July 9, 1963 B. ECK 3,096,931

CROSS FLOW FAN ARRANGEMENT

Filed May 25, 1961 2 Sheets-Sheet 1

Fig.1

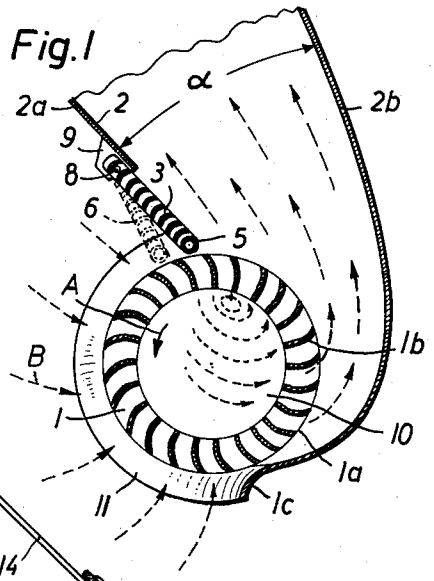
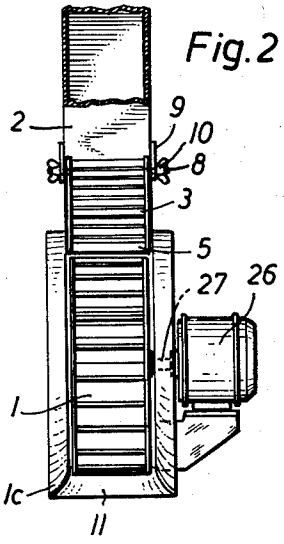


Fig.2



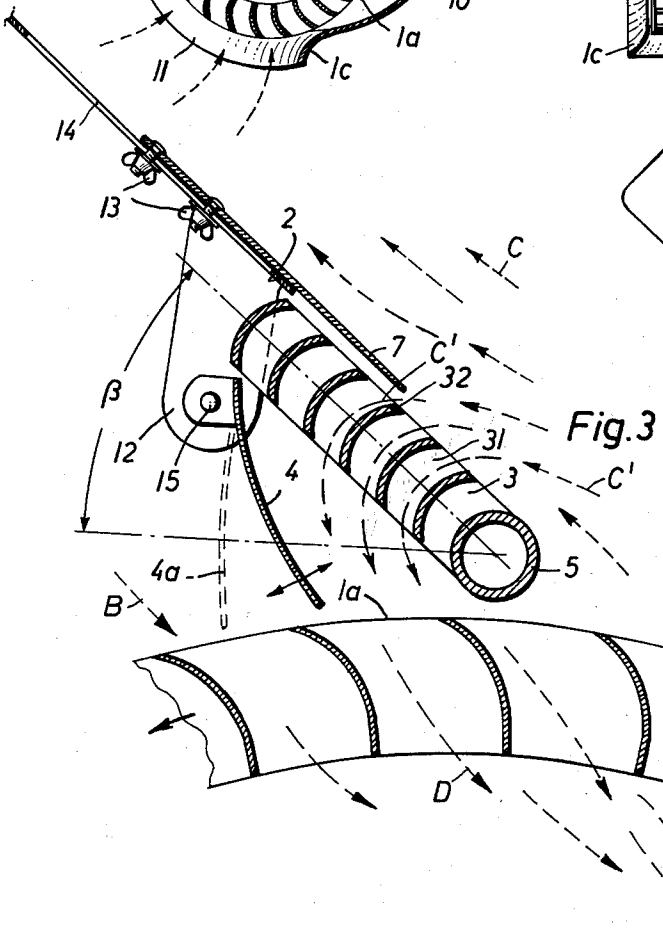
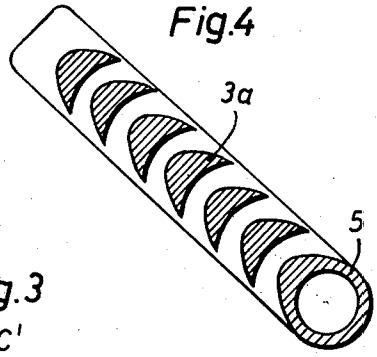


