United States Patent

[11] 3,619,088

[72] Inventor **Charles E. Bullock**
North Syracuse, N.Y.

[21] Appl. No. **12,005**
[22] Filed **Feb. 17, 1970**
[45] Patented **Nov. 9, 1971**

[73] Assignee **Carrier Corporation**
Syracuse, N.Y.

[54] **SINGLE INLET CENTRIFUGAL FAN**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **417/423,** 416/178
[51] **Int. Cl.** **F04b 17/00,** F04d 17/08
[50] **Field of Search** 417/423; 416/178, 179, 180, 181, 182

[56] **References Cited**

UNITED STATES PATENTS

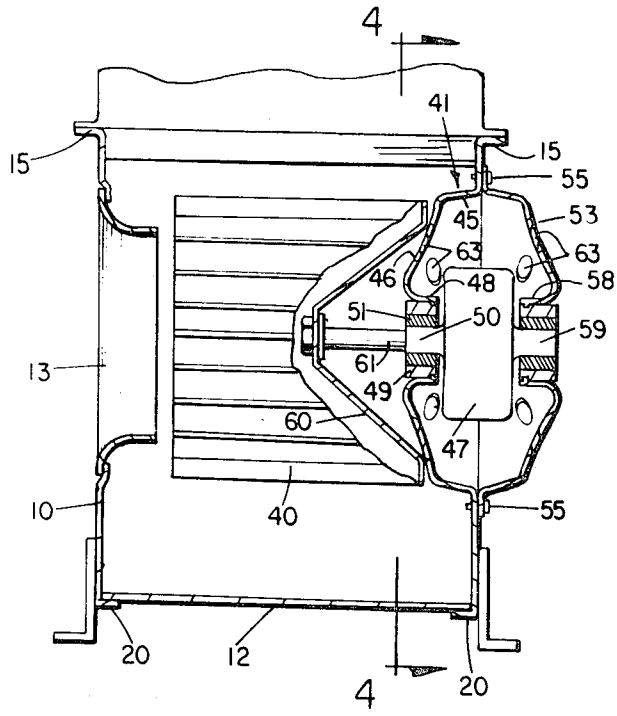
1,163,543	12/1915	Ilg	417/423

FOREIGN PATENTS

898,504	4/1945	France	417/423
977,956	4/1951	France	417/423

Primary Examiner—Robert M. Walker
Attorneys—Harry G. Martin, Jr. and J. Raymond Curtin

ABSTRACT: The invention relates to single inlet centrifugal blowers or fans. The fan is of less axial length than the width of the housing. The rear closed end wall of the housing confronting the backwall of the fan is provided with an inwardly extending cylindrical surface of substantially the same diameter as the fan and terminating in close spatial relation to the backwall of the fan. The cylindrical surface may be formed integral with the closed housing wall, or as a separate piece attached to the housing wall, or as part of the motor mount. The cylindrical surface serves to direct secondary rotational airflow from the space or cavity between the fan backplate and the rear wall of the housing.



