to provide accessible attachment means in this location without affecting the flow of air over the outer surfaces of the splitter.

Other features and advantages will be apparent from the specification and claims and from the accompanying drawings which illustrate embodiments of the invention.

FIGURE 1 is a sectional view to the position of the compressor and fan of a fan type engine showing the device of the invention thereof.

FIGURE 2 is a sectional view on a large scale of the attachment between the splitter assembly and the adjacent parts of the engine with the guide vanes and the stator vanes foreshortened.

Referring first to FIGURE 1 the engine has an outer case 2, an intermediate or compressor case 4 and an inner case or inner duct wall 5. These cases may be held in concentric relation to one another by radial struts 6. Extending between the outer wall, the compressor case and inner duct wall is a row of vanes 7. This row of vanes consists of two vane sections, the outer section extending between the outer wall and splitter 10 and having the appropriate profile forms the fan exit guide vanes 8; the inner section extending inwardly between the splitter and inner duct wall and having a different but appropriate profile forms the compressor stator vanes 12. The vanes 7 have a constant rate of twist starting at the inner end of the compressor stator section and extending to the inner end of the exit guide vane section, the rate of twist extending along the inner end of the exit guide vane an amount sufficient to permit the inner end of the compressor stator to extend through the inner box shroud, hereinafter described. The other end of the exit guide vane section has the same rate of twist as the inner end of the exit guide vane section, the rate of twist extending along the outer end of the exit guide vane for an amount equal to that of the inner end of the exit guide vane. A portion of the inner duct wall is made up

2

of a sleeve 14, a part of a box shroud 16. The other shroud element 18 of the box shroud carries an outwardly projecting lug and is welded to the sleeve. The sleeve 14 and shroud element 18 contain axial aligned contoured slots, the contour corresponding to the rate of twist on the inner end of the compressor stator vane. The part 18 carries inwardly projecting lugs 20 to receive bolts 22 by which the part 18 is attached to a fixed structure 24 within the compressor. The compressor case 4 has at its leading edge an outwardly extending flange 26 which is interrupted at spaced points to receive a cooperating inwardly projecting flange 28 carried by the splitter 10. The flange 28 as shown is spaced from a radial surface 30 on the splitter and the cooperating flanges form a so-called bayonet lock. Thus, in assembling the unitary structure, it is moved axially to position the flange 26 against the surface 30 and then the structure is turned until the flange 28 locks over the flange 26. This arrangement locates the splitter both axially and radially as will be apparent.

The outer ends of the stator vanes 12 are received by the splitter 10, the latter being U-shaped in cross section and the base of the U extending forwardly and dividing an inner wall 32 which receives the ends of the stator vanes 12 and an outer wall 34 which receives the inner ends of the fan exit vanes 8. The inner wall 32 and the outer wall 34 contain axially aligned contoured slots, the contour corresponding to the rate of twist of the middle section of vane 7.

The outer ends of the vanes 8 are positioned in a box shroud 36 made up of cooperating inner and outer shrouded elements 38 and 40 welded together to form a box-like structure. The shrouded elements 38 and 40 contain axially aligned contoured slots, the contour corresponding to the rate of twist on the outer end of the exit guide vane. The downstream end of the box-like structure engages a locating flange 42 on the fan case or outer duct 2 and the box shroud is overlapped by a projecting sleeve 44 forming an integral part of the case 2 and having at its forward end a projecting flange 46. The box shroud 36 has a forwardly projecting series of lugs 47 which are engaged within slots 48 on a sleeve 50 forming a part of the fan duct. The sleeve 50 has a circumferential flange 52 engaging axially with the flange 46 and being substantially bolted thereto. In this way, any torque applied to the exit guide vanes is transmitted into the fan case through the projecting lugs 47.

It will be apparent that this arrangement presents a readily removable structure which is positioned within the engine as a unitary part and may be removed therefrom once the row of bolts 22 is removed in order to permit the assembly to be turned for disengaging the bayonet lock.

It is to be understood that the invention is not limited to the specific description above or to specific figures shown, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. In a turbofan engine;
 - an outer wall,
 - a first shroud means connected to said outer wall,
 - an intermediate wall,
 - a flow splitter attached to the forward end of said intermediate wall, said flow splitter having inner and outer walls containing axially aligned slots so that a vane member may be inserted therethrough,
 - an inner wall,
 - a second shroud means removably connected to said inner wall,
 - a row of vanes, each vane consisting of an inner and outer section, said row of vanes extending from said

3

- first shroud means, through said slots in said flow splitter to said second shroud means,
 an inwardly projecting interrupted flange on said flow splitter, said inwardly projecting interrupted flange being spaced axially from a radial surface on said flow splitter, and 5
 a cooperating outwardly extending flange on said intermediate wall, said cooperating flanges permitting removable attachment of said first shroud, said second shroud, said flow splitter and said row of vanes to said intermediate wall as a unitary assembly. 10
2. A turbofan engine, as in claim 1 including means in said outer wall and said inner wall for rigidly securing said unitary assembly after positioning said inwardly projecting interrupted flange in said outwardly projecting flange. 15
3. A turbofan engine as in claim 1 wherein:
 said outer wall has a plurality of slots, said slots being in abutting relationship to said first shroud, and

4

- a plurality of lugs extending from said first shroud and cooperating within said slots so that any torque applied to said vanes is transmitted to said outer wall.

References Cited

UNITED STATES PATENTS

2,692,724	10/1954	McLeod	-----	230—122	X
2,961,150	11/1960	Pirtle	-----	230—116	
3,112,865	12/1963	Gisslen.			
3,264,482	8/1966	Clark et al.			

FOREIGN PATENTS

937,826	9/1963	Great Britain.
981,476	1/1965	Great Britain.

EVERETTE A. POWELL, JR., *Primary Examiner.*MARTIN P. SCHWADRON, *Examiner.*