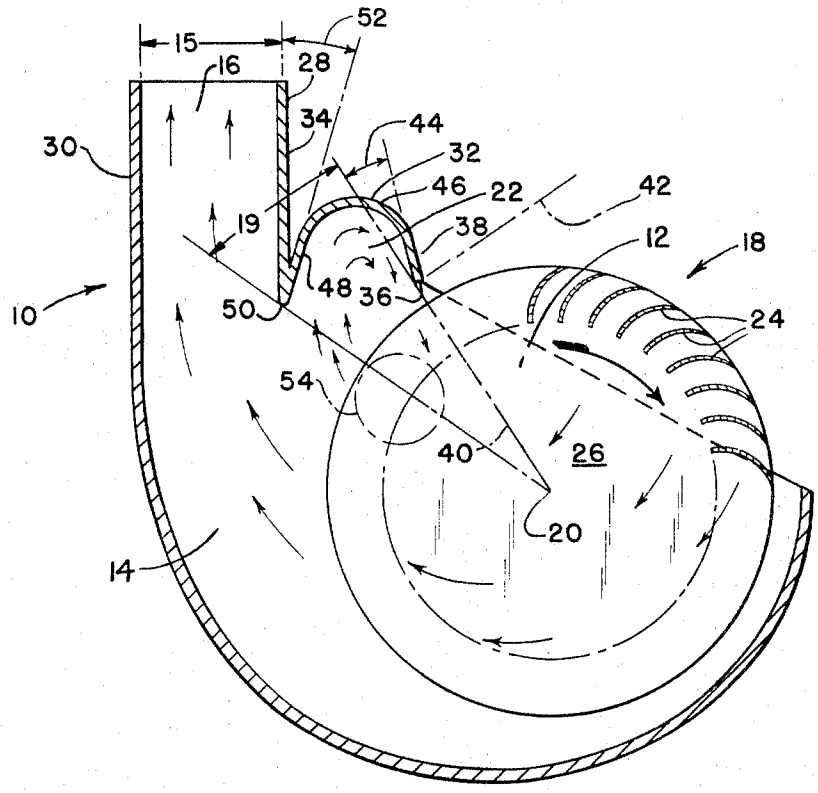
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TRANSVERSE FLOW BLOWER WITH HIGH VELOCITY DISCHARGE

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TRANSVERSE FLOW BLOWER WITH HIGH VELOCITY DISCHARGE

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ABSTRACT OF THE DISCLOSURE

A high velocity transverse flow blower unit having a recirculation cup which is relatively short and deep and which is provided with a reversely curved section adjacent the inlet to induce a tight high velocity vortex.

This invention relates in general to improvements in transverse flow blowers of the type wherein fluid is conveyed from an inlet by a rotor transversely of the rotor to and through a pressure chamber at the generally opposite side of the rotor and is discharged through an outlet associated with the pressure chamber.

In the operation of blowers of this type, it is known that a vortex center is produced on the high pressure or outlet side of the rotor. A portion of the fluid that flows from the inlet and through the rotor is directly discharged through the outlet, however, a portion of the fluid also rotates about the vortex center at high velocity and in the same direction as the rotor and re-enters the rotor and recirculates therethrough. Due to the nature of the flow the vortex center tends to move in a direction opposite to the direction of rotor rotation as pressure increases at the blower outlet. Thus, when the outlet is constricted to effect a narrow fluid discharge stream and a high velocity discharge the vortex tends to move generally into the path of fluid flowing outwardly from the rotor and may assume a position where it virtually prevents fluid flow from reaching the outlet. As outlet pressure increases the recirculation of high velocity flow around the vortex also increases which further reduces the efficiency of the unit and which also tends to produce undesirable noise levels therein.

To compensate for the aforementioned undesirable internal fluid flow characteristic, the blower of the present invention embodies a novel housing structure which induces the vortex center to assume a stable position near the periphery of the rotor and out of the path of the main flow stream from the rotor to the outlet.

Accordingly, it is the general object of this invention to provide a transverse flow blower of improved efficiency.

A further object of this invention is to provide a compact transverse flow blower of relatively low fluid characteristics and which discharges a narrow stream of fluid at a relatively high velocity.