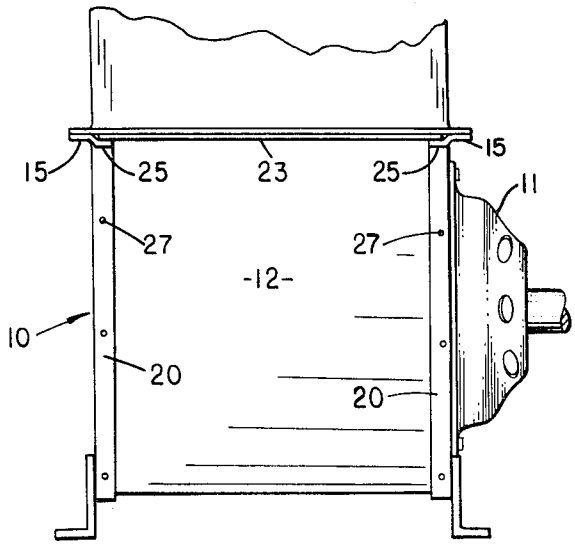


FIG. 1

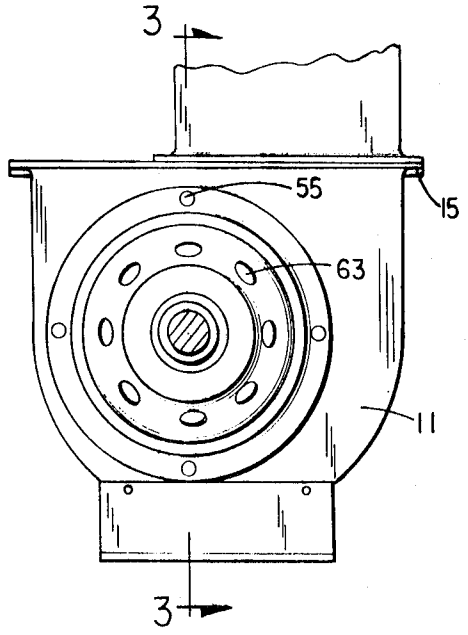


FIG. 2

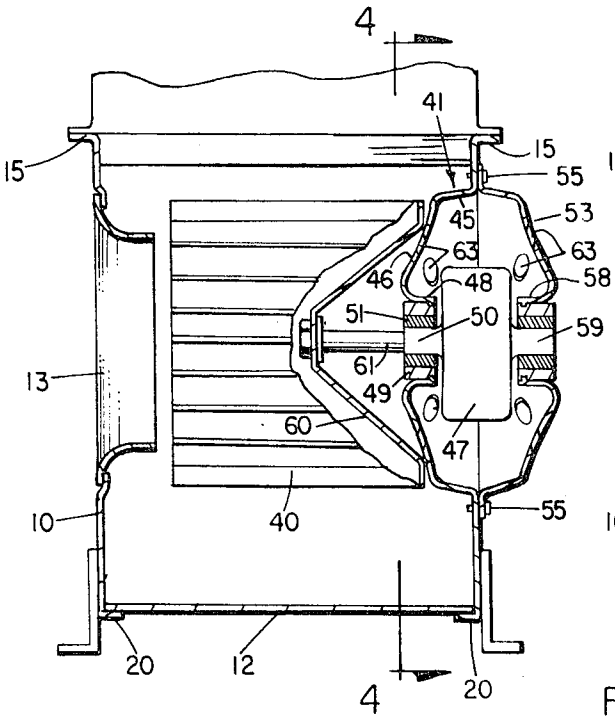


FIG. 3

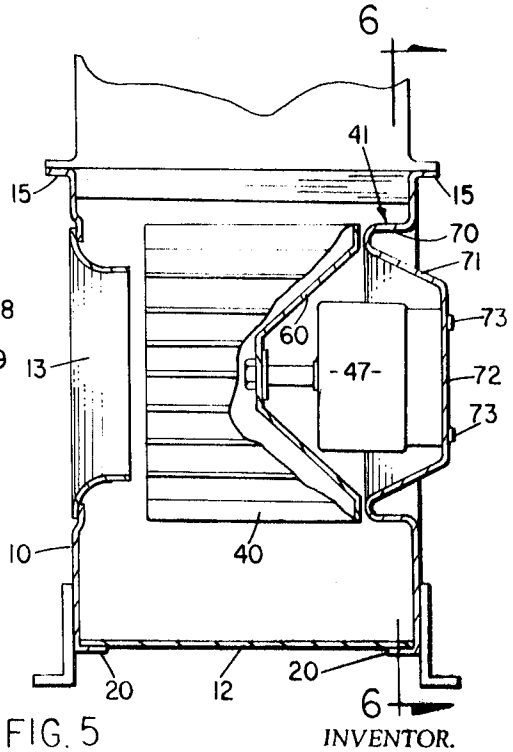


FIG. 5

INVENTOR.
CHARLES E. BULLOCK

BY D. Emmett Thompson

ATTORNEY

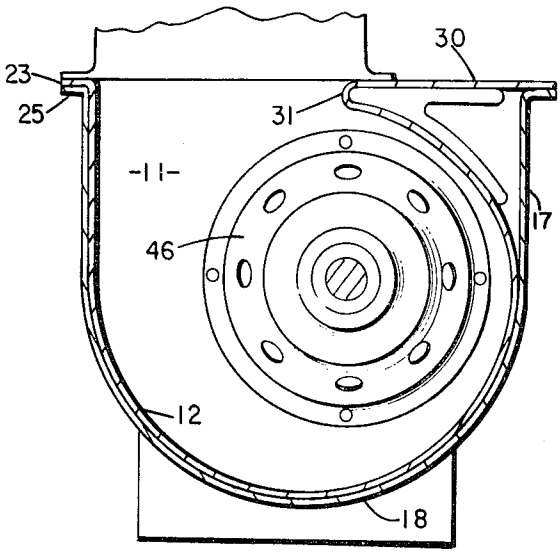


FIG. 4

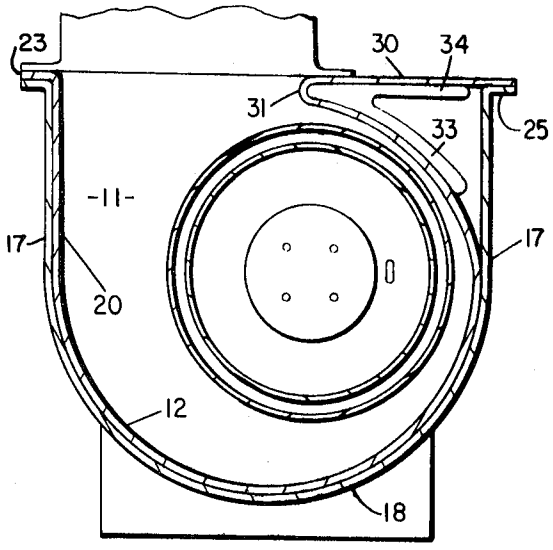


FIG. 6

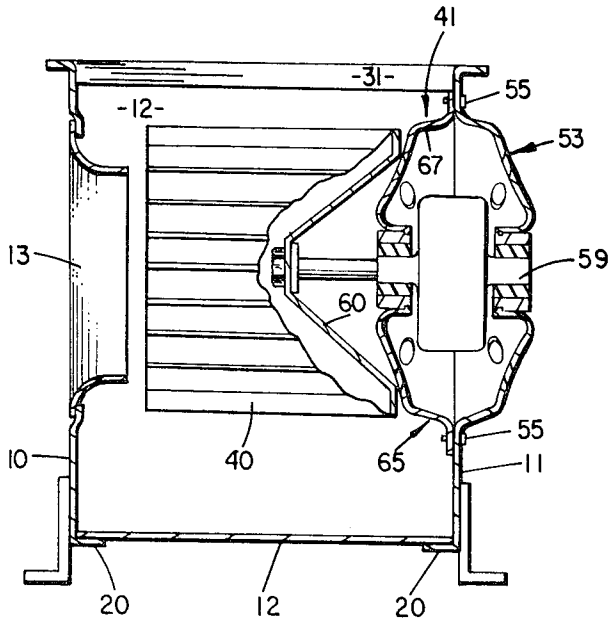


FIG. 7

INVENTOR.
CHARLES E. BULLOCK

BY D. Emmett Thompson

ATTORNEY

SINGLE INLET CENTRIFUGAL FAN

BACKGROUND OF THE INVENTION

There are known advantages in employing a housing of substantially greater length than the axial length of the centrifugal fan. However, with that arrangement in single inlet fans, secondary rotational airflow patterns can be setup in the cavity or space between the backplate of the fan and the rear closed wall of the housing. Such patterns dissipate significant amounts of turbulent energy, reducing the efficiency of the fan.

SUMMARY OF THE INVENTION

This invention is directed to an improved single inlet centrifugal fan structure wherein the fan, having an axial length less than the width of the housing, is mounted substantially midway between the inlet end and the rear closed end of the housing. A cylindrical surface extends inwardly from the rear wall of the housing and is of approximately the same diameter as the fan and terminates in close proximity thereto. The cylindrical surface serves as a barrier to prevent secondary rotational air moving in the space between the backplate of the fan and the rear housing wall. The cylindrical surface may be formed integral with the rear housing wall or provided by a separate piece affixed to the housing wall. In either arrangement, the centrifugal surface is preferably incorporated in the mounting structure for the fan motor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a centrifugal fan structure embodying my invention;

