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ELASTIC FLUID TURBINE

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Fig. 1.

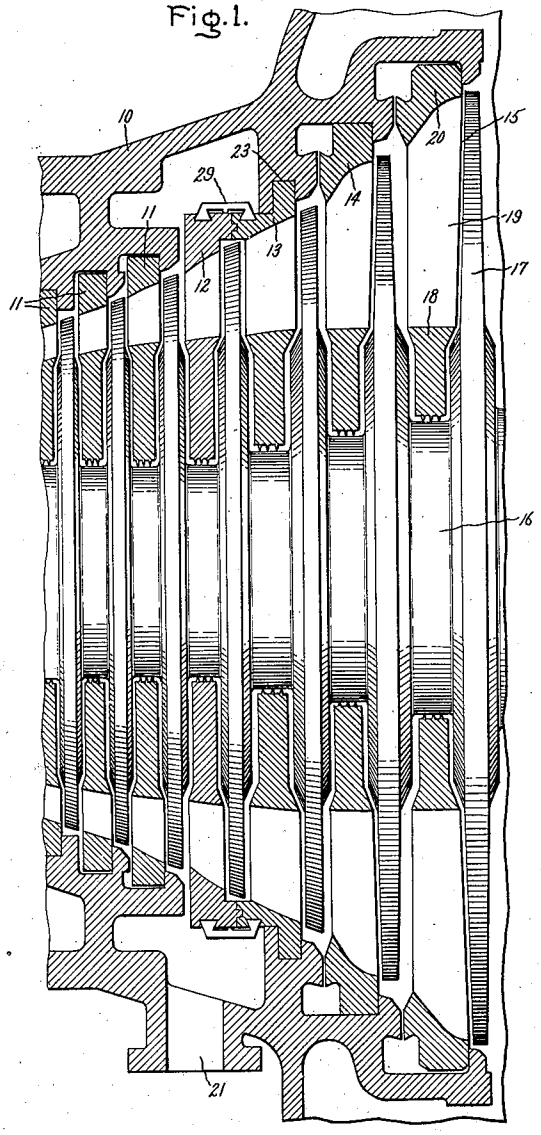
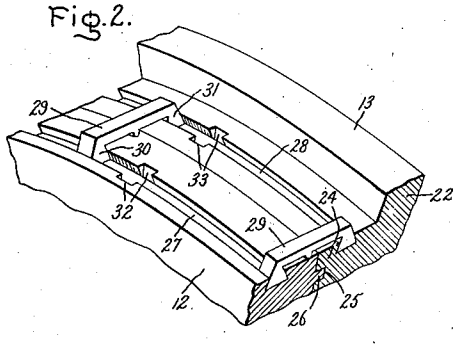


Fig. 2.



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ELASTIC FLUID TURBINE

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3 Claims. (Cl. 253—69)

The present invention relates to elastic fluid turbines of the axial flow type having a casing and a plurality of axially spaced diaphragms supported in the casing for conducting operating fluid to a rotor having a plurality of axially spaced bucket wheels, each cooperatively associated with a diaphragm. More specifically, my invention relates to the type of turbine constructions in which one of the diaphragms is attached to and supported on another diaphragm, which latter in turn is held on the casing. Such arrangements are used, for example, in connection with extraction turbines. Heretofore it has been customary to support such two diaphragms on each other by means of circumferentially spaced, axially disposed bolts or studs. With such arrangements difficulties have been experienced in the dismantling of the diaphragms after the turbines have been in operation for some time. Often the bolts or studs corrode during operation, making it difficult to dismantle the diaphragms. In addition, bolts or studs require the provision of diaphragms with outer rings or bands of a certain minimum thickness.

The object of my invention is to provide an improved construction and arrangement of elastic fluid turbines of the type above specified whereby two diaphragms are supported on each other by a comparatively simple, inexpensive supporting means, permitting easy assembly and dismantling.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing Fig. 1 illustrates an elastic fluid turbine embodying my invention, and Fig. 2 is a perspective, enlarged view of a part of Fig. 1.

The turbine comprises a casing 10 with stationary diaphragms 11, 12, 13, 14 and 15 disposed within and supported on the casing. A rotor having a shaft 16 and a plurality of bucket wheels 17 attached thereto is disposed within the casing, each bucket wheel being associated with one of the diaphragms 11 to 15.