Fig.3

Fig.4



July 9, 1963 B. ECK 3,096,931

CROSS FLOW FAN ARRANGEMENT

Filed May 25, 1961 2 Sheets-Sheet 2

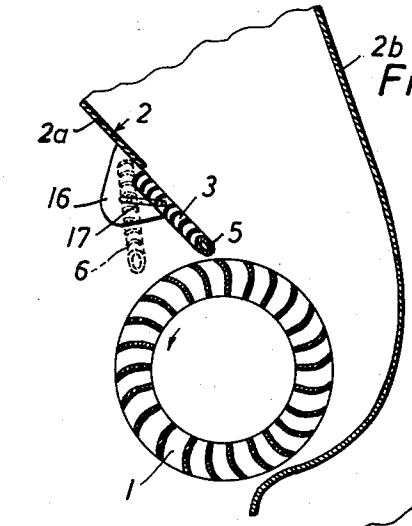


Fig.5

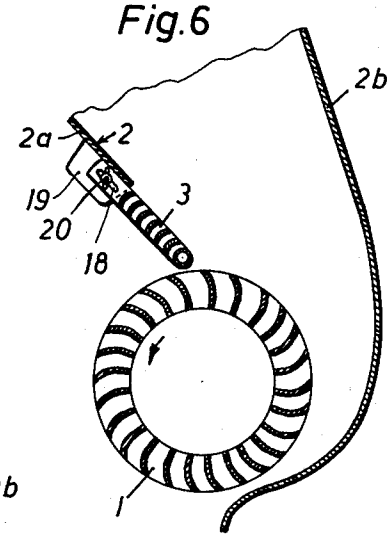


Fig.6

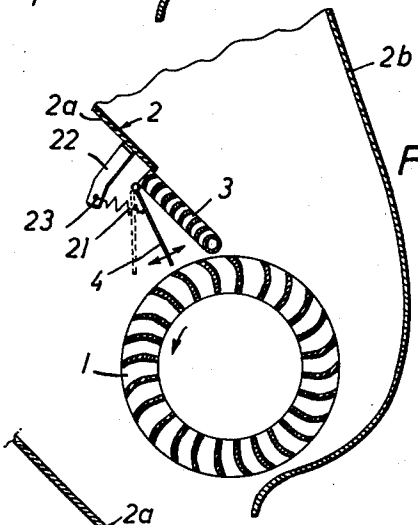


Fig.7

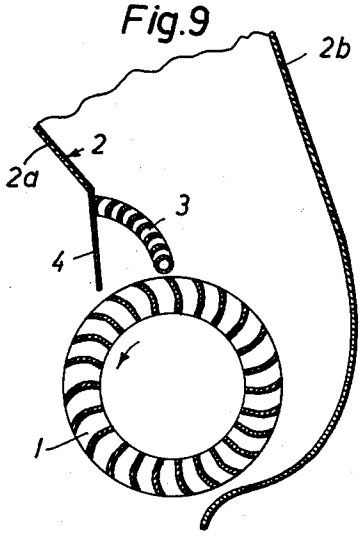


Fig.9

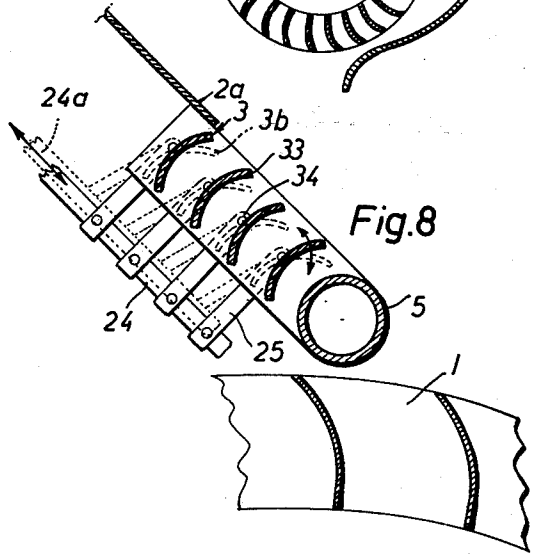


Fig.8

United States Patent Office

3,096,931
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3,096,931

CROSS FLOW FAN ARRANGEMENT

Bruno Eck, Geisbergstrasse 24, Cologne-Klettenberg, Germany

Filed May 25, 1961, Ser. No. 112,587
Claims priority, application Germany May 28, 1960
17 Claims. (Cl. 230—125)

The present invention relates to a cross flow fan arrangement, and more particularly to a cross flow fan of the type disclosed in my U.S. Patent 2,942,773 issued on June 28, 1960.