FIG. 2 is an end elevational view looking to the left of FIG. 1;

FIG. 3 is a view taken on line 3—3 of FIG. 2;

FIG. 4 is a view taken on line 4—4 of FIG. 3 with the fan removed;

FIG. 5 is a view similar to FIG. 3 showing a modified motor mount structure;

FIG. 6 is a view taken on line 6—6 of FIG. 5; and

FIG. 7 is a view similar to FIG. 3 showing a modified form of the motor mount structure shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The fan housing illustrated in the drawings consists of end members **10**, **11** and a scroll member **12** extending between the end members and affixed thereto. The end member **10** is formed with an opening in which an inlet bell **13** is mounted. The end members **10**, **11** are D-shaped in general form having a flat planar edge surface formed by an outwardly bent flange **15**. The side edges of the end members extend normal from the linear edge surface as indicated by the portions **17**, these portions merging with a circular edge portion **18**. The edge portions **17**, **18** are formed with inwardly bent flanges **20**.

The scroll member **12** is formed of relatively thin sheet material such as sheet metal or plastic and is formed at one end with an outwardly bent flange **23** which is positioned on outwardly bent portions **25** of the flange **20**. These outwardly bent portions **25** of the flange **20** are offset downwardly slightly from the plane of the linear edge flange **15** (see FIG. **1**). The ends of the scroll **12** are positioned within the flanges **20** of the end members and are affixed thereto by fasteners **27**.

