Oct. 24, 1933. E. D. DICKINSON 1,932,264

NOZZLE DIAPHRAGM AND THE LIKE AND METHOD OF MAKING THE SAME

Filed March 25, 1932 2 Sheets-Sheet 1

Fig. 1.

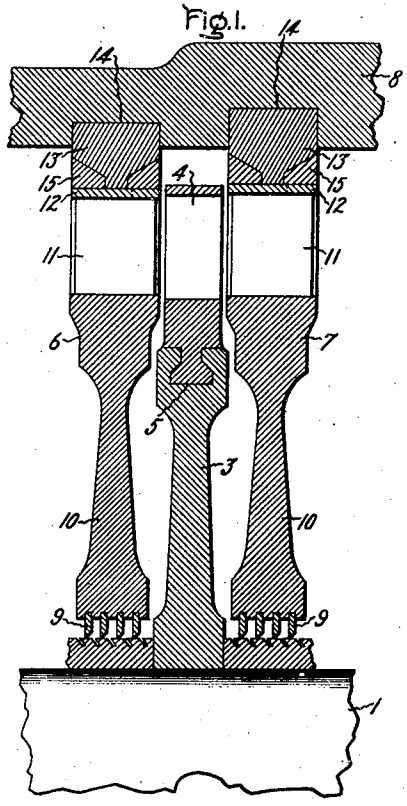


Fig. 2

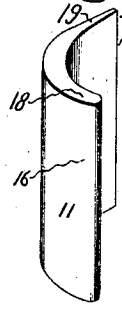


Fig. 3.

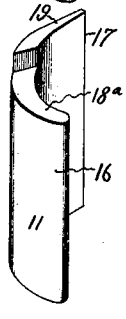
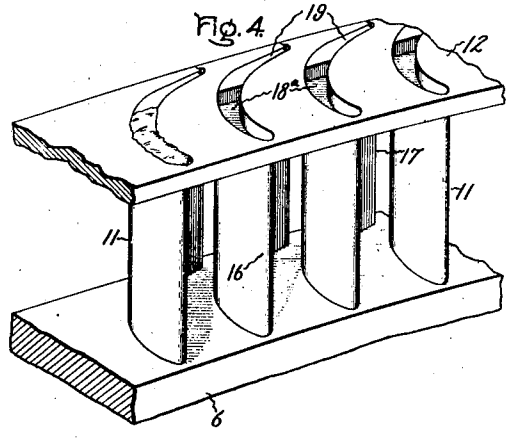


Fig. 4.



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NOZZLE DIAPHRAGM AND THE LIKE AND METHOD OF MAKING THE SAME

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Fig. 5.

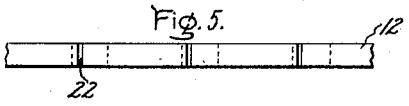


Fig. 6.

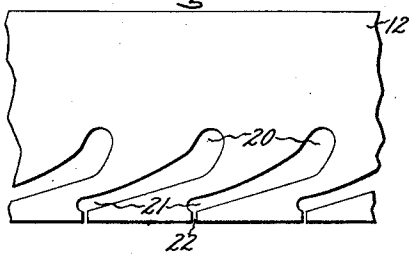


Fig. 9.

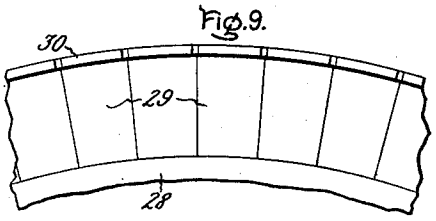


Fig. 7.

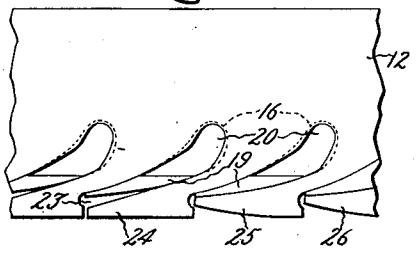
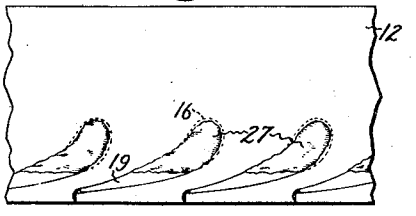


Fig. 8.



