

[54] **INLET STRUCTURE FOR TURBO MACHINE**
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[73] Assignee: **Carrier Corporation, Syracuse, N.Y.**
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[51] Int. Cl. **F01d 25/26**
[58] Field of Search **415/134, 135, 136, 415/139, 217, 218, 219**

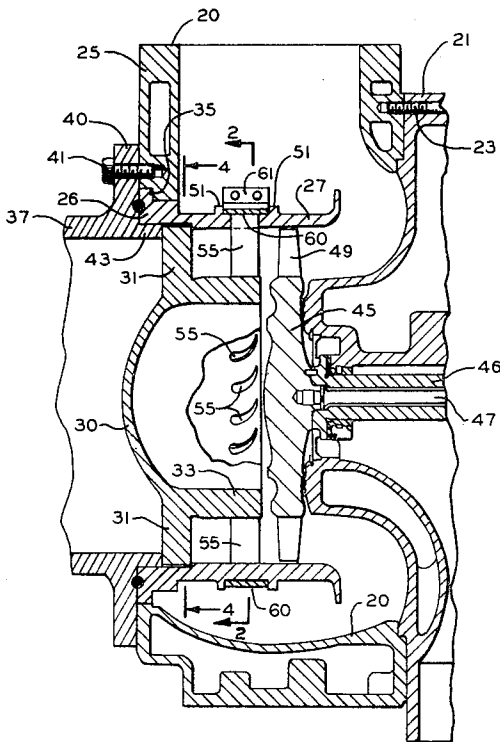
[56] **References Cited**

UNITED STATES PATENTS			
3,476,487	11/1969	Campbell et al.	415/134
2,914,300	11/1959	Sayre	415/135
1,362,437	12/1920	Robb	415/134
2,681,788	6/1954	Wosika	415/136
2,772,069	11/1956	Hockert et al.	415/134

2,811,331 10/1957 Wiegand 415/136
Primary Examiner—C. J. Husar
Attorney—Harry G. Martin, Jr. and J. Raymond Curtin

[57] **ABSTRACT**
The inlet nozzle blades of a fluid turbo machine are mounted radially in the exhaust diffuser tube encircling the nose piece and the turbine wheel. The inner ends of the nozzle blades engage the nose piece and are held against the same by a clamping band encircling the outer ends of the blades. The clamping band will stretch to accommodate radial growth of the blades by expansion during operating temperatures. An inlet passage member is attached to the machine casing and serves to detachably clamp the exhaust diffuser to the casing and also the nose piece in the diffuser. Provision is made for radial expansion of the nose piece relative to the diffuser.