The present application is a continuation-in-part application of my co-pending application Serial No. 82,885, filed on January 16, 1961.

The U.S. Patent 2,942,773 discloses a cross flow fan having a cylindrical impeller surrounding a space through which the fluid is driven by the rotating impeller. A part of the fluid is returned from the outlet of the stator case into the impeller and forms a whirling body of fluid in the inner space so that the whirling body of fluid forms a guide means for the fluid flowing through the impeller eliminating the necessity of providing a fixed guide structure in the impeller.

A substantial part of the outer surface of the impeller blades cannot be utilized due to the provision of the converging gap along the surface of the impeller.

It is one object of the present invention to improve the known cross flow fans, and to provide a cross flow fan in which almost the entire impeller means is utilized for moving a fluid.

Another object of the present invention is to provide a cross flow fan in which the inlet and outlet are seperated by a narrow wall, while nevertheless a whirling body of fluid is formed in the inner space of the impeller for guiding the fluid through the inner space. Another object of the present invention is to provide a cross flow fan in which a whistling sound is suppressed which is produced in known cross flow fans at the point where a stator part separates the inlet and the outlet.

Another object of the present invention is to provide a cross flow fan in which a portion of the fluid passing through the outlet is returned through deflecting guide passages into the inlet. Another object of the present invention is to provide a cross flow fan which operates efficiently even if the amount of transported fluid is reduced, and which is consequently particularly suited for being used in a parallel arrangement with other cross flow fans.

Another object of the present invention is to provide a cross flow fan which produces a tight whirling body of fluid having a diameter substantially smaller than the diameter of the impeller, and having an axis located close to the impeller blades.

With these objects in view, the present invention relates to a cross flow fan which comprises rotary impeller means having a plurality of impeller blades defining a cylindrical outer surface and an inner space within the impeller means; and a stator supporting the impeller means for rotation and including two parts located adjacent the cylindrical outer surface and being spaced circumferentially about the same to define between each other a passage through the impeller means and through the inner space.

The passage has an inlet for a fluid, such as air, on one side of the two parts and an outlet for the fluid on the other side of the two parts so that during rotation of the impeller means a fluid is drawn through the inlet, flows through the passage and is discharged through the outlet.

One of the parts of the stator is formed with a plurality of deflecting passages passing therethrough, and being preferably bounded by a plurality of deflecting guide vanes which form a grid.

The deflecting passages connect the outlet with the inlet and are shaped to guide a portion of the fluid from the outlet back into the inlet and in a stream close to the deflecting vanes and passages through the spaces between the impeller blades so that a whirling body of fluid is formed in the inner space for guiding the main flow of the fluid through the impeller means.

In the preferred embodiment of the invention, the two parts which form the passage, are wall portions of a diffuser. One of the wall portions of the diffuser extends substantially transverse to the outer surface of the impeller, and bounds on one side thereof the inlet, and on the other side the outlet passage formed by the diffuser. This wall portion is formed in accordance with the present invention with a grid including a plurality of deflecting vanes defining guide passages connecting the diffuser passage with the inlet region along the outer surface of the impeller, so that a portion of the discharge fluid is returned into the inlet and flows back into the inner space in the impeller to form a guiding whirling body of fluid. Consequently, the grid forms an extension of a diffuser wall so that only a very small portion of the outer cylindrical surface of the impeller means is not utilized as inlets or as outlets. This is a considerable advantage as compared with the cross flow fans of the prior art, in which a substantial portion of the peripheral surface of the impeller is covered by stator portions, and cannot be utilized for the flow of air.

A further advantage of the arrangement of the invention is that the boundary layer of the fluid flowing through the diffuser is eliminated by the guide passages so that surprisingly great diffuser angles become possible. While the prior art constructions required special measures to overcome the slowing down of the fluid in the diffuser, the arrangement of the present invention solves this problem in a surprisingly simple manner.

This effect of the construction of the present invention is of particular importance due to the fact that the fluid discharged from the impeller means into the outlet moves at substantially different velocities at different portions of the outer cylindrical surface of the impeller passing through the outlet.

In a preferred embodiment of the invention, the position of the grid can be adjusted either by turning movement or by shifting movement. In the latter arrangement, it is possible to move the grid away from the outer cylindrical surface of the impeller, or to move it away from the respective diffuser wall to form a gap.

According to another embodiment of the invention, the deflecting vanes can be turned to vary the direction of the deflected stream of fluid.

