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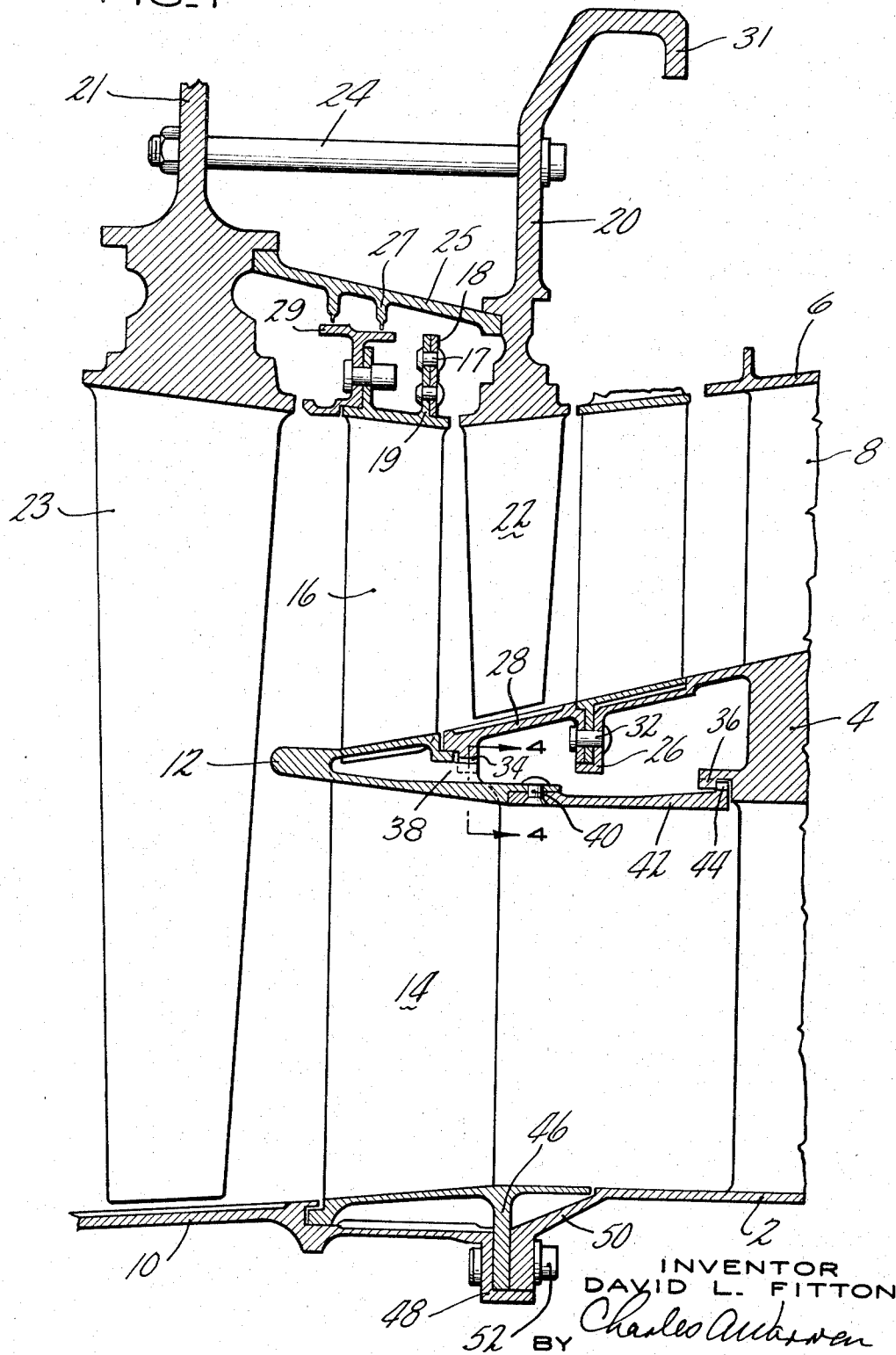
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ATTACHMENT MEANS FOR TURBOFAN LOW COMPRESSOR ASSEMBLY