8 Claims, 4 Drawing Figures



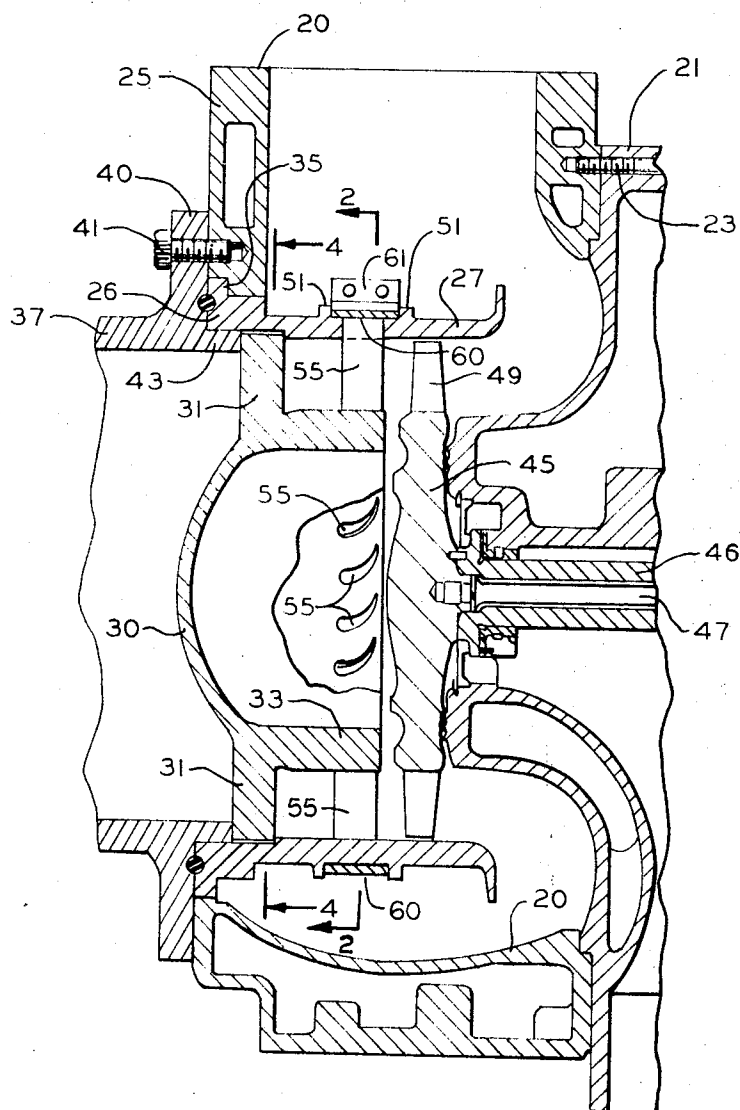


FIG. 1

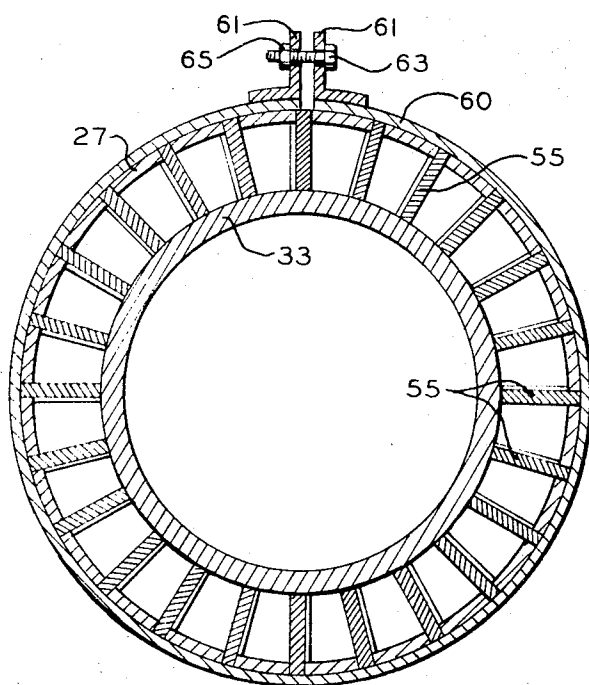


FIG. 2

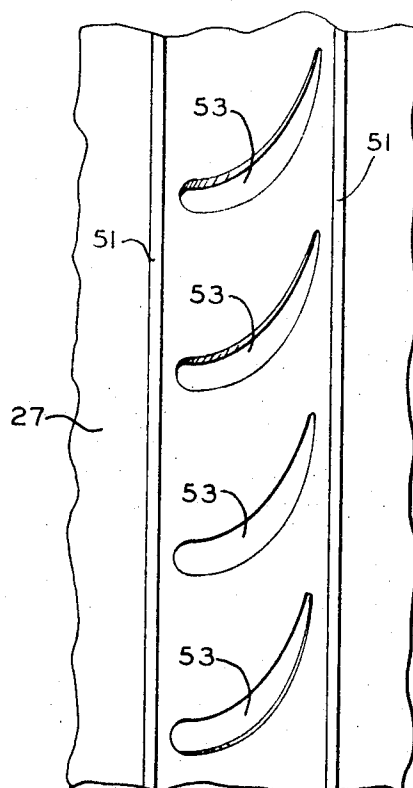


FIG. 3

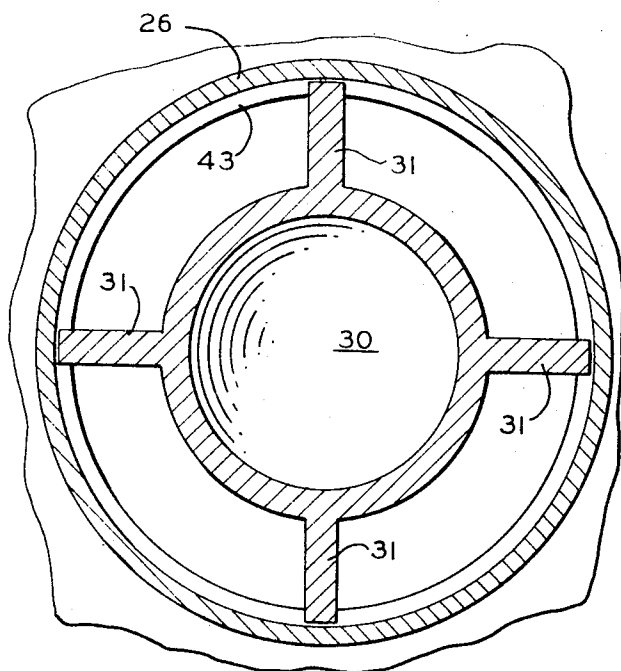


FIG. 4

INLET STRUCTURE FOR TURBO MACHINE

BACKGROUND OF THE INVENTION

In turbo machines of the type shown in U.S. Pat. No. 3,476,487, issued to J. M. Campbell et al., Nov. 4, 1969, the nozzle blade ring, formed with integral blades, is fixedly secured to the nose piece by bolts. The machine is used as a turbocharger for internal combustion engines. The turbine portion is driven by the exhaust gases from the engine and temperatures up to 1,300° F. are encountered. In such machines temperature cycling experienced under field service conditions can reduce the service life of the inlet structure through initiation of stress cracks in the bolted on cast base section of the nozzle ring. Damage to individual nozzle blades in service requires replacement of the entire nozzle ring.

SUMMARY OF THE INVENTION

This invention has as an object a turbo machine inlet replaced structure in which the nozzle blade ring is omitted. The nozzle blades, while maintained securely in proper position, are permitted to expand under severe temperature cycles without incurring any undue stress, also individual blades may be conveniently replaced if damaged. The mounting structure for the nozzle blades is removed from the area of the rotating turbine disk assembly, therefore eliminating the potential hazard to rotating parts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view of the turbine portion of a turbocharger embodying our invention with a portion of the nose piece broken away;

FIG. 2 is a view taken on line 2—2, FIG. 1;

FIG. 3 is a fragmentary exterior view of the exhaust diffuser; and

