Sept. 5, 1967

F. K. BAYLESS

3,339,867

MOTOR MOUNT

Filed June 28, 1966

2 Sheets-Sheet 1

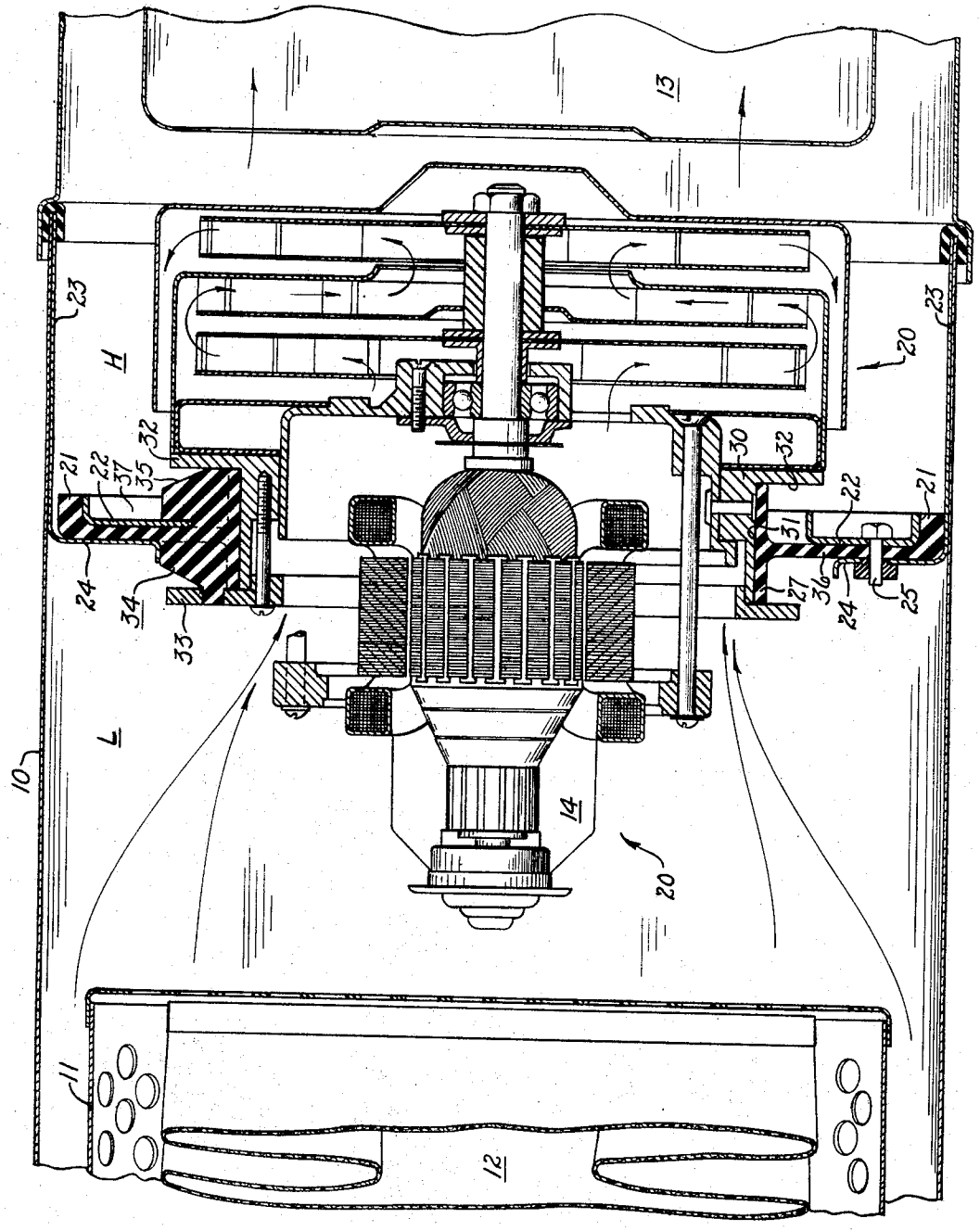


Fig. 1

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Fig. 2

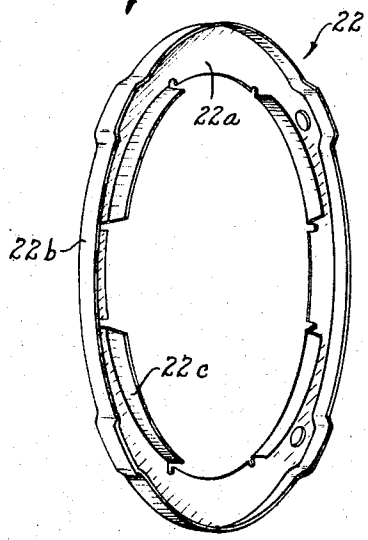


Fig. 4

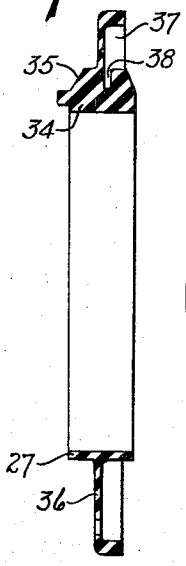


Fig. 3

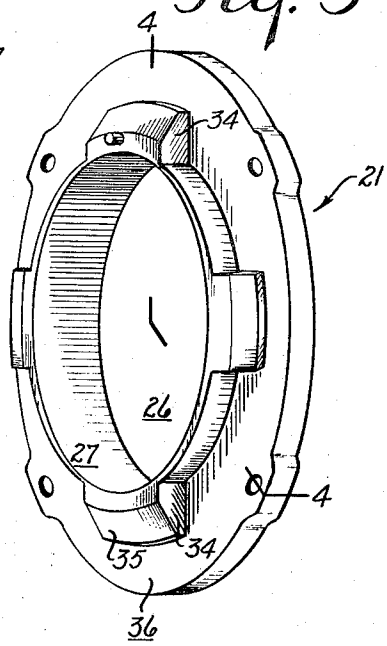


Fig. 5

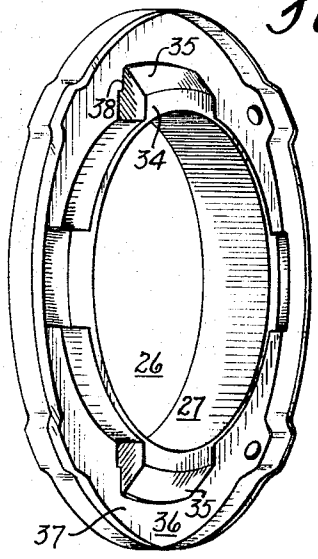
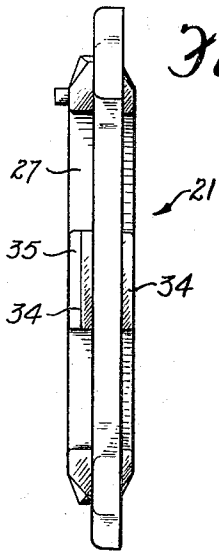


Fig. 6



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United States Patent Office 3,339,867
Patented Sept. 5, 1967

3,339,867

MOTOR MOUNT

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Filed June 28, 1966, Ser. No. 561,245
7 Claims. (Cl. 248—2)

My invention relates to vacuum cleaners, and in particular means for mounting the motor-fan, or blower unit of a vacuum cleaner, in which the mount also provides an air seal to prevent air recirculation between the incoming and outgoing sides of the blower unit.

A vacuum cleaner according to the invention comprises an elongated tank or housing in which a blower unit is axially mounted in spaced relation with the surrounding wall of the tank. Ideally the motor mount must hold the blower unit in position but allow some freedom of movement and minimize axial, radial, torsional or other movement of the unit with reference to the housing, dampen vibration between the motor and housing, and absorb the noise associated with these vibrations, and also protect the blower unit under abnormally severe conditions imposed if the vacuum cleaner is dropped.

In addition a seal must be provided between the motor-fan unit and the adjacent wall of the housing to maintain a differential pressure across the fan and thereby obtain maximum airflow and operating efficiency of the fan.

