May 10, 1932. T. CHESTER 1,858,071

CENTRIFUGAL APPARATUS

Filed Oct. 20, 1931

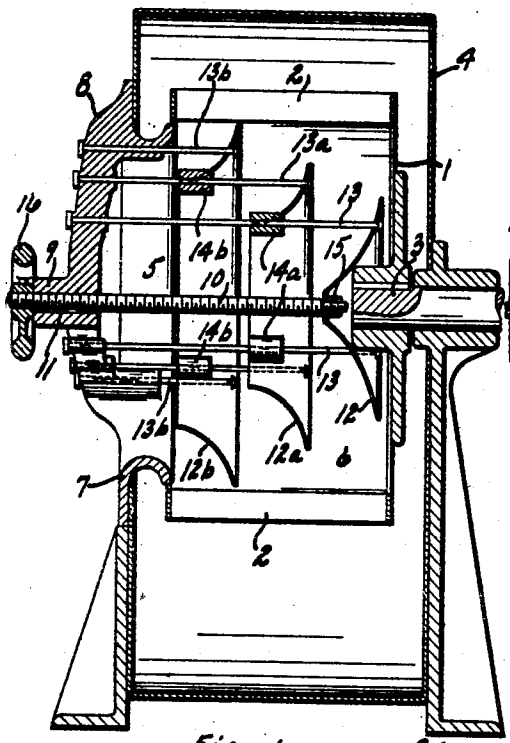

Fig. 1

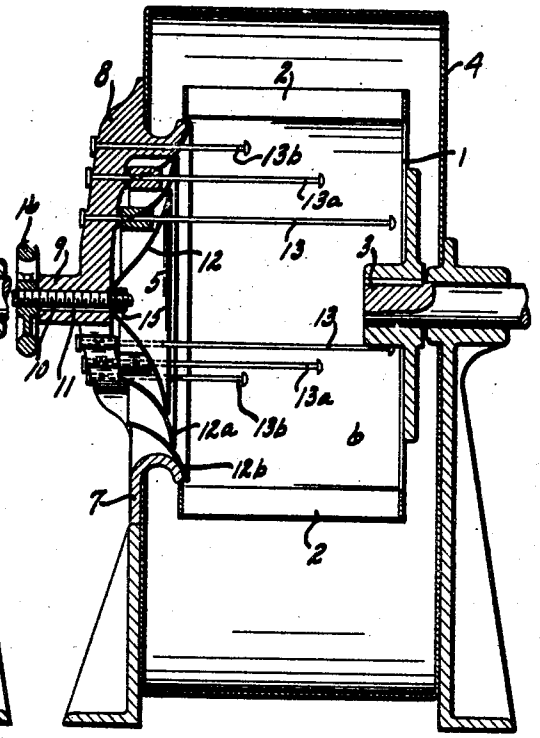

Fig. 2

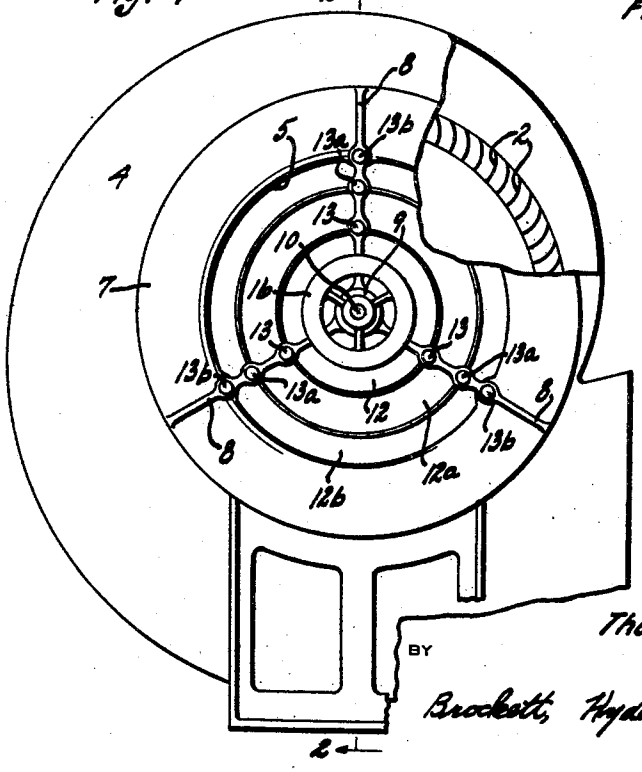

Fig. 3

INVENTOR

Thomas Chester

BY

Brockett, Hyde, Higby & Meyer

ATTORNEYS

Patented May 10, 1932

1,858,071

UNITED STATES PATENT OFFICE

THOMAS CHESTER, OF PITTSBURGH, PENNSYLVANIA

CENTRIFUGAL APPARATUS

Application filed October 20, 1931. Serial No. 569,949.

