May 22, 1956 L. L. ALLDRITT ET AL 2,746,674

VENTILATING FANS

Filed Dec. 23, 1953 3 Sheets-Sheet 1

Fig. 1.

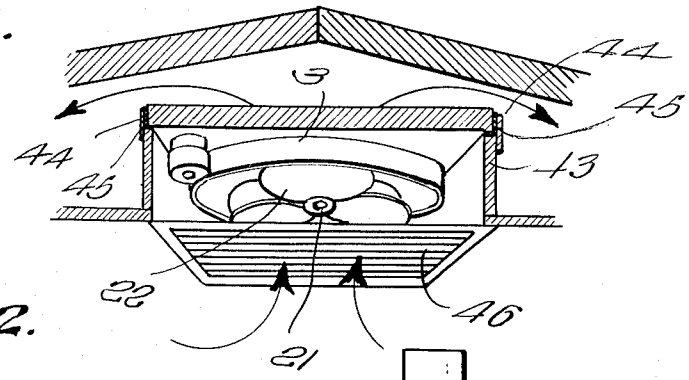


Fig. 2.

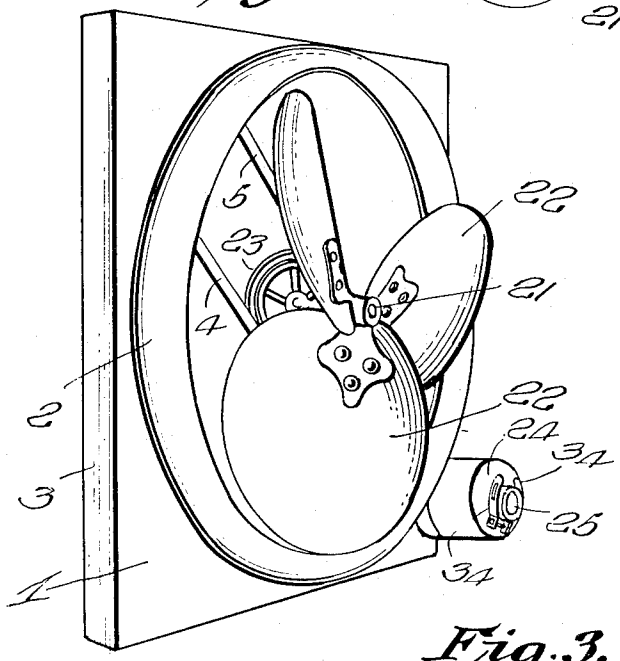


Fig. 4.

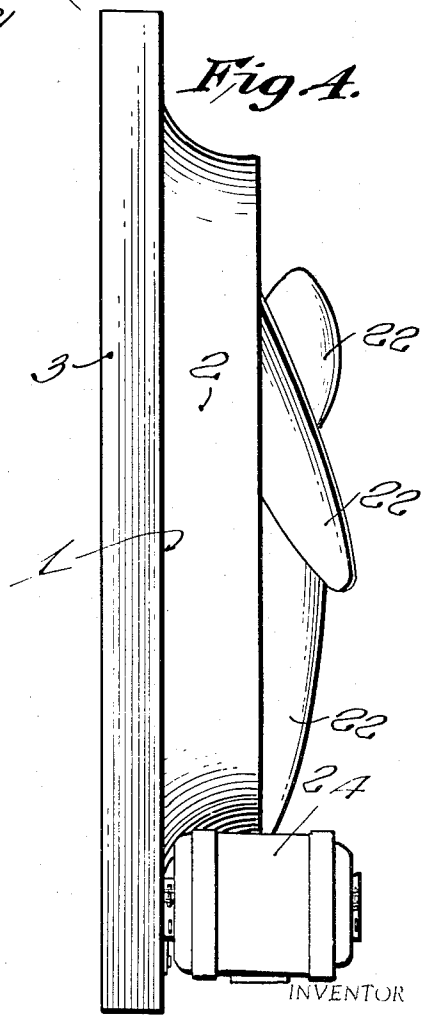
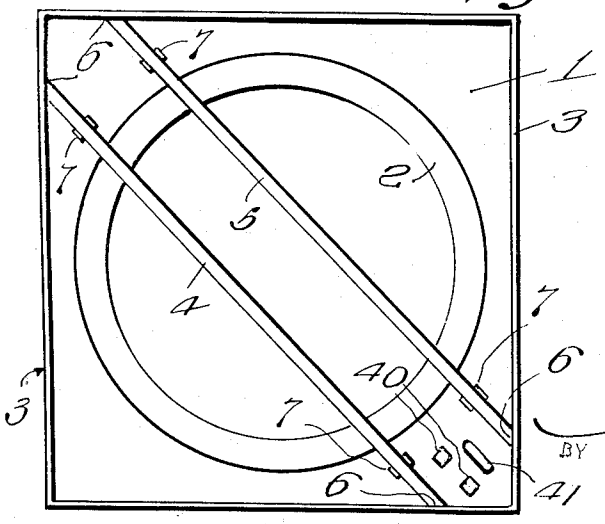


Fig. 3.



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VENTILATING FANS

Filed Dec. 23, 1953 3 Sheets-Sheet 2

Fig. 5.

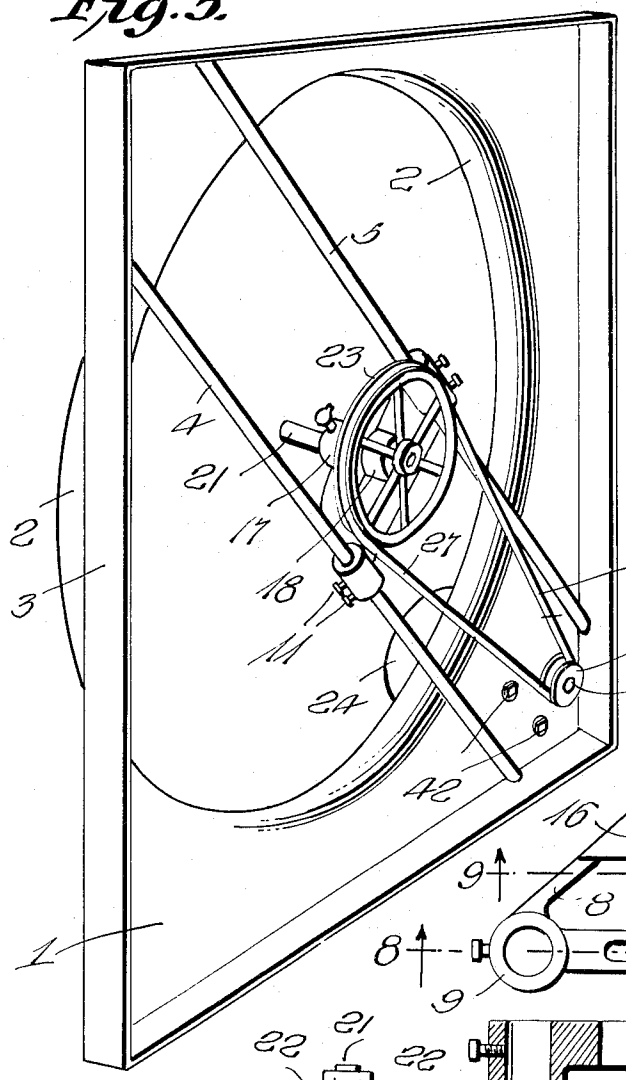


Fig. 10.

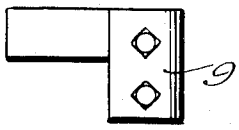


Fig. 11.

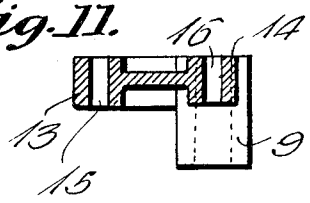


Fig. 9.

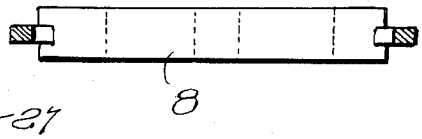


Fig. 7.

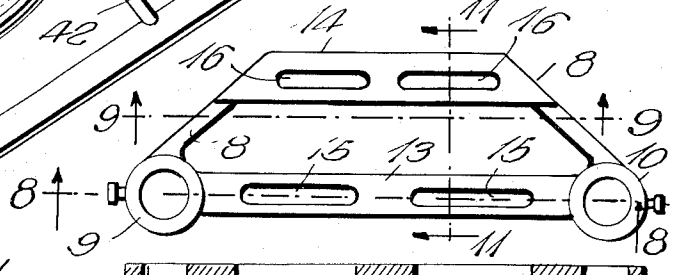


Fig. 8.

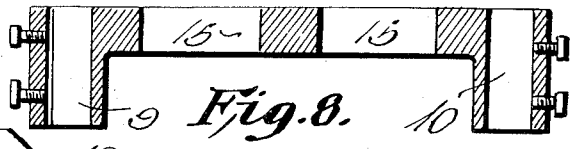
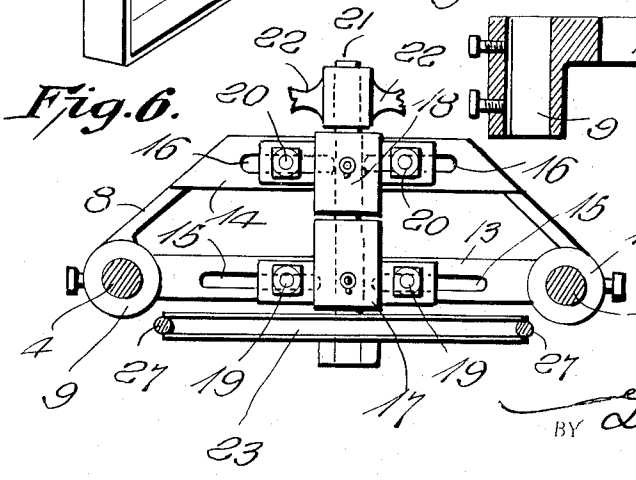


Fig. 6.



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May 22, 1956 L. L. ALLDRITT ET AL 2,746,674

VENTILATING FANS

Filed Dec. 23, 1953 3 Sheets-Sheet 3

Fig. 12.