A blower unit mount and seal is known from U.S. Patent No. 2,973,895. The mount and seal according to said patent satisfactorily supplies the mounting and sealing functions required, but has the disadvantage that it is difficult, and therefore, expensive, to manufacture.

Accordingly one object of my invention is to provide a motor mount for the blower unit of a vacuum cleaner which performs the ideally desired functions in good measure.

Another object of the present invention is to provide a mount and seal for a blower unit of a vacuum cleaner which is simple to manufacture, and therefore inexpensive, and still provides the required mounting and sealing functions.

A further object of the invention is to provide a motor mount and seal for the blower unit of a vacuum cleaner which can be consistently and reliably formed, and readily removed from a mould of simple configuration.

Another object of the invention is to provide a mount and seal for the blower unit of a vacuum cleaner which consists of a minimum number of parts that are readily assembled to form a composite mount, which in turn is quickly and simply united with the frame of the blower unit.

Further objects and advantages of the invention will be apparent from the following detailed description of a presently preferred embodiment illustrated in the accompanying drawing in which:

FIG. 1 is a partial cross-sectional view of a vacuum cleaner assembly having a motor-fan unit and mounting-seal means according to the invention;

FIG. 2 is a perspective view of a metallic suspension ring of the mount-seal means according to the invention;

FIG. 3 is a perspective view of the motor mount of the mounting-seal means according to the invention;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is a perspective view of the motor mount illustrated in FIG. 3, showing the other side thereof;

FIG. 6 is a side elevation of the motor mount shown in FIGS. 3 and 5.

The assembly shown in FIG. 1 comprises a vacuum cleaner housing **10** which is axially elongated and may

be cylindrical, oval or rectangular in cross-section. The left hand end of the housing **10**, as seen in the figure, contains a perforated canister **11** for a dust bag **12** which is a well known arrangement. Air is drawn into the housing **10** through the dust bag by the motor-fan unit generally designated **20** and discharged through an outlet **13** to atmosphere.

The blower unit **20** includes a motor and a two stage centrifugal blower mounted in an open frame member **14** of known construction. As indicated by the arrows in FIG. 1, air which has been drawn through an inlet (not shown) and cleaned as it passes through the filter bag, is passed over the field windings and commutator of the motor of the blower unit for cooling purposes. This airflow is created by a driven first stage fan, a bladed stationary inward air guide and a driven second stage fan as more fully described in the above noted patent.

The blower unit **20**, including the frame **14**, is mounted in the housing **10** by a motor mount assembly including a motor mount **21** (FIGS. 3 to 6) and a suspension ring **22** (FIG. 2). The motor mount assembly is secured to the housing **10** by a bulkhead member having a skirt portion **23** and an inwardly directed flange **24**. The bulkhead skirt **23** is fixedly attached to the housing **10** in an airtight manner by any suitable means, for example by a plurality of spaced welds. It is noted that the configuration of the bulkhead skirt **23** is the same as the housing **10** i.e. cylindrical, oval, or rectangular, to obtain a close fit all around. The bulkhead flange **24**, the motor mount **21** and suspension ring **22** are united by a plurality of bolts **25** extending through appropriate openings provided in each of these members (the flange **24**, mount **21** and ring **22**).

The frame **14** of the blower unit **20** incorporates a seat **30** having a circular surface **31**, and an inner flange **32** which is preferably made integral with the seat. This inner flange **32** extends radially outwardly from the surface **31**. A ring **33** is attached, by suitable bolts, to the seat **30** opposite the flange **32** so that an annular well is formed for receiving the motor mount **21**.

In order to facilitate the further description of FIG. 1, the parts of the motor mount shown in FIGS. 2–6 will now be described in detail.

The suspension ring **22**, shown in perspective in FIG. 2, consists of an annular metal, preferably steel plate **22***a* which is rigidified by an integral peripheral flange **22***b* and a plurality of discrete internal flanges **22***c*. The space between the discrete flanges **22***c* is adapted to receive the blocks **34** of the motor mount **21**. Referring to FIGURES 2 and 4, the suspension ring **22** is nested within the recess **37** as best seen in FIG. 1. In each block **34** of the motor mount **21** a slot **38** is provided for receiving the plate **22***a*. The purpose of this construction will be explained hereinafter.