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UNITED STATES PATENT OFFICE

1,932,264

NOZZLE DIAPHRAGM AND THE LIKE AND METHOD OF MAKING THE SAME

Edgar D. Dickinson, Beverly, Mass., assignor to General Electric Company, a corporation of New York

Application March 25, 1932. Serial No. 601,182

6 Claims. (Cl. 29—156.8)

The present invention relates to articles comprising a plurality of partition members or blades which are held by and securely fastened to one or two holding members and also to the method of producing such articles. The invention relates more particularly to nozzle diaphragms used in elastic fluid engines as stationary means for directing a stream of elastic fluid to rotary bucket wheels although it is not necessarily limited thereto.

One object of my invention is to provide an improved method for the manufacture of turbine diaphragms and like structures whereby the manufacturing cost is reduced. Another object of my invention is to provide an improved construction for nozzle diaphragms and the like whereby the blades or partitions and the holding member or members are rigidly secured to each other.

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 the drawings, Fig. 1 illustrates by way of example a portion of an elastic fluid turbine partly broken away, and Figs. 2 to 9 inclusive show different views and steps in the manufacture of a structure embodying my invention.

In Fig. 1, where I have shown an application of the improved structure in connection with an elastic fluid turbine, 1 represents a rotary shaft to which is fastened a wheel 3 carrying a plurality of buckets 4 held in position by means of dovetail connections 5 with the wheel. 6 and 7 are fluid directing means or diaphragms provided on opposite sides of the bucket wheel and rigidly fastened to the outer casing 8 of the turbine. Diaphragm 6 may serve for directing elastic fluid to wheel 3 and diaphragm 7 may serve for directing this elastic fluid from wheel 3 to the succeeding stage, not shown. 9 designates packings provided between the inner portion of each of the diaphragms and shaft 1 for preventing leakage of elastic fluid along the shaft. Each of the diaphragms comprises an inner member 10, a plurality of blades or partitions 11 fastened to the inner members and defining nozzles, and an outer member or shroud band 12 which may comprise a plurality of sections and serves to hold the blades together. Band 12 is welded to a ring member 13 held in position in a groove 14 of casing 8. The welding between ring members 13 and the shroud band 12 is indicated at 15.

Fig. 2 shows the general form of blades or partitions provided in turbine diaphragms. Each blade comprises a front or head portion 16 and a rear or tail portion 17.

In carrying out one step according to the method of my invention I remove a part 18 of the head portion as shown in Fig. 3 to provide a projecting end portion 19 of the tail. The provision of projections 19 is preferably accomplished by turning off a part of the head portions of the blades after the latter have been welded to disk 6, as shown in Fig. 4. According to my invention I provide an outer shroud band 12 in which holes are formed within the confines of the band, preferably by punching. The projecting tail portions are inserted lengthwise into the holes whereby the ends of the head portions of the blades and portions of the holes define recesses 18*a* (Fig. 4) which are filled with welding material.

More specifically these holes are preferably punched out of the shroud band (Figs. 5 and 6) and have a head portion 20 which is preferably somewhat narrower than the head portions of the blades and tail portions 21 which are wider than those of the blades. It is well known that in turbine structures the nozzle partitions have thin tail portions and the punching of holes corresponding to the cross section of such blades would be rather difficult, if not impossible, in many cases.

The provision of holes having tail portions wider than those of the blades forms an important part of my invention as this construction permits the forming of holes by punching and thus decreases the manufacturing cost. 22 designates openings or saw-cuts in the present instance formed near the end of the tail portion of each hole. The saw-cuts may be provided prior or after the assembling of the shroud band with the blades. In Fig. 7 I have shown a top view of a structure with the shroud band assembled on the outer portions of blades. As already stated, the head portions 16 of the partitions or blades shown in dotted lines abut the inner surface of the shroud band and define with the head portions of the holes recesses, whereas the tail portions 19 project into the tail portions of the holes and have their end surfaces preferably flush with the outer surface of the blade. Having thus assembled the shroud band or ring on the outer portions of the blades, band sections 24, 25 and 26 are pushed or forced inwardly until they abut the sides of said tail portions of the blades as indicated with respect to sections 25 and 26 of Fig. 7. The clearances 23 defined between the tail portions of the partitions and said

band sections or edge portions are thereby eliminated. After this operation the recesses or spaces defined by hole portions 20 and the head portions of the blades are filled with welding material, as shown at 27 of Fig. 8. This causes the band to be securely fastened to the blades.