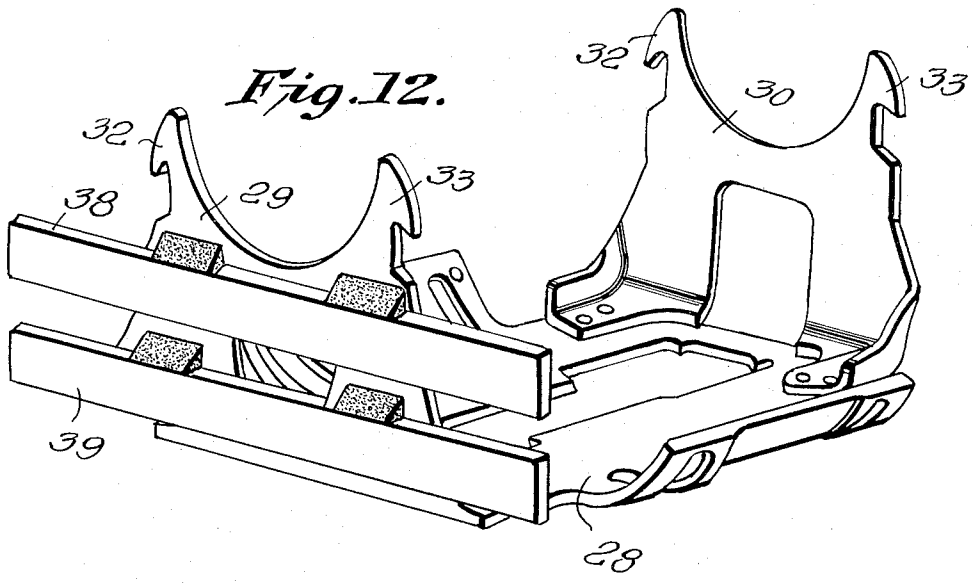
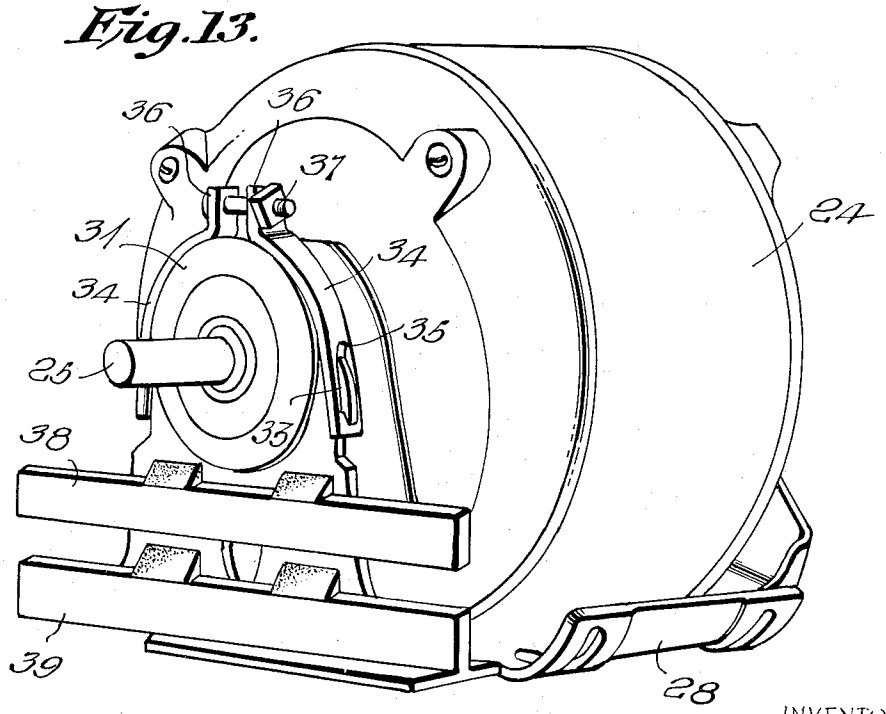


Fig. 13.



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VENTILATING FANS

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Application December 23, 1953, Serial No. 399,929

7 Claims. (Cl. 230—259)

Our invention relates to ventilating and cooling fans, and particularly to belt driven fans intended and adapted for attic and wall mounting, in residences and office buildings and factories and other buildings, both of frame and masonry construction.

An object of our invention is to provide a fan structure for ceiling or attic or wall installation, which has a supporting and mounting structure of compact form and arrangement, thus requiring a minimum of space and depth of wall or frame for installation, so that the fan assembly can be almost completely encompassed within the thickness of an average wall of a frame or masonry house, and that in attic installations a minimum space will be required and the fan can be mounted to hang down inside of the joists instead of resting upon and projecting above the joists.

A further object is to so construct the fan and mounting that the parts are substantially balanced to distribute any strain from the fan and motor mounting and the drive belt therebetween.

Still another purpose is to provide for adjustments such as may be necessary in particular installations, so that the fan can be balanced and will operate with minimum vibration, and will permit installation on the inside of a wall or ceiling shutter, either manually or automatically operated, with the blade away from the shutter so that noise is minimized by the fan blades being in too close to the shutter.

Another purpose is to provide a fan and mounting structure which is simple to install and with which all parts can be readily reached for servicing and the like.

With the above and other objects in view, some of which will be apparent to those skilled in the art, and others of which are inherent in the construction and installation and use, our invention includes certain novel features of construction and assembly which will be hereinafter set forth in connection with the drawings.

In the drawings:

Figure 1 shows a broken-away view disclosing our invention mounted in a ceiling and attic installation.

