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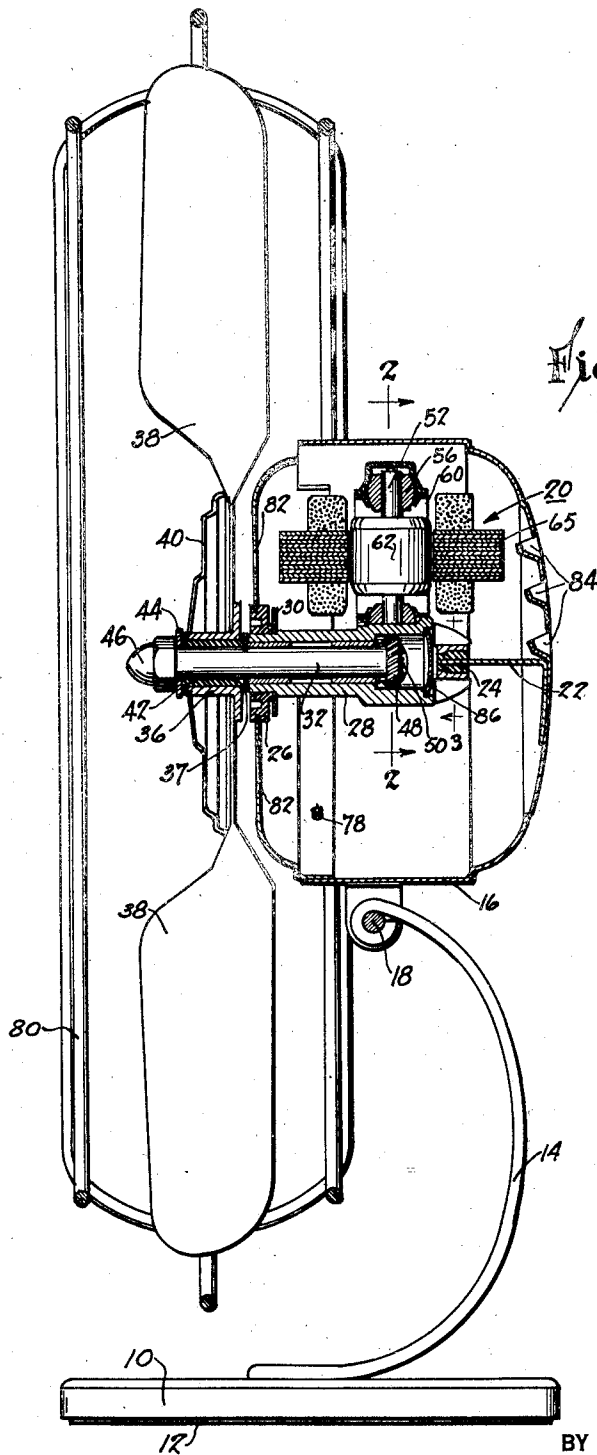
M. A. SMITH, JR

2,098,407

VENTILATING FAN

Filed June 8, 1936

2 Sheets-Sheet 1



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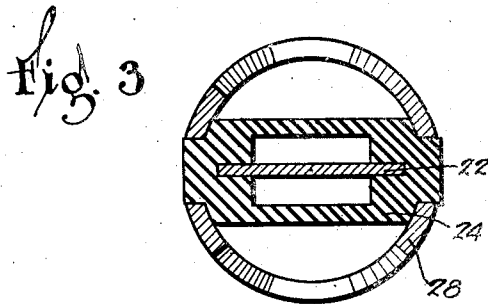
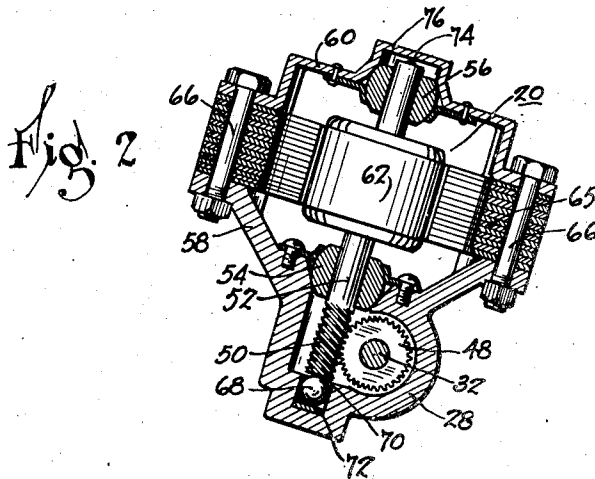
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VENTILATING FAN

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Application June 8, 1936, Serial No. 84,012

7 Claims. (Cl. 230—272)

This invention relates to fans and more particularly to a ventilating fan adapted particularly for use where a quiet running vibrationless fan is required.