A still further object of this invention is to provide an improved transverse flow blower of simple design and durable construction for economical manufacture.

Other objects and advantages of the invention will be apparent from the following description and from the drawing forming a part thereof.

The drawing shows a preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction disclosed and that the drawing and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing; the figure is a somewhat schematic cross-sectional view of a transverse flow blower embodying the present invention.

The transverse flow-blower of the illustrated embodiment comprises a housing indicated generally at **10** which has a fluid inlet **12** and a high pressure chamber **14** which includes a fluid outlet **16**. A rotor indicated generally at **18** is at least partially disposed within the housing **10** between the inlet **12** and the chamber **14** and is rotatable about an axis **20** in a pre-determined direction to convey fluid from the inlet **12** to and through the chamber **14** and outwardly through the outlet **16**. Also included in the housing is a recirculating cup **22** which opens to the chamber **14** and along the periphery of the rotor and which serves to effect a desired fluid flow within the housing in response to the rotation of the rotor in a manner which will be hereinafter further discussed.

Preferably, the rotor **18** is generally drum-shaped and includes a plurality of generally axially elongated circumaxially spaced blades **24, 24** supported by a plurality of rings or discs such as **26, 26**. Each of the blades **24, 24** is generally concave in the direction of rotation which in the illustrated embodiment is shown to be clockwise. The rotor **18** is journalled for rotation with at least a 160° arc of the rotor periphery disclosed in the housing, but preferably the peripheral arc disposed therein is between 200 and 260 degrees.

The housing 10 is characterized by thin walls, a generally volute shape and a preferably generally rectangular cross section. Two spaced apart generally axially extending walls **28** and **30** which form part of the housing **10** each partially define the inlet **12**, the pressure chamber **14** and the associated outlet **16**. One wall **28** which forms one side of the housing includes a first part **32** which defines the recirculating cup **22** and a second part **34** which forms one side of the chamber **14**. The other wall **30** curves generally volutely outwardly from the inlet **12** to the outlet **16** to form another side of the housing. Preferably, the wall **30** turns through an angle of between 130° and 180° between the inlet **12** and the outlet **16** and generally establishes the directional path of fluid flow shown at **15** as being less than 35% of rotor diameter.

At this point it should be noted that the cross section of the inlet **12** is substantially larger than the cross section of the outlet **16**. In the presently preferred embodiment of the invention the cross-sectional area of the inlet is greater than twice the cross-sectional area of the outlet. Further, and as will be apparent from the drawing the outlet is of relatively limited width. The length of the outlet is substantially coextensive with rotor length as is conventional and the width, normal to the length, is shown at **15** as being less than 35% of rotor diameter.

Considering now the recirculation cup **22** it will be seen that the first part **32** of the wall **28** has a generally axially extending edge **36** proximate the periphery of the rotor **18**. The first part **32** also includes a reversely curved first wall portion **38** which extends outwardly from the edge **36**. The first wall portion **38** lies between an axial plane **40** which passes through the edge **36** and a plane **42** which is normal to the axial plane **40** and parallel to the axis **20** and which extends outwardly from the edge **36** in the general direction of rotation of the rotor **18**. An included angle **44** between the first wall portion **38** and the axial plane **40** is less than 70° and preferably the said angle is greater than 5° and less than 20°. In the illustrated embodiment of the invention the included angle **44** is approximately 15°.

At this point it should be noted that the noise level and pressure characteristics of the blower are somewhat effected by the position of the edge **36** relative to the periphery of the rotor. In the illustrated embodiment of the invention the edge **36** is spaced radially outwardly from the periphery of the rotor in a compromise position wherein noise generation is reduced with some slight sacrifice of blower pressure. Preferably, the space between

the edge **36** and the periphery of the rotor **18** is approximately equal to 0.10 rotor diameter.

The outermost portion of the recirculating cup **22** is defined by a generally axially extending concave inwardly opening second wall portion **46** which curves arcuately outwardly from the first wall portion **38**. A generally axially extending third wall portion **48** extends inwardly from the second wall portion **46** and intersects the second wall part **34** along an edge **50** to further define the recirculating cup **22**. An included angle **52** is formed between the second wall part **34** and the third wall portion **48** which is preferably acute. Further and as will be apparent from the drawing the extent of the recirculation cup along the rotor periphery is relatively short and is defined by an included angle **19** which is substantially less than 45°.

