June 28, 1927. 1,633,609

H. F. SCHMIDT

RADIAL FLOW PUMP

Original Filed Oct. 29. 1920

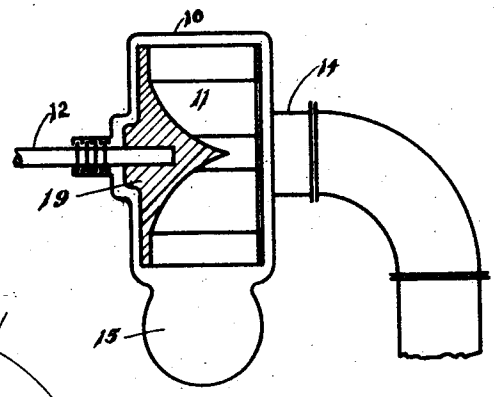


Fig. 1.

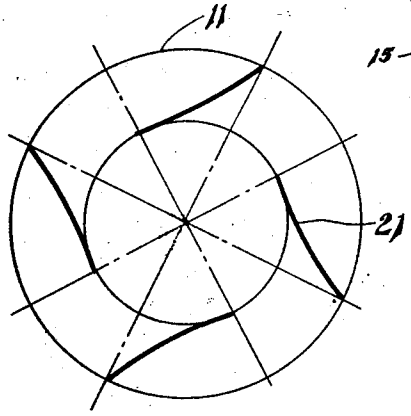


Fig. 3.

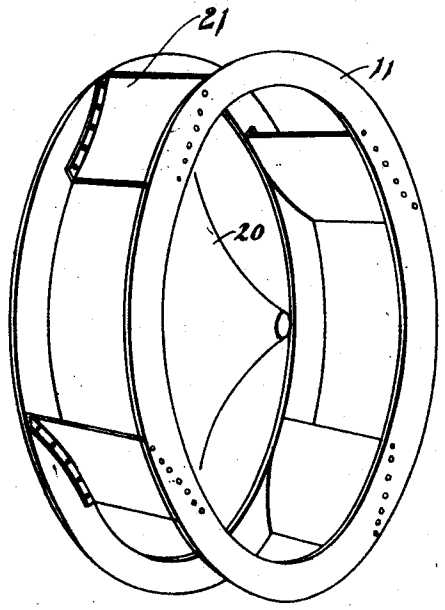


Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY F. SCHMIDT, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

RADIAL-FLOW PUMP.

Application filed October 29, 1920, Serial No. 420,468. Renewed January 28, 1927.

My invention relates to pumps of the radial-flow, propeller type and has for its object to provide apparatus of the character designated which shall be capable of pumping with large capacity and against low heads.

More particularly my invention relates to a pump intended for pumping air or other light fluids and comprises a runner and a casing so designed as to operate with a high degree of efficiency, the pitching of the blades and the ratio of the projected areas thereof to the total circumferential area being effective for the achievement of this desirable result.

In my co-pending application, Serial No. 371,648, filed April 6, 1920 and assigned to the Westinghouse Electric & Manufacturing Company, I disclose a new form of propeller to be used in connection with a propeller pump. The underlying and fundamental ideas of importance in that case are the choice of such a number of blades that a desirable and efficient ratio of projected blade area to total area may be had and the determination of an efficient pitching for the blades. It was ascertained by experiment that the ratio of the projected blade area to the total area should be in the neighborhood of 60%, and, after this determination, a pitch giving the maximum capacity was chosen. The present case is based on the same broad principles but differs in structural details. In accordance with my radial-flow type in which the impeller blades present invention, I provide a pump of the are arranged circumferentially of a runner and in which the sum of the projected blade arcs on a circle of reference is approximately 60% thereof, or the sum of the angles subtended by the blades in the 360° of the runner is slightly over 200°. Also, in my present invention, each blade has a progressively increasing pitch from the inner or inlet edge to the outer or discharge edge.

Apparatus embodying features of my invention is illustrated in the accompanying drawings forming a part of this application in which—

Fig. 1 is a sectional view of a pump showing the interior of the casing and the runner;

Fig. 2 is a perspective view of the runner; and

Fig. 3 is a diagrammatic view showing the relative arrangement of blading.

In the drawings, I show a pump casing 10 of the conventional type. A runner 11 is mounted on a shaft 12 and the latter is journaled in the casing 10. The casing is provided with an inlet member 14 and with a discharge member 15 for the air or other fluid to be pumped. Upon reference to the sectional view, (Fig. 1), it will be seen that the runner 11 comprises a body or support member 19 to which are secured blades 21. The member 19 is provided with a reinforced or enlarged central portion 20 with a conoidal or curved surface facing the incoming air to provide a stream-line directing surface therefor. In this particular example, I have shown four blades, equidistantly spaced circumferentially of the runner; however, it is obvious that the number of blades is immaterial so long as the essential principles of my invention are preserved. The sum of the angle subtended by the blades from the center of the runner is preferably approximately 216° or, in other words, it is preferable that the sum of the projected arcs upon a reference circle shall be approximately 60% of the reference circle. A reinforcing ring 21 is secured to the ends of the blades opposite the body portion 19.

As hereinbefore pointed out, the choice of the number of blades is determined by the number which gives the most efficient degree of operation and by experiment I have determined that the ratio of the projected blade area to the total area should be in the neighborhood of 60%. A slight deviation either above or below this percentage would not materially affect the efficiency in operation. However, so far as I am aware, no one has heretofore approached the problem of impeller pump design with the idea of purposely reducing the number of blades and then choosing a desirable pitch in order to increase the efficiency and effectiveness of the pump. Accordingly, I have shown my runner provided with four equidistantly spaced blades whose projected arcs on a reference circle amount to approximately 60% thereof; however, it will be obvious to those skilled in the art that this ratio might be changed without affecting the principle of the invention involved.

Having selected a desirable ratio of blade projected arcs on a circle of reference, I will now set forth characteristics of the pitch of each blade. Each blade 21 at its inner edge is substantially tangent to a circle contacting the inner edge of the blades or the inner edges of the blades are substantially normal to the radii of the runners. Each blade extends rearwardly and outwardly with a progressively increasing degree of pitch, the blades extending rearwardly from the standpoint of the direction of rotation. It will be apparent that the inner edges of the blades constitute essentially cutting edges and that the air has velocity imparted to it with a progressive degree of acceleration due to the pitching of the blades. The arrangement and design of blading, together with the conoidal surface element 20, cooperate to translate and change the direction of the fluid with a minimum loss due to eddies.

My pump is especially designed to operate at low heads and to care for large quantities of materials such, for instance, as air. Air or other fluid enters centrally of the casing and is discharged outwardly by the blades, the pitching of the latter and the ratio of the projected areas thereof to the total circumferential area being so chosen as to secure efficient operation.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claim.

What I claim is:—

In a radial-flow pump of the character described, a runner comprising a supporting member and blades of progressively increasing pitch arranged circumferentially with reference to the supporting member, the sum of the angles subtended by the blades from the center of the runner being substantially 216°, the leading portion of said blades being substantially tangential to the surface generated by the leading edge of the blades in their rotation.

In testimony whereof, I have hereunto subscribed my name this twenty-seventh day of October, 1920.

HENRY F. SCHMIDT.