FIG. 4 is a view taken on line 4—4, FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 is shown an end section 20 of the machine casing which is fixed to an intermediate section 21 as by screws 23. The end wall 25 of section 20 is formed with a circular opening in which there is mounted the annular end portion 26 of the exhaust diffuser 27. A nose piece 30 is formed with radially extending lugs 31 positioned in the counterbore formed in the outer portion of the diffuser 27. The nose piece is formed with an annular portion 33 positioned by the lugs 31 in spaced concentric relation to the diffuser 27 and forming in conjunction therewith an annular inlet passage.

The annular portion 26 of the diffuser is formed at its periphery with a shoulder 35 abutting against a complementary shoulder formed in the circular opening in wall 25. This shoulder arrangement positions the outer end of the diffuser flush with the wall 25 of section 20.

The lugs 31 of the nose piece engage a shoulder at the inner end of the counterbore in the portion 26. An inlet passage means, as tubular member 37, is formed with a radial flange 40 overlying the annular portion 26 of the diffuser and being fixedly secured against the wall 25 as by screws 41. The inlet member 37 is formed with an annular flange 43 abutting against the outer end portions of the nose piece lugs 31. Accordingly, the inlet tube 37 provides a means for detachably mounting the diffuser tube 27 in the casing member 20, and also

mounting the nose piece 30 in the diffuser 27. The lugs 31 are machined to provide a clearance with the counterbore in the diffuser 27 to permit radial expansion of the nose piece without creating any undue stress therein.

The turbine disk 45 is fixed to the hollow shaft 46 by a thru bolt 47 which also serves to affix the compressor impeller, not shown, to the opposite end of the shaft 46. The shaft 46 is journaled in the intermediate section 21 of the casing. The turbine disk 45 is formed on its periphery with a circular series of integral turbine blades 49. These blades being disposed in registration with the inlet passage between the diffuser 27 and the annular portion 33 of the nose piece. The hot engine exhaust gases flowing through the inlet passage impinges on the blades 49 to effect rotation of the disk 45.