It has been found in the commercial development of ventilating equipment that vibration and noise of the driving motor are amplified by the fan blades and are transmitted to the framework of the fan, whereupon undesirable results are obtained.

An object of this invention is therefore to provide a ventilating fan wherein the driving motor is resiliently suspended in the supporting casing, and the driving shaft of the fan is separated from the fan blades by resilient means interposed between the blades and the shaft.

Another object of the invention is to provide a fan driving means comprising a spiral gear fixed to the fan shaft adapted to be driven by a worm carried on one end of the motor shaft.

A further object is to provide self-aligning bearings to support the motor shaft which may be readily adjusted to position a worm carried by the motor shaft in proper operative relation with a spiral gear carried by the fan shaft.

Another object is to provide anti-friction thrust-absorbing means adapted to restrain the driving shaft in both directions.

A still further object is to provide a novel thrust bearing for supporting the weight of the motor rotor and the end thrust of the worm on the motor shaft, comprising a ball interposed between one end of the motor shaft and a hardened disc positioned in a socket of slightly larger diameter than the ball whereupon the ball may roll on a small radius thereby minimizing wear of the parts.

A further object is to provide a novel thrust absorbing support to absorb thrust developed when the fan is being decelerated, comprising a small conical point on the upper end of the motor shaft adapted to engage a flat bridge positioned adjacent the end of the driving shaft.

Yet a further object is to provide a worm driven fan wherein the center of gravity of the driving motor is suspended directly above the fan shaft.

A further object is to provide novel means for lubricating the worm and pinion driving gear mechanism.

A further object is to provide resilient driving means between the fan shaft and the fan blades.

Yet a further object of the invention is to provide a novel vibration absorbing support between the motor housing of the fan and the support thereof.

Another object of the invention is to provide a ventilating fan of improved design which may be manufactured economically.

A further object is to provide a fan having a rectangular-shaped resilient support which is of

the same width as the fan when viewed in side elevation to facilitate packaging the fan.

Other objects and advantages of this invention will appear from the following detailed description considered in connection with the accompanying drawings submitted for purposes of illustration only, and not intended to define the scope of the invention, reference being had for that purpose to the subjoined claims.

In the drawings, wherein similar reference characters refer to similar parts throughout the several views:

Figure 1 is a side elevation, partly in section of a ventilating fan embodying the present invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1; and

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Referring more particularly to Figure 1, there is shown for purposes of illustrating this invention a ventilating fan having a rectangular-shaped base 10 including cushioning member 12. A resilient strip 14 of metal or other suitable material is fixed to the base 10 and supports a motor casing 16. The fan may be clamped at any desired angle with reference to the base 10 by means of a clamping bolt 18. A driving motor 20 is resiliently supported within the casing 16 at one end by means of a metallic strip 22 spot-welded to the casing 16 at one end, and embedded in resilient supporting material 24 secured to the end of the motor. The other end of the motor is resiliently supported in the casing 16 by means of a resilient grommet 26, which engages the outer end of a shaft housing 28 having a washer 30 at the outer end thereof in contact with the inner portion of the grommet 26 to prevent the motor from moving forward in the casing 16.

The housing 28 receives a shaft 32, to which a fan hub 36 is fixed. A plurality of fan blades 38 are welded or otherwise secured to the hub 36. A shield 40 engages the forward end of the hub 36, and is spun into contact with the blades 38 as shown.

A resilient bushing 42 interposed between the fan hub 36 and the shaft 32 is longer than the hub 36, and is adapted to be compressed between a washer 44 and a washer 37 carried by the shaft 32 when a nut 46 is threaded to the shaft 32. Vibration absorbing means are thus interposed between the shaft 32 and the fan blades 38.

The other end of the fan supporting shaft 32 is provided with a straight cut spiral gear 48 adapted to mesh with a worm 50 formed on a motor shaft 52. The shaft 52 is mounted in self-aligning bearings 54 and 56 supported in a housing 58 and a bearing bracket 60 respectively. A motor rotor 62 is carried by the shaft 52 between

the bearings 54 and 56. The rotor is surrounded by the motor stator 65 interposed between the housing 58 and the bearing bracket 60. The bearing bracket 60 is bolted to the housing 58 by means of bolts 66 projecting through the motor stator 65 and the bearing bracket 60. The axis of the motor shaft 52 may be moved slightly to position the worm 50 in proper driving relation with the spiral gear 48 by slight movement of the bearing bracket 60 with reference to the housing 58.

The lower end of the shaft 52 rests upon a ball 68 positioned in the socket 70 formed in the housing 58. The socket 70 is slightly larger in diameter than the ball 68 and is provided with a flat hardened disc 72 upon which the ball 68 may roll on a short radius when the shaft 52 revolves. The friction torque due to the driving mechanism is reduced to a minimum because the ball 68 is permitted to roll around a circle of small radius between the end of the shaft 52 and the hardened disc 72.