Fig. 2 is a view in perspective showing the fan and mounting from the exhaust side.

Fig. 3 is an elevational view looking at the intake side of the mounting structure.

Fig. 4 is a view in edge elevation showing the fan and mounting structure.

Fig. 5 is a view from the intake side showing the mounting and drive structure with the fan removed.

Fig. 6 is a sectional view to better show the fan mounting bearing.

Fig. 7 is an elevational view of the fan supporting structure.

Fig. 8 is a sectional view substantially on line 8—8 of Fig. 7.

Fig. 9 is a sectional view substantially on line 9—9 of Fig. 7.

Fig. 10 is a view in end elevation of the showing in Fig. 7.

Fig. 11 is a transverse sectional view substantially on line 11—11 of Fig. 7.

Fig. 12 is a view in perspective illustrating a motor mounting bracket structure.

Fig. 13 is a view in perspective of the motor mounting bracket illustrating a motor held in place thereby.

A supporting frame structure has a front plate 1 which is substantially rectangular in outline, and is provided with a fan opening at its center, a venturi-ring 2 being turned outwardly around the fan opening. A marginal flange 3 is provided entirely around the marginal edge of the front plate, the venturi-ring projecting on the discharge side of the mounting structure and the flange 3 being disposed in the intake side. Supporting rods 4 and 5 are secured diagonally across the central opening of the plate 1, preferably on the intake side and in spaced apart relation, as perhaps best shown in Fig. 3. These rods are welded or otherwise secured, as at 6, at their ends to the flange structure 3 and are also preferably welded or rigidly secured, as at 7, to the face of the front plate so that a substantially rigid construction and mounting is accomplished, the purpose being to avoid possibility of vibration and to eliminate noise.

A fan supporting mounting 8 is provided with sleeve portions 9 and 10 which are slidably fitted upon the supporting rods 4 and 5, before these rods are secured in place, and set screws 11 and 12 are provided so that this fan supporting mounting can be rigidly secured upon the supporting rods when adjusted to a desired centering position with respect to the opening through the venturi-ring 2. The fan supporting mounting has a crossbar portion 13 extending substantially straight across between the bearing sleeves 9 and 10, and an offset crossbar portion 14 is spaced somewhat from the crossbar portion 13 on the side of the front plate within the venturi-ring 2. These two crossbar portions have bearing edged faces thereof in substantially the same plane, and crossbar portion 13 has bolt receiving slots 15 therethrough while crossbar portion 14 is provided with bolt receiving slots 16. Fan shaft bearings 17 and 18 are provided to be fitted upon the flanged faces of the crossbar portions 13 and 14, and are adjustably held in place thereon by clamp bolts 19 and 20 passed through the slots 15 and 16.

Fan shaft 21 is fitted through bearing openings of the fan shaft bearings, and a fan 22 is mounted on one end of this shaft 21 within the confines of the opening of the venturi-ring 2. This fan can have two or three or more blades and the blades are angled or pitched so that they are encompassed substantially within the depth of the venturi-ring.

By making the fan supporting mounting 8 adjustable on the supporting rods 4 and 5, and then adjustably mounting the fan shaft bearings 17 and 18 on the cross-bar portions 13 and 14, it is possible to accurately adjust the fan shaft bearings so that the fan shaft rotates substantially axially within the opening of the venturi-ring, and thus the fan can be centered and adjusted to very accurate positioning and to a substantially centered and balanced mounting within the venturi-ring and the supporting structure. Obviously, this balanced mounting will prevent or minimize vibration of the parts and will prevent noise when the fan is rotated. Further, this accurate balance will relieve strain upon the parts and will cause a substantially dynamic balancing of the fan structure so that this will operate most efficiently and without undue wear or strain upon the parts.

On the opposite end of the fan shaft 21, a drive belt pulley 23 is fixed. Of course, the fan shaft bearings 17 and 18 can be provided with lubricating cups or can be equipped with ball or roller bearings, and can be made in substantially any desired and approved manner. When

the fan shaft 21 is being rotated the fan 22 will cause endwise movement or pressure and any suitable provision can be made for a thrust bearing or for otherwise compensating for this end thrust upon the shaft 21 and associated parts.