As the rotor **18** rotates about its axis at a predetermined speed fluid is caused to flow inwardly through the inlet **12** and transversely of the rotor and its interstiched blades as indicated in the drawing, the general path of flow being indicated by arrows. A tight high velocity fluid flow vortex **54** is formed within the rotor and due to the novel configuration of the recirculating cup **22** tends to assume a stable position near the periphery of the rotor and adjacent the recirculation cup **22** so as to be out of the path of high velocity fluid flow from the rotor toward the outlet **16** as shown in the drawing. Thus the vortex exerts minimal impedance upon fluid which flows outwardly from the rotor toward the outlet **16**. This reduction in impedance also effects a corresponding reduction in the recirculation of high velocity flow within the housing which in turn results in a reduction in the operational noise level of the blower.

The recirculating fluid which flows inwardly toward the rotor tends to assume a path of flow generally parallel to the reversely curved wall **38** and to re-enter the rotor in a generally radial direction or in a direction opposing the direction of rotation. Thus the recirculating cup **22** and particularly the wall **38** effects a desirable fluid flow re-entry condition thereby increasing blower efficiency.

The invention claimed is:

1. A transverse flow blower comprising a rotor having a plurality of generally axially elongated circumaxially spaced blades, a housing including two spaced apart generally axially extending walls each partially defining a fluid inlet and a high pressure chamber having a fluid outlet, said rotor being at least partially disposed in said housing between said inlet and said chamber and rotatable in a predetermined direction to convey fluid from said inlet and through said chamber and said outlet, and a recirculation cup defined by a first part of one wall of said housing and opening to said chamber and extending along the periphery of said rotor through an angle substantially less than 45°, said first part of said one wall including a generally axially extending edge adjacent the periphery of said rotor and a first wall portion extending outwardly from said edge, said first wall portion lying between an axial plane which extends through said edge and a plane which is normal to said axial plane and which extends outwardly from said edge in the general direction of rotation of said rotor, the angle between said first wall portion and said axial plane being approximately 15 degrees, said first part of said one wall having a generally axially extending concave inwardly opening second wall portion curving arcuately outwardly from said first wall portion and including a generally axially extending third wall portion extending inwardly from said second portion, said one wall having a second part intersecting said third wall portion of said first wall part and partially defining said chamber.

2. A transverse flow blower as set forth in claim **1** wherein the angle between said first wall portion and said axial plane is approximately 15 degrees.

3. A transverse flow blower as set forth in claim **1** wherein the cross-sectional area of said inlet is greater than twice the cross-sectional area of said outlet.

4. A transverse flow blower as set forth in claim **1** wherein said outlet has normal length and width dimensions the former of which is substantially coextensive with rotor length and the latter of which is less than 35% of rotor diameter.

References Cited

UNITED STATES PATENTS

Re. 25,365	3/1963	Eck	230—125
Re. 25,409	7/1963	Coester.	
820,397	5/1906	Davidson.	
820,398	5/1906	Davidson.	
839,273	12/1906	Davidson.	
3,178,100	4/1965	Dutwyler.	
3,249,292	5/1966	Eck et al.	230—125
3,096,931	7/1963	Eck	230—125
507,445	10/1893	Mortier	230—125
3,322,333	5/1967	Laing	230—125

FOREIGN PATENTS

1,284,741	1/1962	France.
291,007	8/1928	Great Britain.

HENRY F. RADUAZO, *Primary Examiner.*

U.S. Cl. X.R.

230—133

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,415,443 December 10, 1968

Dov Z. Glucksman

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 45, "aforementioned" should read -- aforedescribed --; line 54, "fluid" should read -- flow --. Column 2, line 22, "disclosed" should read -- disposed --; line 39, "shown at 15 as being less than 35% of rotor diameter" should read -- from the inlet to the outlet --. Column 3, line 50, after "inlet" insert -- to --.

Signed and sealed this 10th day of March 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents