Aug. 17, 1954 J. B. BURROWES 2,686,630

BLOWER

Filed Aug. 16, 1950

Fig-1

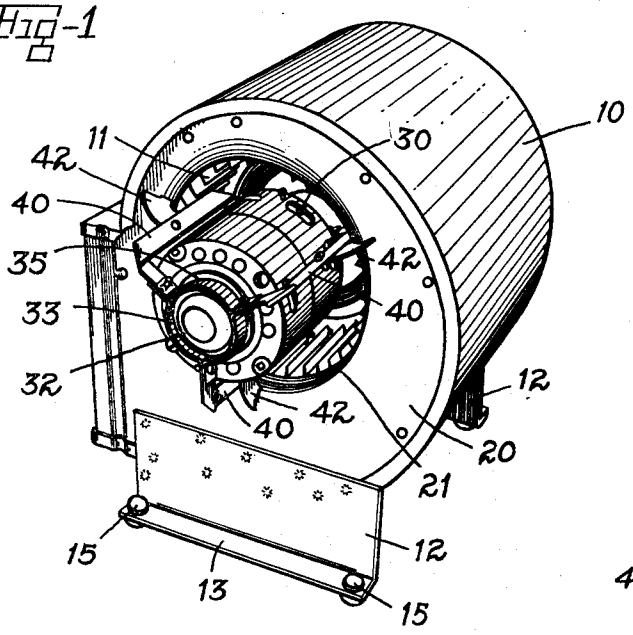


Fig-2

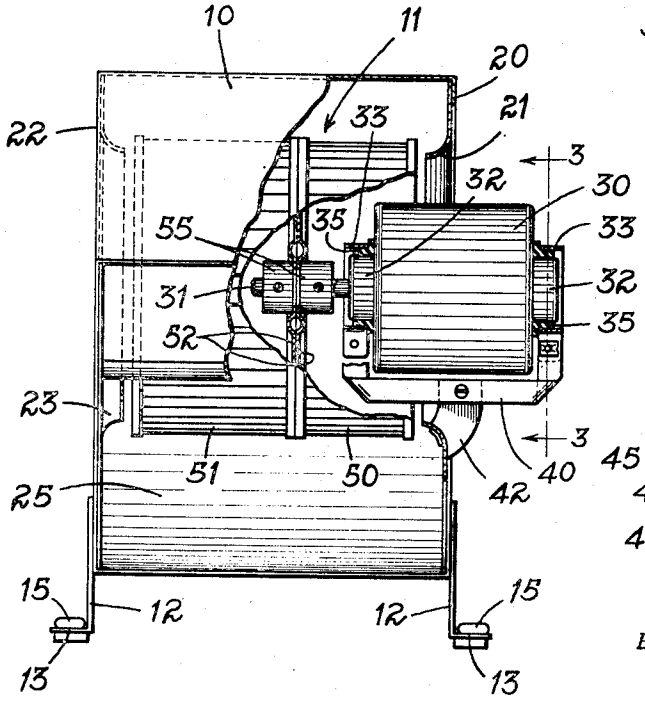


Fig-3

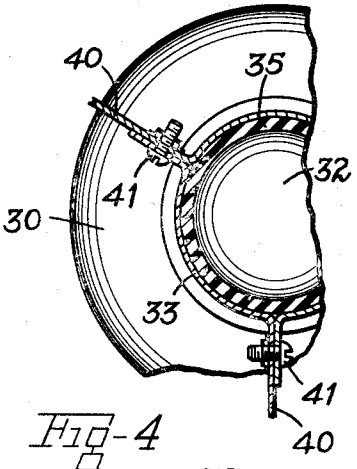
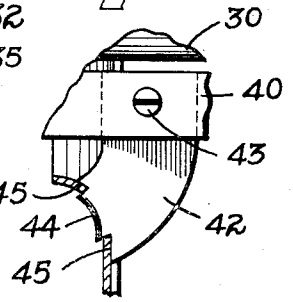


Fig-4



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UNITED STATES PATENT OFFICE

2,686,630

BLOWER

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Application August 16, 1950, Serial No. 179,730

6 Claims. (Cl. 230—117)

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This invention relates to blowers and more particularly to a centrifugal blower and the drive therefor.

Centrifugal blowers such as are used in hot air heating systems, ventilating systems and the like, embody a blower wheel mounted for operation in a housing and driven by means of a motor which is commonly supported on the housing and connected to the wheel through belts and pulleys. Such a device usually requires a fractional horse power motor for driving purposes in order to have available the necessary minimum starting torque required to start the blower wheel through the belt and pulley drive and to overcome the inertia of the system. Ordinarily the power capacity of such a motor has not been effectively utilized under running conditions, and the use of this type of motor has therefore been uneconomical as to size, weight and expense.