Referring now to FIGS. 3 to 6; the motor mount **21**, consisting of rubber or like elastomeric material, has a central opening **26** defined by a cylindrical portion **27**. A plurality of discrete blocks **34** extending radially outwardly from the cylindrical portion **27** are the load carrying members of motor mount **21**. Each block **34** has an inclined or tapered surface **35** on both the front and rear face of the mount **21** as shown in FIGS. 3 and 5. As best seen in FIG. 4, each block is slotted at **38**. The slots **38** extend throughout the length of the blocks **34** in a circumferential direction. The slots **38** are located approximately midway between the front and rear face of each block and extend to a depth approximately in the horizontal plane of symmetry of each block so that a plane of shear is located at about the center of mass of each block for purposes which will be explained more fully hereinafter. The skirt portion **36** of the motor mount is provided for preventing air recirculation around the blower unit as will be explained later also.

The skirt **36** terminates at its outer edge in a bead or enlarged axially extending flange which keeps the flange **36** radially extended so that it cannot creep inwardly between bulkhead flange **24** and ring **22** and thereby breaks the seal between low pressure chamber L and the higher pressure chamber H.

Referring again to FIG. 1, it will be apparent from the foregoing that the motor mount **21** fits onto the seat **30** overlying the surface **31**. In order to consistently obtain a reliable airtight seal over the surface **31**, the O.D. of surface **31** is made slightly larger than the diameter of the opening **26** of the motor mount **21**. As a result a tight fit is obtained betwen the surface **31** of the seat **30** and the motor mount **21**. No air can be passed between the motor mount and the seat of the blower unit frame since the cylindrical portion **27** of the motor mount is secured in airtight relation with the surface **31** of seat **30** over 360°.

During normal operation of the blower unit unavoidable vibrations emanating from various sources within the unit, which may be amplified, or create resonant conditions, are transmitted to the frame **14**. The resultant forces acting on the frame cause slight movement of the blower unit in yaw and/or along the longitudinal axis of the housing. These movements are transferred, through the frame **14** and seat **30**, to the mounting blocks **34**. By virtue of the ring **22**, which is embedded in the blocks **34**, these movements cause the mounting blocks to be placed in shear. It is well known that rubber and like resilient materials, absorb vibrations more effectively when placed in shear than when placed in compression or tension. Further, even though the blower unit moves slightly relative to the housing **10**, there is no relative movement between the blower unit, or its frame **14**, and the motor mount **21** because the blocks **34** are firmly held between the plate **33** and flange **32**.

If the vacuum cleaner is accidentally dropped on one of its ends the resultant shock force or load will be transmitted from the housing **10** through the bulkhead flange **24** and suspension ring **30** to the mounting blocks **34**. Again the blocks will be placed in shear by virtue of ring **22** embedded in the blocks **34**. In addition, as the surface **35** of the blocks abut against the flange **32** (or ring **33**) a complementary, gradually increasing shock absorbing compression of the block takes place to protect the blower unit and mounting assembly. From FIG. 1, it will be clear that even under the most severe conditions, the inner end of the ring **22** cannot escape from the well defined by the seat **30** and the associated flange **32** and ring **33**. Furthermore, the flange **32** and ring **33** form a limit stop to prevent excessive movement of the blower unit i.e. movement which would cause the blower unit to engage the exit end **13** of the housing or the dust bag canister **11**. It will be apparent from the above that the integrity of the assembly illustrated in FIG. 1 is ensured under abnormally severe conditions and under normal operating conditions a highly effective vibration absorbing mount is provided.

The depth of slots **38** in the motor mount blocks **34** is preferably extended to the plane defined by the intersection of the flange **32** and ring **33** with the tapered surface **35**. It is also preferred that the tapered surface **35** extends for approximately one-half of the height dimension of the blocks which is the same for each of them. The angle of inclination of surfaces **35** is chosen to provide a small degree of movement of the blower unit.