The diffuser 27 is formed on its periphery with circumferentially extending and axially spaced apart ribs 51. In the area between the ribs 51, the exhaust diffuser tube is formed with a series of circumferentially spaced apart slots 53. An inlet nozzle blade 55 is positioned in each slot 53. The blades 55 extend inwardly across the annular inlet passage and abut against the portion 33 of nose piece 30. The outer ends of the blades extend a short distance beyond the periphery of the diffuser tube 27.

The nozzle blades 55 are encircled by a split clamping band 60. The band is formed at each side of the split with a radial flange 61. The flanges 61 are apertured to receive clamping bolts 63. Upon tightening the nuts 65, the band 60 is contracted against the outer ends of the nozzle blades 55 moving them into engagement with the annular portion 33 of the nose piece 30. Accordingly, the band 60 serves to maintain the nozzle blades 55 abutting against the nose piece. However, the band 60 will stretch or elongate sufficiently to accommodate radial growth of the nozzle blades under temperature cycles encountered in the operation of the turbo charger.

With this arrangement, the mounting structure for the nozzle blades 55 does not contain any elements positioned in close proximity to the rotating turbine disks 45 and the blades 49 thereof.

We claim:

1. An elastic fluid turbo machine comprising a casing, an exhaust diffuser tube mounted in said casing, a nose piece extending within the diffuser tube in concentrically spaced relation thereto, said diffuser tube and said nose piece forming an annular fluid inlet passage, a bladed turbine wheel journaled in said casing and disposed inwardly of said nose piece with the wheel blades in registration with said inlet passage for the impingement of fluid thereon, said diffuser tube being formed with a series of circumferentially spaced apart apertures, a nozzle blade detachably positioned in each of said apertures, said blades extending radially across said inlet passage, and nozzle blade clamping means disposed externally of said diffuser tube, said clamping means being in engaging relationship with the peripheral ends of said nozzle blades to provide a force operable to hold said nozzle blades with the ends thereof abutting against said nose piece, said clamping means being sufficiently resilient so as to accommodate radial expansion of said nozzle blades.

2. A turbo machine as set forth in claim 1 wherein said diffuser tube is detachably mounted in said casing and said nose piece is supported by said diffuser tube.

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3. A turbo machine as set forth in claim 1 wherein said nozzle blade clamping means consists of a clamping band encircling the outer ends of said nozzle blades and means operable to contract said band about said blades.

4. A turbo machine as set forth in claim 1 and including an inlet fluid supply member detachably secured to said casing and co-operable to affix said diffuser tube in said casing and said nose piece in said diffuser tube.

5. An elastic fluid turbo machine comprising a casing having an end wall formed with an opening, a tubular exhaust diffuser mounted in said opening and extending inwardly therefrom, a nose piece disposed in said tubular diffuser in concentrically spaced relation thereto and forming in conjunction therewith an annular fluid inlet passage, a turbine wheel journaled in said casing and disposed in said diffuser coaxially thereof and inwardly from said nose piece, a circular series of blades fixed to the periphery of said wheel and arranged in registration with said annular inlet passage, said tubular diffuser being formed with a series of circumferentially spaced apart apertures, a nozzle blade positioned in each of said apertures, said nozzle blades being disposed radially in said inlet passage with the inner ends of the nozzle blades contacting said nose piece, and the outer ends of said blades extending outwardly from the peripheral surface of said tubular diffuser, a clamping band encircling the outer ends of said

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nozzle blades and means operable to contract said band to maintain the inner ends of said nozzle blades against said nose piece, said clamping band being in engaging relationship with the peripheral ends of said nozzle blades to provide a force operable to hold said nozzle blades with their inner ends firmly contacting said nose piece, said clamping band being sufficiently resilient so as to accommodate radial expansion of said nozzle blades.

6. A turbo machine as set forth in claim 5 and including a common means for detachably securing said diffuser tube in said wall opening and detachably securing said nose piece in said diffuser tube.

7. A turbo machine as set forth in claim 5 wherein said wall opening and said diffuser tube are formed with co-acting shoulder means, an inlet fluid passage member detachably mounted on said casing wall, said passage member being operable to maintain the shoulder means of said diffuser in engagement with said shoulder means in said opening.

8. A turbo machine as set forth in claim 5 wherein said nose piece is formed with a plurality of radially extending lugs, the outer ends of said lugs terminating in spaced relation to said diffuser tube and means co-operable with said lugs to retain said nose piece in said diffuser tube.

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