It is advantageous to provide a cover means for covering part of the grid and guide passages so that a smaller or greater amount of fluid is returned from the outlet into the inlet and the inner space of the impeller.

In a modified embodiment of the invention, the grid is curved whereby the path of the stream of returned fluid is influenced. It is advantageous to shape the deflecting vanes in accordance with a selected profile, and to streamline the vanes.

In a preferred construction of the invention, a guide wall extends on the inlet side of the grid to the outer surface of the impeller and forms with the grid a space through which the returned fluid is guided before entering the impeller so that the stream of returned fluid is confined to a small portion of the inlet means, and completely separated from the flow of fluid through the inlet means.

Preferably, the guide wall is adjustable to influence the direction of the flow of the stream of the returned fluid whereby particular regulating effects are obtained.

It is advantageous to connect the guide wall to the grid for simultaneous turning movement, and such turning movement may be automatically controlled whereby characteristics of the cross flow fan can be influenced and adapted to prevailing operational conditions.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing, in which:

FIG. 1 is a schematic cross-sectional view illustrating one embodiment of the invention;

FIG. 2 is a side elevation of the embodiment shown in FIG. 1;

FIG. 3 is a fragmentary schematic sectional view illustrating a modified embodiment of the invention;

FIG. 4 is a fragmentary view illustrating the profile of the guide vanes according to the invention;

FIG. 5 is a fragmentary cross-sectional view illustrating another embodiment of the invention;

FIG. 6 is a fragmentary cross-sectional view illustrating a further embodiment of the invention;

FIG. 7 is a fragmentary cross-sectional view illustrating an embodiment of the invention in which the grid is connected to a guide wall;

FIG. 8 is a fragmentary cross-sectional view on an enlarged scale illustrating a further modified embodiment of the invention; and

FIG. 9 is a fragmentary schematic cross-sectional view illustrating a modified embodiment of the invention.

Referring now to the drawings, an impeller **1** has a set of curved impeller blades arranged in a circle so that the impeller defines an inner cylindrical space **10**, and has an outer cylindrical surface **11**. The ends of the elongated impeller blades **1***a* are secured to two end plates from which stub shafts project. The stub shafts **27** are mounted in bearings of a stator so that the impeller **1** is turnable about an axis of rotation coinciding with the center of the circle of impeller blades **1***a*. The stator includes a diffuser **2** whose walls **2***a* and **2***b* define a diffuser angle alpha. The wall **2***a* supports a grid **3** on a pivot means **8** mounted on a slotted bracket **9** so that the grid can be turned by manually operated means, not shown, between the position **3** shown in solid lines and the position **6** shown in broken lines in FIG. 1. As shown in FIG. 2, the turned grid is secured by a wing nut **10**. A motor **26** drives the impeller **1** through stub shafts **27**. As also shown in the enlarged view of FIG. 3, the edge of the grid adjacent the outer cylindrical surface **11** is formed by a tubular member **5** extending in axial direction of the impeller.

Various modifications will be described hereinafter, but in all embodiments of the invention, the impeller means **1** is rotated in direction of the arrow A so that the curved impeller blades **1***b* draw the air in the direction of the arrows B shown in FIG. 1 into the inner space **10** from where the fluid is driven in direction of the arrows C into the diffuser **2**. Therefore, the stator parts **2***a*, **3**, **5** on one hand, and the stator part **2***c* on the other hand form an inlet extending on one side of the impeller **1** between parts **5** and **2***c*, and an outlet extending on the other side of the impeller **1** between parts **5** and **2***c*. In this manner, a passage is formed through the impeller between parts **5** and **2***c*.

As best seen in FIG. 3, a portion of the fluid C in the outlet passes in the direction of the arrows C′ into the guide passages **41** formed between the deflecting vanes **32** of grid **3**. The stream of fluid is deflected by the guide vanes **32** to flow in a stream along the grid **3** in the inlet region, and in the direction of the arrows D into the inner space in the impeller where the whirling body E of the fluid is formed. The stream D may be further confined

by guide wall **4** which extends from the grid to the outer cylindrical surface **11** of the impeller. Guide wall **4** is adjustably mounted on bracket means **12** and pivot means **15** and can be turned to a position **4***a*.

