July 21, 1936. H. BAENNINGER 2,048,049

CENTRIFUGAL FAN

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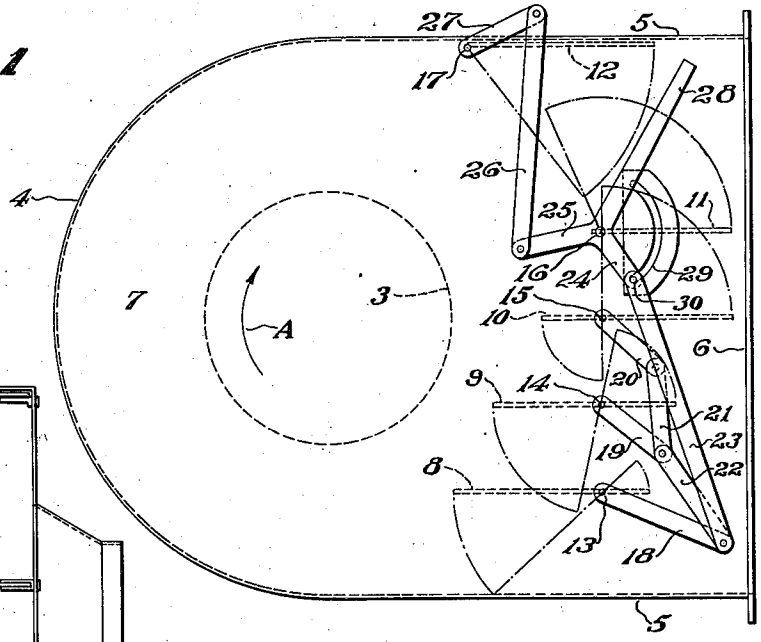
Fig. 1