In accordance with the present invention a blower construction is provided in which the blower wheel is directly carried on the motor shaft with the motor being located adjacent and projecting partially into the inlet at one end of the blower housing, and the motor is mounted directly upon the end of the housing by means of a simple arrangement of brackets and a supporting cage which cooperate with the housing to support the motor in the inlet without obstructing the proper inward flow of air through the inlet to the blower wheel. Because of the reduction in the inertia of the moving system and the elimination of the belt and pulley drive, a shaded pole motor has been found to be entirely practicable and to provide adequate starting torque for such a system. Further, with the motor located in the inlet for one side of the blower, it is subjected to the inflowing stream of air, and thus a highly effective and advantageous cooling action is obtained so that a relatively low power and inexpensive fan type motor without starting switches, centrifugal cut-outs or commutators may be used.

It is further a feature of the invention that with such a motor having the inherent characteristic of reduction in speed on increased load, the motor does not tend to overload and will drop in speed as the resistance to the delivery of the air from the blower is reduced and hence the output of the blower is decreased, thus avoiding possible damage to the motor from an excessive load condition. In addition, the speed of the motor is readily controlled by the incorporation therewith of a variable reluctance choke coil having the effect of reducing the voltage applied to the motor, and thus a simple and highly satisfactory control and variation in the motor speed is obtained.

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In a double inlet blower constructed in accordance with the invention, the entire assembly is properly balanced and correlated through the provision of a double inlet wheel in which the two portions of the wheel are of unequal size, such that their outputs will be balanced throughout their length and the creation of turbulence and loss of output are thereby avoided. It is further desirable to provide the smaller sized wheel on the side adjacent the motor with the larger sized wheel on the opposite side, and with the motor mounted directly on one side of the housing as described, minimum obstruction of the entry of the air from either side is assured and desirable output characteristics obtained.

It is accordingly one of the principal objects of the present invention to provide a blower assembly of simple and compact construction wherein the blower wheel is mounted directly on the shaft of the motor, and the motor is directly mounted on one side or end of the housing in such manner that the motor is supported in the path of the air flowing into the blower for effective cooling without undesirably obstructing the proper flow of air through the inlet.

It is also an object of the invention to provide a blower assembly wherein the drive motor is mounted directly on the housing and partly within one of the inlets to the housing by means of a lightweight and simple arrangement of brackets and a cage which cooperate to suspend the motor in fixed relation with the housing independently of any other mounting parts for maximum simplicity and compactness of construction and without interference with the proper inflow of air to the blower wheel.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing—

Fig. 1 is a perspective view showing a blower assembly in accordance with the invention;

Fig. 2 is a view of the assembly partly in side elevation and partly broken away in vertical section;

Fig. 3 is an enlarged fragmentary view on the line 3—3 of Fig. 2; and

Fig. 4 is an enlarged fragment of Fig. 2 showing the connection between the housing and one of the mounting brackets for the motor-supporting cage.

Referring to the drawing, which illustrates a

preferred embodiment of the invention, the housing 10 for the blower wheel 11 is provided at either end with a support 12 of sheet metal, which may be readily welded to the housing and which is shown as formed with an outwardly turned lower flange 13 provided with rubber grommets 15 which serve as feet for supporting the assembly upon a table or other horizontal surface. The side wall 20 of the housing 10 includes an inwardly turned portion 21 defining one of the inlets for the blower wheel, and the other side wall 22 of the housing has a similarly inwardly turned portion 23 which defines the other inlet for the wheel. The outlet for the wheel from the interior of the housing is indicated at 25.

The drive motor 30 for the blower wheel includes a drive shaft 31 and is provided with boss portions 32 at each end thereof, and the motor is suspended within the inlet 21 by means of a supporting cage which includes annular socket portions 33 at each end adapted to receive the bosses 32 therein. Also, a sleeve 35 of rubber is provided as a lining between each of the bosses 31 and sockets 33, with the inner end of each of these sleeves being turned radially outwardly to extend between the inner end of each socket and the end face of the motor to provide an effective cushion against transmission of vibration from the motor to its supporting cage and the housing.

The two socket portions 33 of the motor-supporting cage are connected by three ribs 40 formed of sheet metal in a generally U-shape to extend along the outside of the motor. Each of the socket portions 33 is formed as shown in Fig. 3 of three arcuately shaped strips of sheet metal each of which is integral at one end with one of the ribs 40 and has an outwardly turned flange at its other end which is shown as bolted at 41 to the adjacent rib portion to complete the socket portions of the cage. A short bracket 42 of sheet metal is secured to each of the ribs 40, as by a weld or bolt 43, and the outer end of each bracket includes a tang 44 which extends through a slot in the housing wall 22 and is flanged over on the inside of the housing and welded or otherwise secured thereto.