The whirling body E thus produced is located directly adjacent the inner surface of the rotary impeller, and is tightly confined so that only a small part of the inner space **10** is taken up by the whirling body E. Although the whirling body E is necessary for guiding the fluid properly through the inner space of the impeller without turbulence it is advantageous to confine the whirling body to a small area since in this manner the capacity and output of the fan are increased.

The direction of the stream D can be adjusted in the embodiment of FIG. 1 by turning the grid **3** about pivot means **8** into the position illustrated in broken lines. In this manner, the diameter of the whirling body E can be varied in accordance with the prevailing operational condition, the amount of air to be moved, and the rotary speed of the impeller.

In the embodiment of FIG. 3, a cover plate **7** is mounted on the diffuser wall **2***a* for sliding movement between an advanced position covering a selected number of guide passages **31** in grid **3** and a retracted position in which a greater number of guide passages **31** is uncovered. Wall **2***a* has a slot **14** so that plate **7** can be fixed in adjusted positions by wing nuts **13**. It is evident that in this manner, the width of the stream D can be adjusted. Particularly, if the cover plate **7** is moved to the position shown in FIG. 2, no fluid can flow from the outlet in diffuser **2** through those guide passages **31** which are located outside of the guide wall **4**, and consequently, the stream D is completely confined within the guide wall **4** leaving the inlet region almost completely free of the return stream and resulting in a very tight whirling body E. Under other operational conditions, a wider stream may be desired, and in this event, cover plate **7** is retracted so that a return stream flows into the inlet region through the guide passages **31** which are located outwardly of the confining guide wall **4**. When the cover plate **7** is in the position shown in FIG. 2, and the return stream is confined by the guide wall **4**, the angle between the return stream and the main stream B in the inlet region is beta.

The embodiment illustrated in FIG. 5 corresponds in every respect to the embodiment described with reference to FIG. 1, except that the pivot means **17**, **16** is located in the center portion of grid **3** so that by adjustment of grid **3** a somewhat different position **6** of the return stream D is obtained. FIG. 4 shows the preferred profile of the guide vanes **32**.

In the embodiment of FIG. 6, the grid **3** is mounted on the stator wall **21** for movement in its own plane between a retracted position in which its front edge is spaced a greater distance from the peripheral surface of impeller **1**, and an advanced positon in which the front edge is located directly adjacent the impeller **1**. A projecting part **1***a* is mounted in wall **2***a* and has a slot **18**. After adjustment, grid **3** is fixed by wing nut **20**. By shifting the grid **3**, the return stream can be varied in accordance with operational conditions.

FIG. 7 illustrates an embodiment in which grid **3** is coupled to the movable guide wall **4**. A spring is articulated to guide wall **4**, and secured to portion **23** of a fixed pin **22** on wall **2***a*. By automatic adjustment of members **3**, **4**, the characteristics of the fan can be automatically controlled and varied as required by operational conditions.

The embodiment of FIG. 8 corresponds to the embodiment of FIG. 3, but is modified inasmuch as the vanes **33** are mounted on the frame **24** of the grid for turning movement to a position **24***a* about pivot means **34** defining axes parallel to the axis of the impeller **1**. Frame **24** includes members **25**. It is evident that by turning of vanes **33**, the stream D can be more or less confined to a smaller or larger portion of the inlet region.

FIG. 9 illustrates another embodiment in which the grid **3** is curved and connected to a guide wall **4** so that the

outermost portions of the return stream are deflected by the guide vanes to flow in substantially radial direction toward the impeller.

Cross flow fans of the type with which the present invention is concerned have a characteristic graph which slopes downwardly as the amount of conveyed fluid is reduced indicating an unstable condition which is undesirable, particularly if cross flow fans are to be operated in parallel. The grid arrangements of the present invention, particularly the embodiments of FIGS. 7 and 9, result in characteristics graphs which are substantially straight or even rise at reduced quantities of conveyed fluid, indicating a completely stable operation of the fan under these conditions. The reason is that, if the actual amount of fluid conveyed by the fan is reduced, a part of the fluid is returned from the outlet into the inlet, so that the amount of fluid in the inlet is increased. Consequently, a greater volume of air flows through the impeller than is actually transported by the cross flow fan which is due to the fact that some of the fluid is recirculated and thus provides the impeller with sufficient fluid for efficient operation, although a lesser amount of fluid is sucked in and finally discharged in accordance with the prevailing requirements.