Whereas the filling in of holes 20 with welding material is sufficient as regards the securing of the shroud band to the blades I may, if desirable, also weld the tail portions of the blades to the shroud band and fill in the saw-cuts. For providing a straight edge of the blade after sections 24, 25 and 26 have been forced inwardly the edge of the blade is preferably removed by a turning process whereby a structure as indicated in Fig. 8 may be obtained.

Fig. 9 illustrates a side view of a diaphragm after being assembled. 28 is the disk to which blades 29 are secured by welding and 30 designates the outer shroud band manufactured and assembled as described above.

Having described a diaphragm structure according to my invention together with the method of manufacturing it, I wish to have it understood that the structure and the method are only illustrative and that changes may be made in both the structure and method without departing from the spirit of the invention and the scope of the appended claims.

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

1. Method of manufacturing a structure including a band and a partition having a thin portion, said method comprising punching a hole within the confines of the band having a portion for the thin portion of the partition but wider than that portion, inserting the partition lengthwise into the hole and forcing an edge portion of the band towards the thin portion of the partition.

2. Method of manufacturing a structure including a band and a partition having a thin portion, said method comprising punching a hole within the confines of the band having a portion for the thin portion of the partition but wider than that portion, cutting through the edge of the band, inserting a part of the partition lengthwise into the hole and forcing an edge portion of the band adjacent the cut towards the thin portion of the partition.

3. Method of manufacturing a structure including a band and a partition having a thin portion, said method comprising forming a partition having a projecting thin tail portion and a head portion, forming a hole within the confines of the band having a portion for the thin tail portion but wider than said portion and a portion for the head portion but narrower than said head portion, inserting lengthwise the projecting tail portion into the hole, cutting through the edge of the band near the tail portion of the hole, forcing the edge portion adjacent the cut towards the partition, and welding the band and the partition together.

4. Method of manufacturing a turbine diaphragm which comprises welding a row of partitions to a disk, removing a part of the head portions of the blades whereby the tail portions of the blades project beyond the remaining head portions thereof, punching holes in a band having tail portions wider than the tail portions of the partitions, assembling the band on the partitions with the projecting tail portions of the partitions in the tail portions of the holes and parts of the head portions of the partitions abutting the inner surface of the band, cutting the tions with the projecting tail portions of the holes, forcing the edge portions near the cuts towards the partitions, and welding the band to the partitions.

5. In a structure, an inner member, a row of partitions welded thereto, each partition having a thin projecting tail portion and a head portion, an outer member provided with holes, each hole having a tail and a head portion, the thin projecting portions of the partitions being inserted into the tail portions of the holes and having their ends flush with the outer surface of the outer member, the head portions of the partitions and the holes in the band defining recesses, said recesses being filled with welding material.

6. In a diaphragm structure a disk member, a row of partitions welded thereto, each partition having a thin projecting tail portion and a head portion, a shroud ring having holes, each hole having a tail and a head portion, the thin projecting portions of the partitions being inserted into the tail portions of the holes and having their ends flush with the outer surface of the shroud ring, the head portions of the partitions abutting the inner surfaces of the shroud ring and defining with the head portions of the holes in the shroud ring recesses, said recesses being filled with welding material, a portion of one edge of the band near the tail of each partition being saw-cut and forced towards the thin portion of the partition.

EDGAR D. DICKINSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,932,264. October 24, 1933.

EDGAR D. DICKINSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 98, claim 4, strike out the syllable and words "tions with the projecting" and insert instead edge of the band near the; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of November, A. D. 1933.

F. M. Hopkins

(Seal) Acting Commissioner of Patents.