As shown in Fig. 4, the tang 44 on each bracket 42 extends only partway across the end of the bracket, leaving a shoulder 45 which seats against the outer surface of the housing wall to brace the bracket for balancing the weight of the motor and blower wheel. Satisfactory conditions of balance have been obtained in practice with the brackets 42 secured to the ribs 40 at positions approximately equidistant the ends of the motor, and preferably at positions such that the center transverse plane through the motor substantially coincides with the outer surface of the housing wall 20.

The blower wheel 11 is of the double inlet type, and it is shown as formed of a pair of single inlet wheels 50 and 51 each including a disk 52 at one end supporting a hub 55 and with these disks 52 arranged in contact at a position intermediate the ends of the resulting composite wheel. For example, satisfactory results have been obtained with two single inlet wheels 50 and 51 constructed by welding their component parts as described in copending application of Carl S. Wilken, Serial No. 735,163, filed March 17, 1947, now Patent No. 2,628,769 and assigned to the same assignee as this application, and with these wheels mounted in back to back relation as shown. The hubs 55 are mounted directly on the motor shaft 31 in

such manner that the motor and its supporting cage project through the inlet 21 and partly into the interior of the adjacent wheel portion 50. Since, therefore, the inlet 21 has less effective area than the inlet 23, it has been found desirable to construct the wheel with its two portions of correspondingly different size and capacity in order to obtain effective balance of the output of the wheel throughout its length, the wheel portion 51 being shown as substantially greater in axial length than the wheel portion 50.

The sizes of the two portions of the blower wheel are correlated in accordance with the desired proportions and capacity of the blower assembly as a whole. Considering each portion of the wheel as a single inlet wheel, preferred results in operation are obtained when the length of the wheel is approximately one-half its diameter, and since the inlet 23 is entirely open, the wheel portion 51 can be constructed to meet these proportions, satisfactory results having been obtained with this wheel portion approximately 4¼ inches in length and 7½ inches in diameter. Then if the inlet 21 is approximately 7 inches in diameter and the motor 30 is approximately 5⅝ inches in diameter, satisfactory balance is obtained with the wheel portion 50 of the same diameter as wheel portion 51 and approximately 3 inches in axial length, each wheel portion drawing air in through its own inlet and the disks 52 blocking the flow from one end of the wheel to the other.

The capacity of the motor 30 may be selected in accordance with the proportions of the blower wheel, and with the wheel of the dimensions given above and mounted directly on the motor shaft, highly satisfactory results have been obtained with a shaded pole motor 30. Such a motor has adequate starting torque to overcome the low starting inertia of the system, and since it has a drooping speed characteristic, i. e., the inherent characteristic of reduction in speed on increased load, it does not tend to overload and will drop in speed as resistance to the delivery of the air to the blower is reduced.

It will be noted that even though the motor 30 does extend partly through the inlet 21, the construction and arrangement of the assembly is such that the motor does not undesirably interfere with the proper flow of air through this inlet to the wheel portion 50. On the contrary, with the motor wholly supported on the housing by means of the cage unit of the construction described, the motor and inlet 21 define a substantially unobstructed annular passage 60 through the inlet which is entirely adequate to provide the proper supply of air to the wheel portion 50, since with the ribs 40 and brackets 42 formed of sheet metal and arranged radially of the motor as shown, the cage offers no appreciable resistance to air flow through this passage 60.

This arrangement provides materially improved operation as contrasted with conventional blower constructions wherein the supporting shaft for the blower wheel is mounted by means of brackets and bearings which extend radially across the outer end of the inlet. The maximum inward flow of air takes place around the outer portion of the inlet, i. e., in the area which is nearest to the blade portions of the wheel, and with conventional constructions wherein the supports for the shaft brackets extend across these areas of the inlet, these brackets tend to produce undesirable turbulence in the incoming flow of air. This effect is substantially absent from the con-

struction of the present invention, since the sheet metal brackets and ribs which support the motor offer no appreciable interference to the flow of air through the annular passage 60 which includes the areas of maximum air flow through inlet 21, and the inlet 23 is entirely open. In addition, the air entering through the inlet 21 flows along the surface of motor 30 and provides a highly desirable and efficient cooling effect for the motor.

This construction and arrangement of blower assembly also has the advantage of being highly compact as well as simple to fabricate and light in weight. The over-all dimensions of the assembly in height and width are substantially equal to the corresponding dimensions for the housing 10 alone, and the motor and its supporting cage project only a short way outwardly at one end of the housing. Furthermore, with the motor provided with the rubber cushioning members between itself and the socket portions of its supporting cage as described, there is minimum tendency for transmission of vibration between the motor and housing, and thus desirable silent operation is obtained.