This invention relates to that type of centrifugal apparatus known variously as fans, pumps, blowers or exhausters, hereinafter termed blowers, the uses of which are to pump, compress or expand, or otherwise generally to move, fluids which may be gaseous or liquid.

Such a blower comprises two principal parts, a rotatably mounted impeller, and a stationary casing therefor. The impeller is of radial outward flow type provided with a plurality of blades concentrically arranged as in squirrel cage or other formation about its axis so as to set into rotary motion fluid between blades. Centrifugal force is thus caused to act upon the fluid, forcing it out of the impeller in all directions radial of the axis. The casing is arranged about the impeller and its function is to take the fluid discharged therefrom and lead all of its component portions to a common mouth, the blower outlet. The casing is, therefore, of gradually expanding or volute form having a spiral wall peripheral of the impeller, starting from a point adjacent the impeller, leading thereabout while receding therefrom, and terminating at the mouth of the casing, which mouth is between the two ends of the spiral casing wall and thus directed generally tangentially of the impeller. Since the impeller is of radial outward flow type, the casing is provided with a circular inlet opening at one or both sides, through which the fluid to be acted upon may enter the hollow of the impeller about which the impeller blades are arranged.

Considering one inlet opening only, flow will be therethrough parallel with the axis of the impeller, thence spreading radially thereof in all directions to and between the impeller blades, the characteristic path of flow thus including a 90° bend. It is an object of my invention to provide deflector means for stabilizing the flow through this angle, to thereby reduce the inlet loss.

It is usually a condition of the installation that the impeller be driven at a constant speed, whereas in many cases the volumetric demand upon the blower varies greatly. This may be accomplished by obstructing the flow either to or from the blower. According to my invention I provide novel means for controlling the inlet opening.

A further object of my invention is to combine in this means the functions of both regulating the inlet opening, and controlling the path of flow within the impeller; and still another object is to accomplish this in a novel manner by providing deflector members adjustable between closed positions at the inlet opening, and open or deflecting positions within the impeller.

The exact nature of my invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawings, in which Figs. 1 and 2 are sectional elevations as in the plane of line 2—2, Fig. 3, showing an embodiment of my invention with the parts adjusted to open and closed positions respectively; and Fig. 3 is a side elevation of the same, parts being broken away to show details of construction.

With reference now to the drawings, 1 is the impeller of the blower, having blades 2 and journalled as at 3 to be rotatably driven. The casing 4 is arranged about the impeller, the casing having an inlet opening 5 leading into the hollow 6 within the impeller and surrounded by the blades 2 of the latter.

In the embodiment shown, a casting is arranged at the inlet 5 having a circular peripheral portion 7 defining the inlet passage, a plurality of radial arms 8, three being shown, forming a spider supporting a central boss 9.

For cooperation with the rim 7 about the inlet opening to control the latter, I provide a number of deflector members 12, 12*a*, 12*b*, etc., three being shown. The central one of these deflector members 12 is generally circular; the remaining ones are annular, the largest being of sufficient diameter to seat upon the rim 7. The relative sizes of these members are such that when concentrically arranged, in the zone of the inlet opening, as shown Fig. 2, they will seat one upon the other to completely close the opening; and when in extended relation within the impeller, as shown Fig. 1, the opening will be unobstructed by them. The members may

be of sheet metal as indicated, deformed to provide anticlastic faces so that when in the open position they will direct axial flow from the inlet opening, radially toward the impeller blades with a minimum of turbulence.