The efficient operation of the fan is nevertheless maintained, since the whirling body E is disposed closely adjacent the impeller vane, even if small amounts of fluid are conveyed by the fan, whereas in the known constructions the whirling body spreads and extends toward the center of the inner space of the impeller when the output of the impeller is reduced and less fluid is sucked in and discharged by the cross flow fan.

It will be understood that each of the elements described above or two or more together, may also find a useful application in other types of cross flow fans differing from the types described above.

While the invention has been illustrated and described as embodied in a cross flow fan having a diffuser wall provided with a grid having guide passages for returning fluid from the outlet of the fan into the inlet of the fan, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed and described to be secured by Letters Patent is:

1. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts being a grid including a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage.

2. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage.

3. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet and a guide member extending in axial direction of said impeller means directly adjacent said cylindrical outer surface, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage.

4. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said grid extending transverse to said cylindrical outer surface, and means for mounting said grid on said stator for movement rela-

tive to the same and to said impeller means whereby the path of said stream and the position and shape of said whirling body can be adjusted.

5. A cross flow fan as set forth in claim 4 and wherein said means on said stator support said grid for turning movement about a pivot axis parallel to said axis of said impeller means.

6. A cross flow fan as set forth in claim 5 wherein said pivot axis is located at the end portion of said grid remote from said impeller means.

7. A cross flow fan as set forth in claim 5 wherein said pivot axis is located in the center portion of said grid.

8. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts being formed with a plurality of deflecting guide passages passing therethrough and connecting said outlet with said inlet, said guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said stator including a movable cover means movable between an inoperative retracted position and a plurality of advanced positions for covering and closing a selected number of said deflecting guide passages.

9. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said stator including a cover plate movable between a retracted position and a plurality of advanced positions located on said grid for covering and closing a selected number of said deflecting guide passages.

10. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts being formed with a plurality of deflecting guide passages passing therethrough and connecting said outlet with said inlet, said guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said stator including a guide wall extending from said one part into said inlet and to said cylindrical outer surface of said impeller means and defining with said one part a space for said stream so that said stream is confined along said guide passages in said inlet before passing into said inner space.

11. A cross flow fan as set forth in claim 10 wherein said guide wall is mounted on said stator for movement between adjusted positions for influencing the direction of flow of said stream.

12. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, each of said deflecting vanes being turnable about an axis passing therethrough parallel to said axis of said impeller means so that the direction of said stream can be adjusted by turning said vanes.

13. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said deflecting vanes being curved in accordance with a selected profile to guide said stream along a selected path.

14. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller

means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a curved grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage.

15. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said grid extending transverse to said cylindrical outer surface, and means for mounting said grid on said stator for movement relative to the same and to said impeller means whereby the path of said stream and the position and shape of said whirling body can be adjusted, said stator including a cover plate movable between a retracted position and a plurality of advanced positions located on said grid for covering and closing a selected number of said deflecting guide passages.

16. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each

other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid movably mounted on said stator and having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said grid to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, a guide wall connected to said grid for movement therewith and defining with said grid a space for said stream so that said stream is confined along said grid in said inlet and separated from the fluid drawn into said inlet by said impeller means whereby adjustment of the position of said grid and guide wall effects a variation of the direction of said stream.

17. A cross flow fan comprising, in combination, rotary impeller means having an axis and a plurality of impeller blades defining a cylindrical outer surface on said impeller means and an inner cylindrical space within said impeller means; and a stator supporting said impeller means for rotation about said axis in one direction of rotation and including a diffuser having two parts located adjacent said cylindrical outer surface spaced circumferentially about the same and defining between each other a passage through said impeller means and through said inner space, said passage having an inlet for a fluid on one side of said two parts and an outlet for the fluid on the other side of said two parts so that during rotation of said impeller means in said one direction a fluid is drawn through said inlet, flows through said passage and is discharged through said outlet, one of said parts including a grid having a plurality of deflecting vanes defining deflecting guide passages connecting said outlet with said inlet, said vanes and guide passages being shaped to guide a portion of said fluid from said outlet back into said inlet and in a stream along said one part to form a whirling body of fluid in said inner space for guiding the main flow of the fluid through said passage, said grid being a plate extending in a plane transverse to said cylindrical outer surface, and means for mounting said grid on said stator for movement in said plane relative to the same and to said impeller means whereby the gap between said grid and said cylindrical outer surface, the path of said stream and the position and shape of said whirling body can be adjusted.

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