Dec. 11, 1945. D. J. BLOOMBERG 2,390,772

ELASTIC FLUID TURBINE

Filed Jan. 25, 1943

Fig. 1.

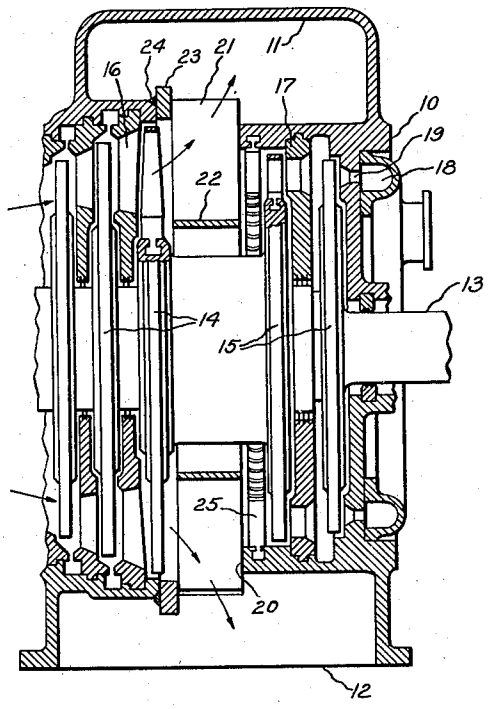
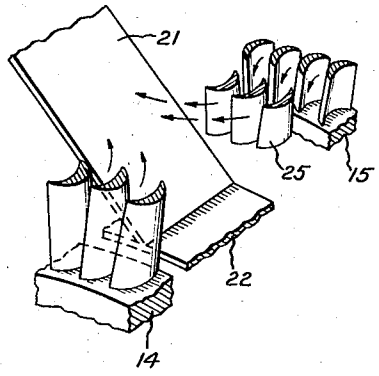


Fig. 2.



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ELASTIC FLUID TURBINE

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4 Claims. (Cl. 253—70)

The present invention relates to elastic fluid turbines comprising a forward section for operation in one direction of rotation and a reversing section for operation in the opposite direction of rotation such as are used, for example, in ship propulsion arrangements to drive a ship in forward and reverse directions. More particularly, the invention relates to the kind of turbines in which the discharge sides of the forward and reversing turbine sections face each other and exhaust into a common exhaust casing or hood. Various constructions have heretofore been devised to deflect elastic fluid discharged from either the forward or the reversing section into the common exhaust casing to prevent fluid discharged from one section from entering the other section.

The object of my invention is to provide an improved construction and arrangement of turbines whereby elastic fluid discharged from the ahead and reversing sections of such turbine is effectively and efficiently turned outward into a common exhaust casing.

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 a section of an elastic fluid turbine embodying my invention, and Fig. 2 is a perspective view of certain parts of Fig. 1.

The turbine in the present example comprises a casing 10 which has an exhaust section or hood 11 for receiving exhaust fluid and conducting it through an opening 12 to a condenser or the like. A rotor 13 is disposed within the casing and includes a forward section with a plurality of bucket wheels 14 and a reversing section with a plurality of bucket wheels 15. The elastic fluid on its path through the bucket wheels 14 of the forward section is guided by diaphragms 16 interposed between successive bucket wheels and supported on the casing 10. A similar diaphragm 17 is interposed between the two bucket wheels 15 of the reversing section. Elastic fluid is conducted to the first stage wheel 15 of the reversing section from a chest 18 by means of a stationary nozzle section 19. The last stage bucket wheels, 14, 15, of the two sections face each other and are arranged to discharge through an annular outlet opening 20 in the turbine casing into the exhaust hood 11. In order to prevent elastic fluid discharged from either section from being forced axially against the discharge side of the other section I provide improved means for radially deflecting elastic fluid discharged from both sections. This means in the present example comprises a plurality of circumferentially spaced, fluid directing baffles 21 which have inner edges secured to a cylindrical ring 22 concentrically spaced from the turbine shaft and an outer portion secured to a ring 23 supported on the turbine casing by a weld 24. These vanes may have any desirable shape and curvature. In the present instance they are flat and each is inclined by about 45 degrees towards a radial plane through the center of the turbine and the inner edge of the vane.