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2 Sheets-Sheet 1

FIG. 1



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FIG. 2

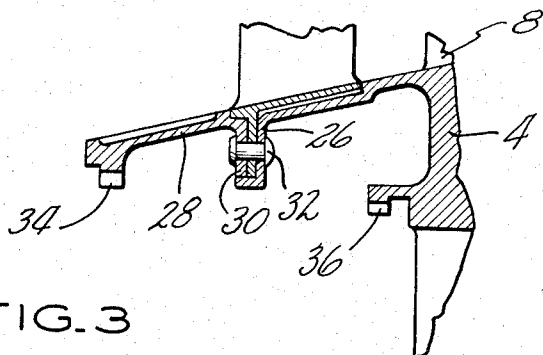


FIG. 3

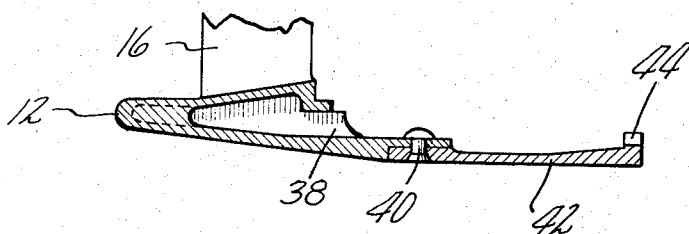


FIG. 4

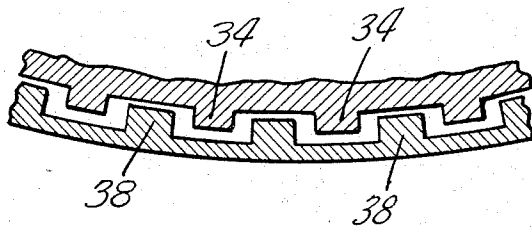
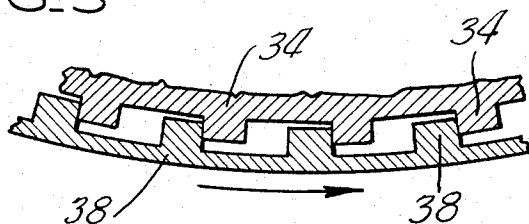


FIG. 5



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ATTACHMENT MEANS FOR TURBOFAN LOW COMPRESSOR ASSEMBLY

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This invention relates to a fan type of gas turbine engine and particularly to an arrangement for positioning the low pressure compressor assembly and fan exit guide vanes within the engine.

In the assembly of this portion of the fan engine, it is desirable and advantageous to dynamically balance the fan and low pressure compressor assembly and then remotely attach this assembly to the turbofan engine. To this extent one feature of the invention is the unitary assembly of the fan exit guide vane and low pressure compressor within the engine as a unit.

In this type of engine, it is conventional to provide support for the compressor stators within the compressor case and then support the compressor case by an intermediate case. Since the compressor stators are subject to heavy air loads, it is necessary to transmit this load to the intermediate case as directly as possible. Another feature of the invention is an arrangement by which the axial and tangential loads on the compressor stator vanes are transmitted to the intermediate casing from the compressor stators.

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

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

FIG. 2 is a sectional view on a larger scale of the top half portion of the intermediate casing and the attaching parts to the splitter assembly.

FIG. 3 is a sectional view of a larger scale of the attaching parts of the splitter assembly.

FIG. 4 is a sectional view substantially along the line 4-4 in the non-rotated position.

FIG. 5 is a sectional view substantially along the line 4-4 in the rotated position.

Referring first to FIG. 1, the engine has an outer casing 2, an intermediate casing 4 and an inner casing 6. These cases are held in concentric relation to one another by radial struts 8. Extending between a fan casing 10 which is attached to the upstream end of outer casing 2 and a flow splitter 12 attached to the upstream end of intermediate casing 4 is a row of fan exit guide vanes 14. A row of compressor stator vanes 16 extend between the flow splitter and an inner support ring 18. The outer end of the stator vanes are supported by the flow splitter and the inner end is secured by bolts 17 extending through the inner support ring and stator vane flange 19. In the present embodiment of the invention, single rows of vanes are illustrated; however, any number of rows may be employed.

Compressor rotor disc 20 and fan disc 21 support and rotate a row of compressor blades 22 and a row of fan blades 23. The rows of blades are on opposite sides of the row of compressor stator vanes 16. While only two stages of blades are illustrated the invention is not limited to this number. Tie rod 24 connects and provides support for the rotor discs. A spacer sleeve 25 spaces the discs and carries seal flanges 27 cooperating with a seal ring 29 on the inner end of stator 16. The compressor disc 20 has an integral mounting flange 31 which connects with a turbine drive, not shown here.

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Now referring to FIG. 2, the intermediate casing carries an outwardly projecting flange 26. A first ring 28 which surrounds the tips of blades 22 carries an outwardly projecting flange 30 and is rigidly secured to the intermediate casing by rivets 32. At the forward end of ring 28 are outwardly projecting lugs 34. The intermediate casing also carries axially directed circumferential fingers 36. These fingers are distally spaced from the intermediate casing, thereby forming a plurality of circumferentially aligned grooves. Both the outwardly projecting lugs 34 and the circumferential fingers 36 are axially aligned.