The upper end of the shaft 52 is provided with a small conical point 74 adapted to engage a flat metallic bridge 76 carried by the bearing bracket 60 to absorb the thrust transmitted to the shaft 52 when the fan is being decelerated, during which time the blades 38 drive the motor 20.

The casing 16 may be formed in two sections as shown, fixed together by means of self-tapping sheet metal screws 78. The screws 78 may also fix a fan blade guard 80 to the casing 16.

The casing 16 is provided with ventilating louvers 82 and 84 to permit a free flow of air through the motor assembly to adequately cool it.

The operation of this device is as follows.

When the motor 20 is started the shaft 52 drives the shaft 32, supporting the fan blade 38, through the worm 50 and the spiral gear 48. The downward thrust of the shaft 52 is absorbed by the ball 68 interposed between the end of the shaft 52 and the hardened disc 72 thereby minimizing the friction in the driving mechanism.

As previously indicated the blades 38 are insulated from the shaft 32 by the resilient bushing 42, and the motor 20 is insulated from the casing 16 by the resilient grommet 26 and the resilient support 24. A vibrationless, quiet running fan is thus procured. When the fan is decelerated the shaft 52 is driven by the blade supporting shaft 32, whereupon the shaft 52 moves upwardly in the housing 56, and the conical point 74 engages the bridge 76 to absorb the thrust transmitted thereto without excessive friction.

It will be observed that the driving mechanism including the worm and gear, and the thrust resisting mechanism is housed within a single chamber, which may be packed with lubricant and sealed by a welch plug 86.

The fan may be mounted on the wall by removing the bolt 18 and reversing the position of the resilient strip 14 with reference to the casing 16.

While the invention has been described with particular reference to a preferred embodiment thereof, it is to be understood that many changes may be made in the specific construction without departing from the spirit of the invention as defined by the following claims.

I claim:

1. A fan having a driving motor including a driving shaft, a substantially horizontal supporting shaft projecting below said motor at right angles to the driving shaft in one plane and at an

angle in another plane and so constructed and arranged that the center of gravity of the motor is positioned directly above the supporting shaft, driving means between the driving and supporting shafts, a bladed fan resiliently supported on the supporting shaft, a casing surrounding the motor, and resilient means supporting the motor in the casing.

2. In a ventilating fan, a casing, a horizontal tubular support resiliently mounted at each end in said casing, a fan shaft journaled in said support and carrying a bladed fan exteriorly of the casing, and means for driving said shaft comprising a motor supported solely by said tubular support within said casing and having a driving shaft connected with the fan shaft.

3. In a ventilating fan, a casing, a horizontal tubular support resiliently mounted at each end in said casing, a fan shaft journaled in said support and carrying a bladed fan exteriorly of the casing, and means for driving said shaft comprising a motor positioned above said shaft with the center of gravity thereof aligned vertically with the fan shaft, said motor being supported solely by the tubular support within said casing and having a driving shaft connected with the fan shaft.

4. A fan comprising a supporting member, a substantially horizontal fan shaft rotatably carried by said supporting member, a bladed fan carried by said fan shaft, a motor including a driving shaft drivably connected to said fan shaft, means mounting the motor on said supporting member and so constructed and arranged that the center of gravity of the motor is directly above the axis of the fan shaft.

5. A fan comprising a supporting member, a substantially horizontal fan shaft rotatably carried by said supporting member, a bladed fan carried by said fan shaft, a motor including a driving shaft drivably connected to said fan shaft, means mounting the motor on said supporting member and so constructed and arranged that the center of gravity of the motor is directly above the axis of the fan shaft a casing surrounding the supporting member and motor, and resilient means mounting the supporting member in the casing.

6. A fan comprising a supporting member, a substantially horizontal fan shaft rotatably carried by said supporting member, a bladed fan carried by said fan shaft, a motor mounted solely on said supporting member and drivably connected to the fan shaft, a casing surrounding the supporting member and motor, and resilient means adjacent the ends of said fan shaft for resiliently mounting the supporting member in the casing.

7. A fan comprising a supporting member, a fan shaft rotatably carried by said supporting member, fan blades mounted on said shaft at one end, a gear fixed to the shaft adjacent its other end, a motor housing rigidly carried by said supporting member, a bearing bracket adjustably secured to said housing, self-aligning bearings carried by said housing and bracket, a motor rotor journaled in said bearings, a gear member carried by said rotor for meshing with said first named gear, said bracket being so constructed and arranged that adjustment thereof relative to the housing will position said gear member in proper meshing relation to the gear on the fan shaft.

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