As indicated by arrows in Fig. 2, with this arrangement elastic fluid discharged from the bucket passages of the last turbine stage 14 of the ahead section is deflected radially outward towards the opening or outlet 20 into the exhaust hood 11. In order to render the same baffles 21 effective with regard to elastic fluid discharged from the reversing section, a plurality of circumferentially spaced stationary guide vanes 25 are supported in the casing 10 between the baffles 21 and the last stage wheel 15 of the reversing section. The vanes 25 reverse the direction of fluid discharged from the last bucket wheel 15 and direct the fluid with an appreciable tangential component towards the baffles 21, as is also indicated by the arrows in Fig. 2.

Thus, with my arrangement elastic fluid discharged from the last stage bucket wheels of the ahead and reversing sections of a reversing turbine is effectively turned outward into a common exhaust hood or casing. The baffles and guide vanes are entirely supported on the casing. Therefore, they do not increase the mass of the turbine rotor. Moreover, the arrangement as described above permits comparatively close spacing of the last stage wheel of the ahead and reversing sections, resulting in a compact and economical construction.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I wish 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. Elastic fluid turbine comprising a casing defining an exhaust hood, a rotor disposed in the casing and including a forward section with a plurality of bucket wheels and a reversing section with a bucket wheel having a discharge

side facing the discharge side of the forward section, and means for directing elastic fluid discharged from the reversing and the ahead sections into said exhaust hood comprising a plurality of circumferentially spaced substantially flat baffles supported in the casing, each baffle being arranged at an angle of about 45 degrees to a radial plane through the center of the turbine and an inner edge of the baffle and a plurality of stationary guide vanes supported in the casing and disposed between the discharge side of one section and said baffles.

2. An elastic fluid turbine comprising a casing, a rotor supported in the casing and having at least one forward bucket wheel and a reversing bucket wheel, said bucket wheels being arranged on the rotor with their discharge sides facing each other and with a common annular discharge passage defined therebetween, said casing forming an annular exhaust hood in communication circumferentially with said discharge passage, a plurality of circumferentially spaced substantially rectangular baffles supported by the casing and arranged in said discharge passage, each baffle having its width substantially parallel to the axis of the rotor and its length extending radially outward with an appreciable tangential component so that the baffle forms an acute angle with a radial plane through the axis of the rotor so as to deflect fluid discharged from one bucket wheel radially outward into the exhaust hood, and an annular row of stationary guide vanes supported in the casing between said baffles and the other bucket wheel and arranged to cause fluid discharged from said other bucket wheel to impinge on said baffles with a tangential velocity component having the same direction as that of fluid discharged from the first-mentioned bucket wheel.

3. An elastic fluid turbine comprising a casing, a rotor supported in the casing and having at least one forward bucket wheel and a reversing bucket wheel, said bucket wheels being arranged on the rotor with their discharge sides facing each other and with a common annular discharge passage defined therebetween, said casing forming an annular exhaust hood in communication circumferentially with said discharge passage, a plurality of circumferentially spaced substantially rectangular baffles supported by the casing and arranged in said discharge passage, each baffle having its width substantially parallel to the axis of the rotor and its length extending radially outward with an appreciable tangential component so that the baffle forms an acute angle with a radial plane through the axis of the rotor so as to deflect fluid discharged from the forward bucket wheel radially outward into the exhaust hood, and an annular row of stationary guide vanes supported in the casing between said baffles and the reversing bucket wheel and arranged to cause fluid discharged from the reversing bucket wheel to impinge on said baffles with a tangential velocity component having the same direction as that of fluid discharged from the forward bucket wheel.

4. An elastic fluid turbine comprising a casing, a rotor supported in the casing and having a forward section and a reverse section with their discharge sides facing each other and a common annular discharge passage defined therebetween, said casing forming an annular exhaust hood in communication circumferentially with said discharge passage, one of said sections including an annular row of stationary guide vanes at its discharge end adapted to direct the elastic fluid into said common discharge passage with a tangential velocity component of the same direction as that of the fluid discharged from said other section, and a set of circumferentially spaced inclined baffles supported by said casing and arranged between said two sections and closely adjacent the discharge sides thereof, said baffles extending toward said discharge hood and being adapted to guide and direct the fluid discharged from either section into said discharge hood in such a way that the fluid passes over substantially the whole area of said baffles.

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