Each diaphragm has an inner disk 18. A plurality of circumferentially spaced, radial partitions 19 are attached to the disk 18 and an outer ring or band 20 is suitably secured, preferably welded to the outer ends of the partitions 19. The first three diaphragms 11 and the diaphragms 13, 14 and 15 are directly supported on the casing 10, their outer bands 20 or a portion thereof being located in circumferential grooves formed in the casing.

In the present example the turbine has an extraction stage after the bucket wheel following the third diaphragm 11. To extract fluid from such intermediate stage, an annular channel 21 is formed by the casing. The provision of this channel 21 and the desirability of keeping the dimensions of the casing small make it necessary to support the diaphragm 12 on the diaphragm 13. The latter has an annular flanged portion 22 projecting into a groove 23 in the casing. An axially extending portion 24 (Fig. 2) of the outer ring 20 of the diaphragm 13 is provided with an annular groove 25 for receiving a tongue or axial annular projection 26 of the outer ring 20 of the diaphragm 12. Thus, the diaphragm 12 is centered and supported on the diaphragm 13 by means including an annular tongue and groove connection formed between the outer bands or rings of the two diaphragms. In order axially to secure the diaphragm 12 to the diaphragm 13, a plurality of circumferentially spaced clamping means are provided attached to the outer cylindrical surface of the two diaphragms.

In the present example the outer cylindrical surfaces of the diaphragms 12, 13 have two axially spaced, circumferentially extending grooves 27 and 28. Opposite surfaces of the grooves 27, 28 are inclined towards each other, that is, the axial width of each groove increases toward the bottom of the groove. A plurality of circumferentially spaced, essentially U-shaped clamps 29 engage the outer surfaces of the two diaphragms. Each clamp has legs 30, 31 projecting into the grooves 27, 28 respectively. The legs 30, 31 are tapered, the thickness of each leg increasing towards its free end and the legs and grooved rings 20 form dovetail connections with each other. In order to enable insertion of the legs 30, 31 into the grooves 27, 28 the latter have notches 32 and 33 respectively.

During assembly the diaphragm 12 is first attached to the diaphragm 13 by the tongue and groove connection 25, 26. Thereupon each clamp 29 is applied to the outer cylindrical surfaces of the two diaphragms. The legs 30, 31 of each clamp are inserted into the grooves through the notches 32, 33 respectively, whereupon each clamp 29 is moved circumferentially along the grooves 27, 28. After the clamps have been moved into their proper position they may be fixed in these positions by any suitable means, for example, by the provision of a small weld

or by peening over of portions of the grooved outer bands adjacent the clamps.

In certain instances, the clamps 29 may be heated before insertion into the grooves of the diaphragm to produce a shrinking fit.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an elastic fluid turbine of the axial flow type comprising a casing and a plurality of diaphragms supported in the casing, one of the diaphragms being directly held on the casing and having an outer circumferentially extending groove, and means for supporting another diaphragm having another circumferentially extending groove on the last mentioned diaphragm, said means comprising a plurality of circumferentially spaced U-shaped clamps, each having legs forming dovetailed connections with the grooves of the respective diaphragms.

2. In an elastic fluid turbine of the axial flow type comprising a casing and a plurality of diaphragms supported in the casing, one of the diaphragms being directly held on the casing and having an outer circumferentially extending groove, and means for supporting another diaphragm having another circumferentially extending groove on the last mentioned diaphragm, said means comprising a plurality of circumferentially spaced U-shaped clamps, each having legs forming dovetailed connections with the grooves of the respective diaphragms, and a tongue and groove connection formed between the diaphragms.

3. In an elastic fluid turbine of the axial flow type comprising a casing and a plurality of axially spaced diaphragms in the casing, each having a disk, circumferentially spaced partitions secured at one end to the disk and an outer ring secured to the other ends of the partitions, at least one of the diaphragms being directly supported on the casing, and means for supporting another diaphragm on the last mentioned diaphragm, said means comprising an annular tongue and groove connection between the rings of said diaphragms, the diaphragms having outer cylindrical surfaces each with a circumferentially extending groove increasing in width towards its bottom, a notch opening for each groove, and a plurality of circumferentially spaced clamps each having legs with enlarged free ends inserted through said notches and slid along the grooves axially to secure the two diaphragms together.

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