Reference is made to my copending application Serial No. 132,931, filed December 14, 1949, and assigned to the same assignee as this application.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A blower assembly comprising a double inlet blower wheel, a partition within said wheel blocking the flow from one end thereof to the other, a housing for said wheel having inlets at each end thereof, a motor having a drive shaft, means supporting said wheel on said shaft with said motor extending into the adjacent end of said wheel in telescoping relation therewith, means secured to said housing for suspending said motor within one of said inlets with the center transverse plane through said motor substantially coinciding with the outer surface of said housing, said motor being of materially smaller diameter than said inlet to provide an annular passage for flow of air therethrough while leaving the other said inlet unobstructed, said partition being located at a greater distance from said unobstructed inlet than from said one inlet to provide greater capacity in the portion of said wheel adjacent said unobstructed inlet for effecting a substantially balanced output throughout the length of said wheel.

2. A blower assembly comprising a blower wheel, a housing for said wheel having an inwardly turned inlet in at least one end wall thereof, a motor of smaller diameter than said inlet located in said inlet and having a drive shaft, means supporting said wheel on said shaft, a supporting cage for said motor including socket portions receiving each end of said motor and ribs of sheet material arranged radially of said motor and connecting said socket portions, brackets of sheet material secured to said ribs at positions between the ends of said motor and extending radially outwardly from said ribs to offer minimum resistance to the flow of air through said inlet, and means for securing said brackets directly to said inlet to suspend said motor in said inlet while providing for inward flow of air through said inlet, said brackets being proportioned to locate said motor with at least substantially one-half the length thereof lying inwardly of said end wall of said housing.

3. A blower assembly comprising a double inlet blower wheel having a partition therein dividing the interior of said wheel into respectively larger and smaller sections, a housing for said wheel having inlets at each end thereof for said wheel sections, a motor located in the inlet for said smaller wheel section and of smaller diameter than said inlet, said motor having a drive shaft forming the support for said wheel within said housing, a supporting cage for said motor including socket portions receiving each end of said motor, brackets extending radially outwardly from said cage at positions spaced substantially equidistant the ends of said motor, means for securing said brackets directly to said housing with said motor extending through said inlet to suspend said motor in said inlet while providing for inward flow of air through said inlet and leaving the other said inlet unobstructed, and said larger wheel section being of greater capacity than said smaller sections to provide a substantially balanced output throughout the total length of said wheel.

4. A blower assembly comprising a double inlet blower wheel having a partition therein dividing the interior of said wheel into respectively larger and smaller sections, a housing for said wheel having inlets at each end thereof for said wheel sections, a motor located in the inlet for said smaller wheel section and of smaller diameter than said inlet, said motor having a drive shaft extending within said housing and forming the support for said wheel, a supporting cage for said motor including socket portions receiving each end of said motor and ribs of sheet material arranged outwardly and radially of said motor to connect said socket portions, resilient means interposed between said socket portions and said motor to damp transmission of vibration from said motor to said cage, brackets extending radially outwardly from said ribs at positions substantially equidistant said socket portions to offer minimum resistance to the flow of air through said inlet, and means for securing said brackets directly to said housing to suspend said motor within said inlet while providing for inward flow of air throughout said inlet while leaving the other said inlet unobstructed, said larger wheel section being of greater axial length than said smaller section to provide a substantially balanced output throughout the total length of said wheel.

5. A blower assembly comprising a double inlet blower wheel, a housing for said wheel having inlets at each end thereof for said wheel, a motor located in one of said inlets and of smaller diameter than said inlet to leave an annular clearance thereabout through said inlet, said motor having a drive shaft forming the support for said wheel within said housing, a supporting cage for said motor including socket portions receiving each end of said motor and three ribs of sheet material extending radially outward of said motor in connecting relation with said socket portions, brackets of sheet material extending radially outwardly from said cage at positions spaced between the ends of said motor, means for securing said brackets directly to said housing with said motor extending through said inlet to suspend said motor in said inlet and with

said brackets and said ribs lying in planes parallel with the axis of said motor to provide minimum resistance to flow of air through said annular passage to the interior of said wheel.

6. A blower assembly comprising a double inlet blower wheel, a housing for said wheel having inlets at each end thereof for said wheel, a motor located in one of said inlets and of smaller diameter than said inlet, said motor having a drive shaft extending within said housing and forming the support for said wheel, a supporting cage for said motor including socket portions receiving each end of said motor and ribs of sheet material arranged outwardly and radially of said motor to connect said socket portions while offering minimum resistance to the flow of air through said one inlet, resilient means interposed between said socket portions and said motor to damp transmission of vibration from said motor to said cage, brackets extending radially outwardly from said ribs and formed of sheet material lying in planes parallel with the axis of said motor to offer minimum resistance to the flow of air through said inlet, and

means for securing said brackets directly to said housing to suspend said motor within said inlet while providing for inward flow of air throughout said inlet and leaving the other said inlet unobstructed.

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