Means for movably supporting the deflector members for adjustment between the two illustrated positions, are provided. The supporting means illustrated comprises a number of members, all extending parallel with the impeller axis, and including the members 13 carried by the arms 8, and the central member 10. There is a set of members 13, including one in each arm 8, for each deflector member. Thus three supporting members 13*b* are provided for the deflector member 12*b*, three supporting members 13*a* are provided for the deflector member 12*a*, and three supporting members 13 are provided for the deflector member 12. Each supporting member 13 is preferably secured in its arm 8, extends therefrom into the hollow 6 of the impeller and is provided at its inner end with a head as indicated. Each deflector member 12 is perforated to receive its supporting members 13 so as to be slidable therealong, yet supported thereupon concentric with the impeller. In addition each annular deflector member 12 has similar sliding connection with the supporting members 13 of its next smaller adjacent deflector member. Thus the deflector member 12*b* is provided with bosses 14*b* drilled to receive the supporting members 13*a* for the next smaller deflector member 12*a*.

The central deflector member 12 is connected with the end of a central supporting member 10 as indicated, as by bolting thereto at 15. It will be apparent that the set of deflector members is held by the supporting arrangement described, in concentric relation by the supporting members 10 and 13, but is allowed thereby adjustment between open and closed positions.

The boss 9 is bored coaxial with the impeller, to slidably receive the member 10 which is threaded, but prevented from rotation in the boss as by the key 11 extending into slots in both the boss and the member 10. A hand wheel 16 is threaded upon the member 10 outside the boss 9 by which the member 10 is adjustable along the impeller axis.

Operation will be apparent. Assuming the parts in the position of Fig. 2 with the impeller in operation, since the inlet is closed the blower will deliver no fluid, and the impeller will operate with but slight load on its driving means as its blades will be moving in a substantial vacuum. As the hand wheel 16 is adjusted to allow the supporting member 10 to move inwardly toward the position of Fig. 1, atmospheric pressure and velocity of flow always tending to move the deflector members inwardly from closed position, all of the deflector members will move from the opening, the outermost deflector member 12*b* unseating from the rim 7 and thus providing an annular effective inlet opening. As the opening adjustment of the hand wheel 16 is continued, the deflector members will together continue their opening movement until the outermost one 12*b* bears against the heads on the ends of its supporting members 13*b*. Thereafter this deflector member will remain so positioned and the remaining deflector members will continue opening. Ultimately the second deflector member 12*a* will be stopped by the heads on its supporting members 13*a*. Thereafter the central deflector member 12 alone will continue opening movement until it is stopped by its supporting members 13.

In the closing operation the parts move in the reverse manner.

Obviously the blower output at any time depends upon the instant setting of the deflector members, since this determines the effective inlet opening.

What I claim is:

1. In a centrifugal device comprising a rotatably mounted impeller and a casing therefor having an inlet opening, a plurality of members arranged for adjustment along the axis of said impeller between closed position at said opening and open position within the impeller, said members being adapted for cooperation one seating upon another to close said opening when in said closed position, and each to direct flow from a portion of said opening to a portion of said impeller when in said open position.

2. In a centrifugal device comprising a rotatably mounted impeller and a casing therefor having an inlet opening, a plurality of members arranged for adjustment along the axis of said impeller between closed position at said opening and open position within the impeller, said members being adapted for cooperation one seating upon another to close said opening when in said closed position, and each to direct flow from a portion of said opening to a portion of said impeller when in said open position, each of said members having for the latter purpose an anticlastic surface concentric with said impeller, one of said members being circular and another being annular.

3. In a centrifugal device comprising a rotating impeller and a stationary casing therefor having an inlet opening, a plurality of concentric deflector members supported for adjustment along the axis of the impeller between closed positions at said opening and open positions within the impeller, said deflector members including an annular member and its supporting means including a plurality of supporting members spaced about said opening, and said deflector members including a central deflector member and its

supporting means including a supporting member disposed along the impeller axis.

4. In a centrifugal device comprising a rotating impeller and a stationary casing therefor having an inlet opening, a plurality of concentric deflector members supported for adjustment along the axis of the impeller between closed positions at said opening and open positions within the impeller, said deflector members including an annular member and its supporting means including a plurality of supporting members spaced about said opening, said deflector members including a central deflector member and its supporting means including a supporting member disposed along the impeller axis, and said deflector members including a deflector member intermediate said described deflector members, and its supporting means including supporting members associated with the latter.

In testimony whereof I hereby affix my signature.

THOMAS CHESTER.