The opposite end of the scroll **12** is formed with a plate **30** of substantial length. The joinder of the scroll with the inner end of the plate **20** forms the cutoff **31** (see FIGS. **4** and **6**). The outer end of the plate **30** also overlaps the flanges **25** at the opposite sides of the end members. The end members **10**, **11** are each formed with an embossment extending inwardly from the inner surface of the end member and including an arcuate portion **33** and a linear portion **34** positioned immediately below the linear edge surface of the end members. These embossments serve to position and locate the cutoff end portion of the scroll.

Referring to FIGS. **3**, **5**, and **7**, it will be seen that the end members **10**, **11** are spaced apart a distance considerably greater than the axial length of the centrifugal fan **40**. The inlet bell **13** extends inwardly a substantial distance from the end member **10**. A cylindrical surface **41** extends inwardly from the rear or closed wall **11** and terminates in close proximity to the inner end of the fan **40**, and is substantially the same diameter as the fan. This surface **41** serves as a barrier to prevent secondary rotational air moving in the space between the end wall **11** and the inner end of the fan.

Referring to FIGS. **1**, **2**, and **3**, the cylindrical surface **41** is formed integral with the end wall **11**. The end wall **11** is drawn to provide an inwardly extending circular flange **45** merging with a radially inwardly extending portion **46** apertured at its center for attachment to one end of the fan driving motor **47**.

As shown in FIG. **3**, the portion **46** is formed with an inner cylindrical flange **48** dimensioned to engage a metal ring **49** fixed to the motor-bearing boss **50** by a resilient sleeve **51**. With the motor mounted to the end wall in this manner, an outboard motor support is affixed to the wall **11**. This outboard motor support is formed complemental to the portions **45**, **46**, **48** of the structure formed integral with the end wall. This outboard support **53** is attached to the end wall as by fasteners **55**, flange portion **58** engaging the resilient mounting structure carried by the motor-bearing boss **59** at the opposite end of the motor.

The fan **40** is formed with a conical-shaped backwall **60** fixed to the motor shaft **61**. The portion **46** and the complemental portion of the outboard support **53** and may be formed with venting holes **63**.

The arrangement shown in FIG. **7** is similar to that described in connection with FIGS. **1–3**. However, in FIG. **7** the end wall **11** is drawn outwardly to provide an integral motor mount for engagement with the outer motor-bearing boss **59**. An inboard motor support **65** embodying structural form similar to that of the outboard support **53** is attached to the inner surface of the end wall **11** as by the fasteners **55**, the circular flange portion **67** of this inboard support forming the cylindrical barrier surface **41**.

Referring to FIG. **5**, the end wall **11** is drawn to provide a circular flange **70** extending inwardly and merging with an outwardly extending conical portion **71** terminating in a central discoidal portion **72** to which the fan motor **47** is affixed as by fasteners **73**. In this arrangement, the flange **70** provides the cylindrical surface **41** providing the barrier between the inner end of the fan and the closed wall **11** of the housing.

In structures described, the cylindrical surface **41** not only serves as a barrier to prevent secondary rotational airflow patterns between the backwall of the fan and the closed wall of the housing, but also the motor is not positioned in the primary airstream and thus does not degrade the aerodynamic performance of the fan as is the case in conventional fan structures. The formation of the cylindrical barrier surface incorporated in the motor mounts greatly increases the stiffness and rigidity of the mounts and makes the unit less sensitive to fan wheel or motor imbalance.

I claim:

1. A centrifugal single inlet fan structure comprising a housing having a rear closed end wall and an inlet end wall formed with an inlet opening, a fan journaled for rotation in said housing intermediate said walls, said walls being spaced apart a distance greater than the axial length of said fan, a motor operatively connected to said fan for effecting rotation thereof, said rear wall being formed with a first integral radially inwardly extending central portion offset axially from the plane of said wall, a motor support member of circular form fixed at its periphery to said rear wall and being formed with a radially inwardly extending central portion formed complemental to said central first portion and being spaced axially from said first portion, said central portions being formed with aligned apertures, said motor being mounted between said portions, the ends of said motor being fixedly mounted in said apertures.

2. A centrifugal fan structure as set forth in claim 1 wherein said motor support member is attaches to the outer surface of said rear wall.

3. A centrifugal fan structure as set forth in claim 1 wherein said motor support member is attached to the inner surface of said rear wall.

* * * * *