Referring to FIG. 3, the flow splitter carries spaced circumferential splines 38. The spacing between the splines is sufficient to accommodate lugs 34 and permit a slight angular rotation of the splines between the lugs. After this rotation, the splines and lugs are in contact, FIG. 5, and the circumferential loads are thereby transmitted to the intermediate casing. A ring 42, connected to the flow splitter by rivets 40, carries inwardly projecting tangs 44. These tangs are axially aligned with splines 38 and cooperate within the groove formed by the circumferential fingers 36 and the intermediate casing. The axial alignment and arrangement of the parts is such that when the splines 38 and lugs 34 are in contact, the tangs 44 and circumferential fingers 36 are in axial alignment and in contact thereby transmitting the axial loads to the intermediate casing. The before and after angular rotation position of the lugs and splines is illustrated by FIG. 4 and FIG. 5.

The outer end of the fan exit guide vanes 14 carries an outwardly projecting flange 46. This flange is riveted or otherwise attached to flange 48 carried by the fan casing 10 and cooperates with flange 50 carried by the outer casing. After the fan and compressor assembly consisting of fan casing 10, flow splitter 12, guide vanes 14, stator vanes 16, compressor rotor discs 20 and 21, and rotor blades 22 and 23 has been attached to the intermediate casing by mating the splines with the lugs, and the tangs with the circumferential fingers, the fan and compressor assembly is rotated causing contact between respectively the splines and lugs and the tangs and circumferential fingers. This rotation aligns the bolt holes in flanges 46, 48 and 50 and the whole assembly is then locked in place by bolts 52.

It is apparent that the arrangement presents a readily detachable structure which is positioned within the engine as a unitary assembly and which may be readily removed by removing bolts 52 and rotating the fan and compressor assembly.

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, a compressor stator vane support assembly, comprising:

- a fan casing,
- a splined flow splitter, concentric with said fan casing,
- a ring connected to the aft end of said flow splitter, said ring having a plurality of inwardly projecting tangs, said tangs being axially aligned with said splines,
- an inner support ring concentric with said fan casing and said flow splitter,
- a row of guide vanes extending between said fan casing and said flow splitter, said guide vanes being connected to said flow splitter at one end and to said fan casing at the other end, and
- at least one row of compressor stator vanes extending between said flow splitter and said inner support ring, said stator vanes being connected to said flow

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- splitter at one end and to said inner support ring at the other end.
2. In a turbofan engine, a fan and compressor stator vane assembly, comprising:
- an outer casing,
 - a fan casing,
 - an intermediate casing concentric with said outer casing, said intermediate casing having a plurality of circumferential, axially directed fingers,
 - a first ring connected to the forward end of said intermediate casing, said first ring having a plurality of outwardly projecting lugs, said fingers and lugs being in axial alignment,
 - a splined flow splitter, said splines being in cooperation with said lugs,
 - a second ring connected to the aft end of said flow splitter, said ring having a plurality of inwardly projecting tangs, said tangs and said splines being axially aligned, and said tangs being in cooperation with said fingers,
 - an inner casing concentric with said outer casing and said intermediate casing,
 - at least one row of struts extending between and connecting, respectively, said outer casing, said intermediate casing and said inner casing,
 - an inner support ring,
 - a row of guide vanes extending between said fan casing and said flow splitter, said guide vanes being connected to said flow splitter at one end and said fan casing at the other end and,
 - at least one row of compressor stator vanes extending between said flow splitter and said inner casing ring, said stator vanes being connected to said flow splitter at one end and to said inner casing at the other end.
3. In a construction, as in claim 2, in which said splines are spaced permitting angular rotation of the cooperating lugs therebetween, said lugs and said splines being in contact after said angular rotation so as to transmit the circumferential loads to said intermediate casing.
4. In a construction, as in claim 2, in which said fingers are distally spaced from said intermediate casing thereby forming grooves, said tangs cooperating in said grooves and being axially aligned with said fingers after said angular rotation so as to

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- transmit the axial loads to said intermediate casing.
5. In a construction, as in claim 3, in which said fingers are distally spaced from said intermediate casing thereby forming grooves, said tangs cooperating in said grooves and being axially aligned with said fingers after said angular rotation so as to transmit the axial loads to said intermediate casing.
6. A turbofan engine, as in claim 2:
- including means for rigidly securing said compressor stator assembly to said outer casing as a unitary assembly.
7. In a turbofan engine, a fan and compressor assembly, comprising:
- a fan casing,
 - a splined flow splitter concentric with said fan casing,
 - a ring connected to the aft end of said flow splitter, said ring having a plurality of inwardly projecting tangs, said tangs being axially aligned with said splines,
 - an inner support ring concentric with said fan casing and said flow splitter,
 - a row of guide vanes extending between said fan casing and said flow splitter, said guide vanes being connected to said flow splitter at one end and to said fan casing at the other end,
 - at least one row of compressor stator vanes extending between said flow splitter and said inner support ring, said stator vanes being connected to said flow splitter at one end and to said inner support ring at the other end,
 - a turbine drive means,
 - at least one compressor rotor disc, said disc having means for connecting to said turbine drive means,
 - at least one row of compressor rotor blades mounted on said disc, said blades being axially spaced between said compressor stator vanes and cooperating therebetween.

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