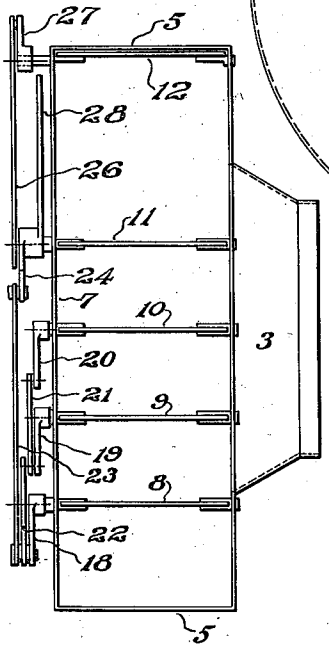


Fig. 2

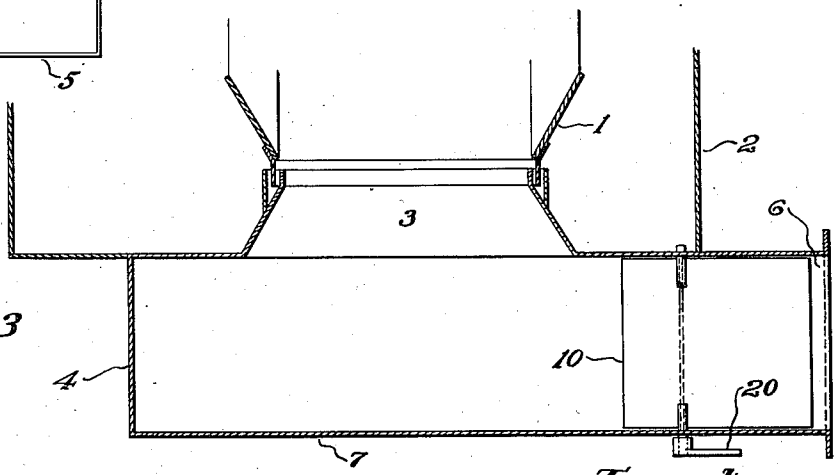


Fig. 3

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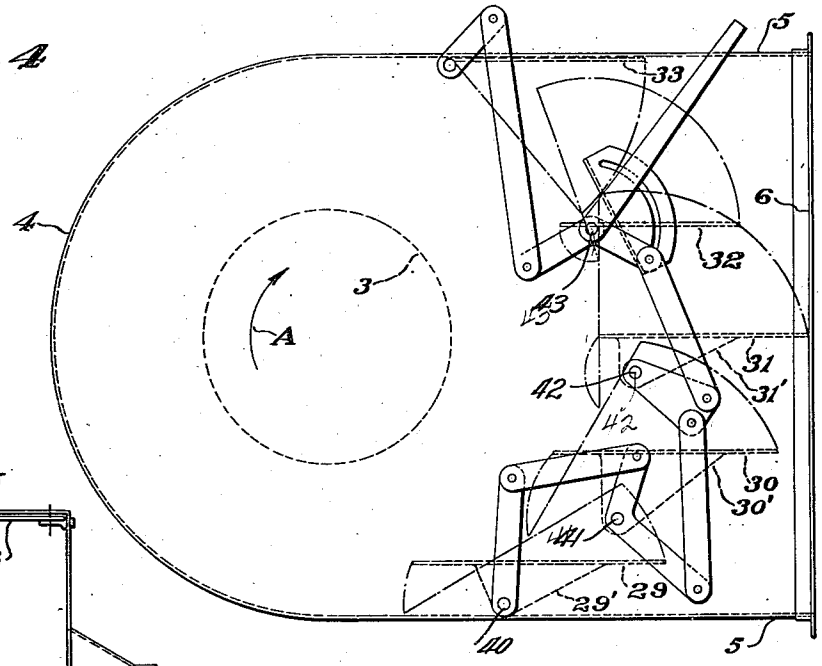
Fig. 4



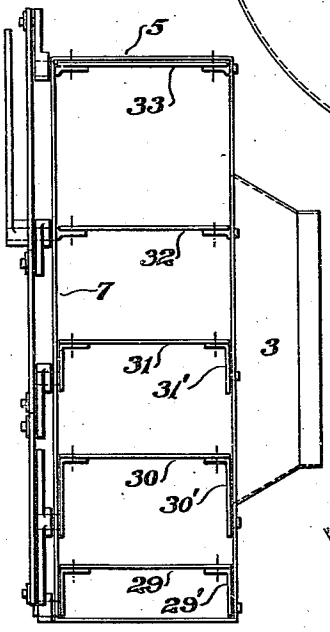


Fig. 5

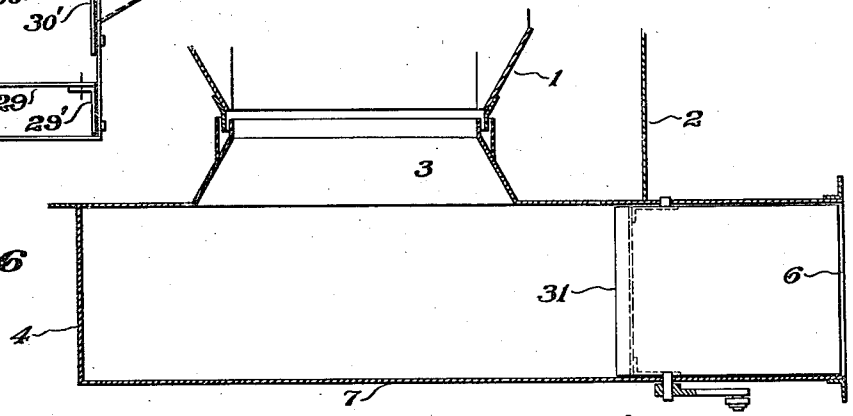


Fig. 6

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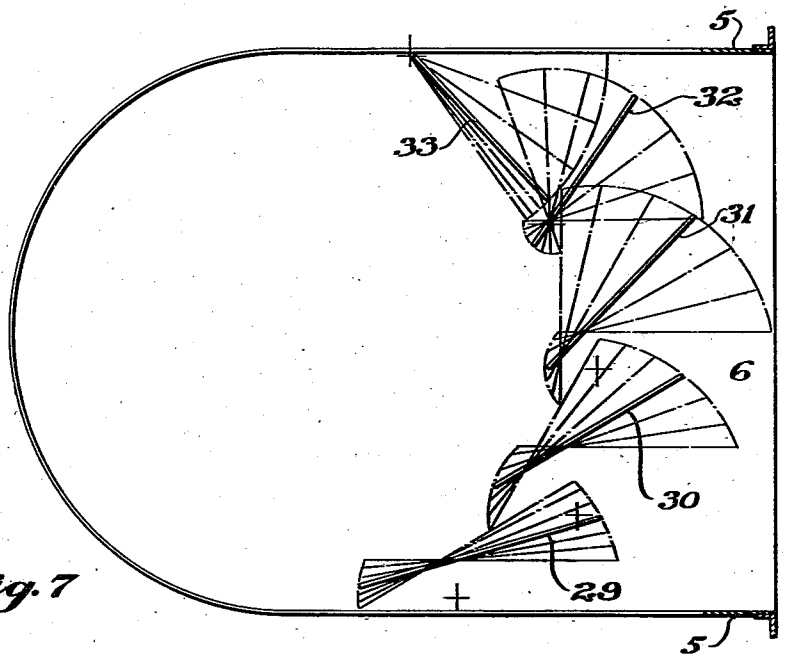