As stated above the motor mount **21** also provides a seal to prevent air recirculation between the high pressure chamber H of the housing **10** and the low pressure chamber L created during operation of the blower unit. The seal between the bulkhead skirt **23** and housing **10**, and the blower unit frame seat **30** and cylindrical portion of the mount **21** have already been noted. A further seal is provided by clamping the skirt **36** of the motor mount between the suspension ring **22** and the bulkhead flange **24**. The clamping force required for this purpose is supplied by bolts **25** supplemented by the rigid characteristics of the ring **22** and bulkhead flange **24** provided by the associated flanges.

It will be apparent from FIGS. 3 to 6 that the motor mount **21** does not have any undercuts or opening at an angle to the direction of removal of the piece from a mould or which require careful application of the raw material to the mould. The slots in the mounting blocks do not present any problem because they are relatively shallow and the inclined surface of the blocks allows the block to be readily deformed to open the slot during removal of the piece from the mould. Therefore the motor mount can be reliably formed and removed from a mould of conventional shape which is inexpensive to manufacture.

From the above description of the invention it will be apparent also that a motor mount and seal are provided with a minimum number of parts which are readily assembled on the frame of the blower unit and this subassembly is quickly and easily attached to the bulkhead flange of the vacuum cleaner housing.

The foregoing description of my invention is given by way of illustrating a presently preferred embodiment thereof. However, the foregoing is not intended to limit the scope of the invention defined by the subjoined claims or to limit use of the invention to vacuum cleaners.

What is claimed is:

1. Apparatus comprising a motor mount consisting of resilient material having an axially extending cylindrical portion defining a central opening, a plurality of discrete radially outwardly projecting mounting blocks integral with said cylindrical portion, said mounting blocks extending over a portion of the circumference of said cylindrical portion and being substantially axially coextensive with said cylindrical portion, a radially extending annular skirt member integral with both said cylindrical portion and said mounting blocks, each said mounting block having a slot therein, each said slot extending radially inwardly of said mounting blocks; a suspension ring having an annular radially extending flange in side by side abutting relation with said skirt portion, said suspension ring flange being received in said slots for placing said blocks in shear when said suspension ring and motor mount are moved relative to one another in an axial direction tending to separate said ring and mount.

2. The apparatus according to claim **1** in combination with a blower unit having a frame member, said frame member including a seat having a circular outer surface, said surface having a diameter greater than the diameter of said central opening, said seat being received in said central opening whereby an airtight seal is formed between said outer surface of the seat and the cylindrical portion of said motor mount defining said central opening.

3. Apparatus according to claim **2** wherein said seat comprises a pair of radially outwardly extending flange members contiguous with said outer circular surface at each side thereof defining an annular well; said mounting blocks engaging each said flange member over at least a part of the radial extent of said annular well, said mounting blocks having a surface inclined away from each said flange member and progressively spaced therefrom, said flanges providing a limit stop against movement of said mounting block a distance greater than the width of the space defined by said inclined surface and the adjacent flange member.

4. Apparatus according to claim **3** with the addition of an elongated vacuum cleaner housing member, said housing member having a bulkhead member attached to the inner surface of said housing member, said bulkhead member having a radially inwardly extending bulkhead flange portion; said annular skirt portion of the motor mount abutting said bulkhead flange at one side thereof, means for clamping said skirt between said one side of

the bulkhead flange and said suspension ring on the side of said skirt opposite said bulkhead flange whereby said skirt defines an annular airtight joint between said ring and bulkhead flange; said blower unit being suspended in said housing axially thereof by said motor mount and said motor mount defining a seal between said housing member and said blower unit for preventing air recirculation between said member and unit.

5. Apparatus according to claim 1 wherein said slot extends into said mounting block a distance substantially equal to one-half of the corresponding dimension of said block.

6. Apparatus according to claim 3 wherein said slot extends into said mounting block a distance substantially equal to the vertical height of said inclined surface.

7. An article of manufacture according to claim 1 wherein said motor mount consists of rubber material

configured by moulding, said cylindrical portion being axially elongated; said mounting blocks having an inclined surface at each side thereof, said inclined surfaces being spaced from said cylindrical portion in the radial direction of said motor mount; said slots extending into each said mounting block a distance substantially equal to the vertical dimension corresponding with said inclined surfaces.

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