Nov. 8, 1932. H. MAWSON 1,887,417

ROTARY PUMP AND FAN

Filed June 10, 1932

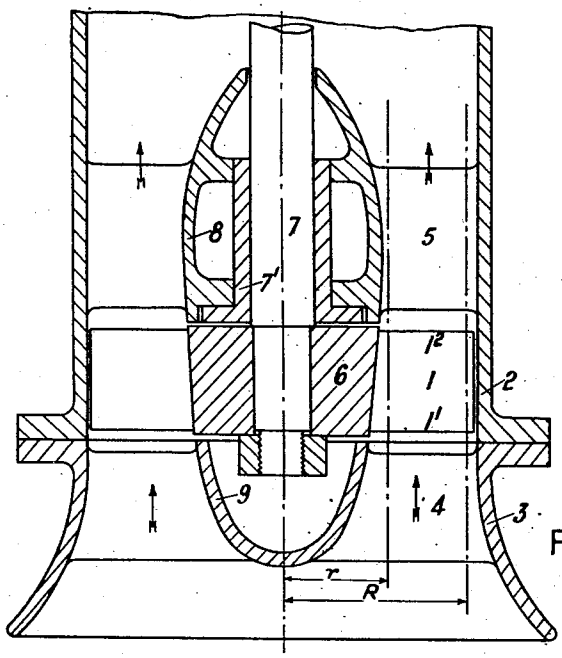


FIG. 1.

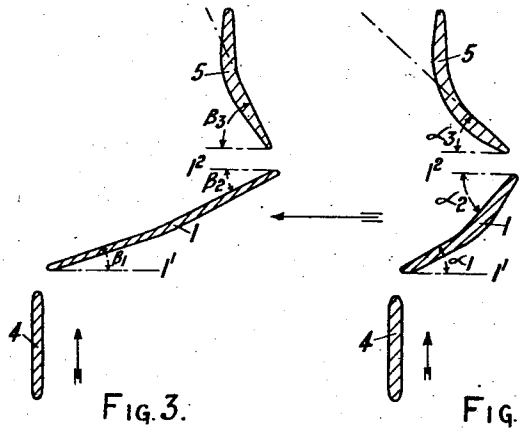


FIG. 3.

FIG. 2.

FIG. 4.

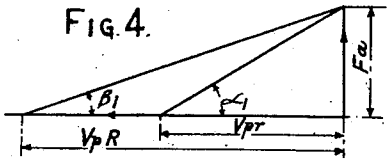
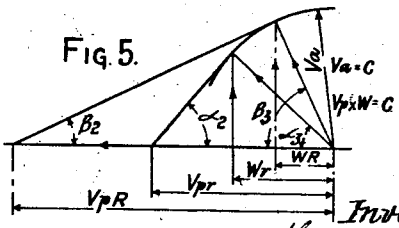


FIG. 5.



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UNITED STATES PATENT OFFICE

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ROTARY PUMP AND FAN

Application filed June 10, 1932, Serial No. 616,551, and in Great Britain August 31, 1931.

This invention relates to rotary pumps and fans of the axial flow or screw propeller type.

In pumps and fans of this type it is desirable that each particle of fluid dealt with should enter the rotor with the same pressure and absolute velocity without slip; should have the same energy impressed upon it during its passage though the rotor; and should leave the rotor with constant pressure and absolute velocity. Otherwise, there result shock and cross-flow with consequential loss of energy.

With these desiderata in view the present invention consists of an axial-flow or screw propeller pump or fan having a rotor constructed as a compounded screw, slipless, of radially constant pitch at entrance, and of radially varying pitch at exit, producing absolute exit velocities of the fluid equal in magnitude at all radii, and whirl velocities which vary inversely as the radii.

The invention is illustrated in the accompanying drawing, in which Fig. 1 is an axial section of a pump assembly. Figs. 2 and 3 developed sections of the rotor and guide vanes at radii r and R, respectively, (Fig. 1), and Figs. 4 and 5 velocity diagrams for the rotor entrance and exit, respectively.

Referring to the drawing, 1 denotes the blades of the pump rotor which rotates within a casing 2 having a flared inlet or mouthpiece 3. The rotor is interposed between inlet guide vanes 4 integral with the mouthpiece 3 and exit guide vanes 5 integral with the casing 2.

The rotor blades 1 radiate from a boss 6 secured on a driving shaft 7 journalled axially of the casing in a bearing 7′ mounted in a stream-lined boss 8 unitary with the casing 2, the boss 6 being interposed between the boss 8 and a stream-lined boss 9 integral with the mouth-piece 3.

The rotor is constituted as a compound screw, the pitch of the blades 1 being radially constant at the rotor entrance 1′ and radially varying at the rotor exit 1^2, the radially varying pitch producing absolute exit velocities of the fluid equal in magnitude at all radii, and whirl velocities which vary inversely as the radii.

Referring to Fig. 2, $\alpha 1$ and $\alpha 2$ denote the pitch angles on radius r, at the entrance and exit, respectively, of the rotor blades, while $\alpha 3$ denotes the entrance angle for the exit guide vanes 5 at radius r.

Referring to Fig. 3, $\beta 1$ and $\beta 2$ denote the pitch angles on radius R, at the entrance and exit, respectively, of the rotor blades, while $\beta 3$ denotes the entrance angle for the exit guide vanes 5 at radius R.

In the velocity diagrams (Figs. 4 and 5) VpR denotes the peripheral speed at radius R and Vpr denotes the peripheral speed at radius r. Fa (Fig. 4) denotes the axial speed of the fluid at the rotor entrance. Wr and WR (Fig. 5) denote the whirl velocities at radii r and R, respectively. Va denotes the absolute fluid speed, which is constant at all radii.

The guide vanes 4, 5 may be dispensed with.

What is claimed is:—

1. In an axial flow pump or fan, a rotor constituted as a compound screw, slipless, of radially constant pitch at entrance and of radially varying pitch at exit, producing absolute exit velocities of the fluid equal in magnitude at all radii and whirl velocities which vary inversely as the radii.

2. In an axial flow pump or fan, in combination with a casing having inlet and exit guide vanes, a rotor interposed between said guide vanes, said rotor being constituted as a compound screw of radially constant pitch at entrance and of radially varying pitch at exit, producing absolute exit velocities of the fluid equal in magnitude at all radii and whirl velocities which vary inversely as the radii.

I hereby sign my name to this specification.

HUBERT MAWSON.