Fig. 7

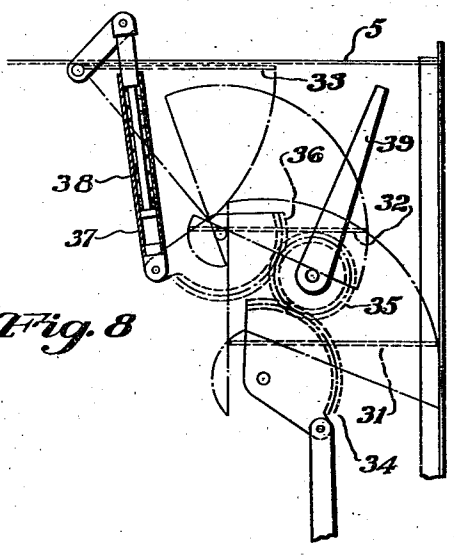

Fig. 8

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UNITED STATES PATENT OFFICE

2,048,049

CENTRIFUGAL FAN

Hermann Baenninger, Glasgow, Scotland, assignor to B. F. Sturtevant Company, Hyde Park, Mass., a corporation of Massachusetts

Application October 23, 1935, Serial No. 46,301
In Great Britain April 5, 1934

2 Claims. (Cl. 230—114)

The present invention relates to centrifugal fans and more particularly to fans in which the output may be controlled by a whirl or spin imparted to the entering fluid.

The principal object of the present invention is to provide a simple and efficient means for controlling the spin imparted to the entering fluid.

With this and other objects in view, the present invention comprises the fan hereinafter described and particularly defined in the claims.

In the acompanying drawings, Fig. 1 is a side elevation of a fan according to the present invention; Fig. 2 is an end elevation; Fig. 3 is a horizontal section showing the fan inlet box and the guide vanes or flaps; Figs. 4 to 6 are views corresponding, respectively, with Figs. 1 to 3, showing a modification; Fig. 7 is a view illustrative of the differential angular settings of the guide vanes or flaps shown in Figs. 4 to 6; and Fig. 8 is a fragmentary elevation illustrative of a further modification.

Referring to the construction shown in Figs. 1 to 3, 1, 2 and 3 denote the impeller or wheel, the impeller casing, and the inlet eye, respectively, of a centrifugal fan.

Fluid enters the inlet eye 3 through an inlet box of which the peripheral wall includes a cylindrical segment 4 co-axial with the impeller 1 and merging into tangents 5 forming the top and bottom walls of an inlet box. A plate 7 forms the vertical wall of the inlet box remote from the inlet eye 3.

For the purpose of imparting a controllable amount of pre-whirl to the fluid entering the inlet eye 3, there are fitted within the inlet 6 of the inlet box guide vanes 8—12 movable angularly about pivots 13—17, respectively, parallel to the impeller axis, and spaced vertically apart.

On the pivots 13, 14 and 15 of the guide vanes 8, 9 and 10 are secured arms 18, 19 and 20, respectively, operatively interconnected by links 21, 22. The arm 18 is connected by a link 23 to one arm 24 of a three-armed lever secured on the pivot 16 of the vane 11. A second arm 25 of the three-armed lever is connected by a link 26 to an arm 27 secured on the pivot 17 of the vane 12. The third and longest arm 28 of the three-armed lever is adapted for manual operation. A fixed arcuate guideway 29 concentric with the pivot 16 of the vane 11 is engaged by a pivot bolt 30 connecting the arm 24 with the link 23, whereby to permit the manually operable lever 28 to be locked to the guideway 29 after adjustment.

When the guide vanes 8—12 are in full open position, as shown in ordinary dotted lines in Fig. 1, and in full lines in Fig. 2, they lie in spaced parallel relation in parallelism with the line of flow of fluid through the inlet 6, so that no pre-whirl is imparted to the fluid entering the inlet eye 3 of the fan. When the guide vanes are in shut position, as indicated in chain-dotted lines in Fig. 1, they overlap one another and form a substantially uninterrupted polygonal wall opposed to the segment 4, and having a surface approximating an imaginary cylinder, which includes the wall 4. When, however, the guide vanes are angularly set between their limiting positions, they form deflecting louvres for the fluid stream entering the inlet 6 and impart to said stream a predetermined amount of pre-whirl in the direction of rotation of the impeller 1, indicated by the arrow A in Fig. 1, said amount increasing as the guide vanes are moved away from neutral or full open position.

The components 18—28 of the vane-operating link system are so proportioned that the guide vanes perform differential angular adjusting movements, and in their angular settings the guide vanes are disposed substantially tangential to the whirling volume of fluid within the inlet box.

It will be seen that the guide vanes 8—11 are angularly movable in the same direction, while the guide vane 12 is angularly movable in the direction counter to the direction of movement of the guide vanes 8—11. The guide vane 12, when in neutral or full open position, lies flat against the adjacent wall 5 of the inlet box.

The pivots 13—17 of the guide vanes lie in, or closely adjacent to the planes of the guide vanes.

In the modification shown in Figs. 4–7, guide vanes 29—33 are employed. The guide vanes 29—31 are provided with brackets 29′ 30′ and 31′, respectively, to offset the vanes from their respective pivots, so that these guide vanes project into the whirl chamber within the inlet box to a considerably less extent than do the corresponding guide vanes 8—10 of Figs. 1–3, particularly when in full open position, it being understood that excessive projection of the guide vanes into the whirl chamber will interfere with free whirling motion of the fluid. The pivots 40, 41, 42 and 43 for the vanes 29—32 respectively are not arranged in a vertical plane as in Fig. 1, but are disposed on a curved surface. The vane-operating link system shown is a simple modification of that described with reference to Figs.

1–3, and will be understood without further explanation. Fig. 7 shows the differential angular settings of the guide vanes 29—33.

Fig. 8 shows a modified vane-operating arrangement contrived to permit the guide vanes to be moved reversely from neutral position and so to impart pre-whirl to the fluid in the direction counter to the direction of rotation of the impeller 1. According to this arangement, the vanes 31 and 32 are operatively interconnected by toothed gear elements 34, 35 and 36, the gear element 34 being connected to the other guide vanes by a link system, and the gear element 36 being connected to the guide vane 33 through the medium of a telescopic strut 37 including a compression spring 38. The vane 33, like the vane 12 in Figs. 1–3, or the vane 33 in Figs. 4–7, lies flat against the adjacent wall 5 of the inlet box, when in full open or neutral position. As will be understood, the arrangement is such that, if the vane-adjusting lever 39 attached to the gear element 35 is moved backwardly beyond the position which corresponds to the full open position of the guide vanes, the strut 37 will telescope and allow the vanes 29—32 to be angularly set to impart pre-whirl to the fluid in the direction counter to the direction of rotation of the impeller 1.

The invention having been thus described, what is claimed is:—

1. A centrifugal fan comprising a wheel, a casing having an eye, an inlet box to conduct fluid to the eye, a plurality of pivoted guide vanes in the inlet box at one side of the eye, one of the guide vanes being pivoted immediately adjacent to the casing to lie against the casing in open position, and means for simultaneously adjusting the vanes about their pivots, said means having provision for moving the vane adjacent the casing in the opposite angular sense from the other vanes.

2. A centrifugal fan comprising a wheel, a casing having an eye, an inlet box to conduct fluid to the eye, a plurality of pivoted guide vanes in the inlet box at one side of the eye and arranged to be in substantial parallelism in wide open position, one of the vanes being pivoted immediately adjacent the casing, means for simultaneously adjusting the vanes angularly to impart a whirl to the fluid in one direction, said means having provision for moving the vane adjacent the casing in the opposite angular sense from the other vanes, and means permitting movement of said other vanes to impart a whirl in the opposite direction without movement of the vane adjacent the casing.

HERMANN BAENNINGER.