With the parts mounted and associated in the manner set forth, the structure is very compact as the fan 22 is substantially positioned within the venturi-ring structure, and although the leading edges of the blades may project slightly, this does not add materially to the overall thickness of the assembly. The fan supporting mounting 8 is compact and yet gives rigid support for the fan, and the drive belt pulley 23 is located closely adjacent to the supporting rods 4 and 5, and the parts are well within the depth of the marginal flange 3. As has been stated, the fan supporting mounting 8 can be bodily moved along the supporting rods 4 and 5, and the fan shaft bearings 17 and 18 can be adjusted laterally, and thus the fan can be accurately positioned and centered, and the axial alignment of the bearings can be set to coincide with a desired axial alignment of the fan shaft 21.

A motor 24 is provided to rotate the fan, and this motor is mounted at one corner of the substantially rectangular front plate and substantially centered between the supporting rods 4 and 5, in a manner to be hereinafter more fully described.

The motor shaft 25 is provided with a belt pulley 26, and a belt 27 is fitted upon the belt pulleys 26 and 23. This belt 27 can be of the V-belt type and the pulleys 26 and 23 can be correspondingly shaped, although obviously the belt and pulley drive can be of multiple belt or any other desired form.

In Figs. 12 and 13 we have illustrated a motor mounting which can be conveniently used to support the electric motor 24 in position. As here shown, a base plate 28 has end portions 29 and 30 spaced apart to accommodate the length of the motor, and these end portions 29 and 30 are recessed at their upstanding edges to substantially fit the bearing portions 31 at the ends of the motor casing. On opposite sides the end portions 29 and 30 are provided with the hook formations 32 and 33, and clamping straps 34 provided with slotted openings 35 are fitted upon the hook portions 32 and 33. These clamping straps have upstanding ears 36 at their ends provided with aligned openings through which a clamping screw or bolt 37 is fitted, and as is illustrated in Fig. 13, when the motor is placed in the cradle thus formed and the clamping screws or bolts 37 are tightened, the motor will be substantially rigidly assembled and held in place.

Adjusting slide bars 38 and 39 are secured on the motor mounting, across the end portion 29, and are spaced apart sufficiently to receive clamping bolts.

The rectangular front plate has clamp bolt openings 40 stamped or drilled or otherwise formed through one corner, substantially as illustrated in Fig. 3, between the two supporting rods 4 and 5, and substantially aligned with the diagonal extent thereof. Also, in this area an elongated fan shaft receiving slot 41 is provided through the front plate. Motor mounting bolts 42 are passed through the openings 40 and have the head portions thereof fitted between adjusting slide bars 38 and 39, so that the motor and mounting will be adjustably held in place with the motor shaft 25 received through the elongated motor shaft receiving slot 41. This mounting will of course be accomplished before the belt pulley 26 is fitted and secured upon the motor shaft 25, and when the belt 27 is in place, the motor and mounting can be adjusted so that proper tension is secured on the motor belt, following which clamp nuts can be tightened upon the clamp bolts 42 to secure and hold the adjustment of the motor substantially rigid.

It will be appreciated that the rectangular front plate is made very rigid by turning out the venturi-ring 2 on one side and turning back the marginal flange 3 on the opposite side. Further, this front plate assembly is reinforced by the diagonally extending supporting rods 4 and 5 welded or otherwise rigidly secured at their ends to the inside of the marginal flange 3 and then welded or otherwise rigidly secured to the face of the front plate.

These two supporting rods are spaced apart sufficiently that they give a braced or almost trussed support and rigidity to the front plate assembly. When the motor is mounted in place upon this substantially rigid structure, and the fan supporting structure 8 is secured the parts will be substantially immovably associated, after the motor has been adjusted to its desired position, and a very rigid supporting structure will be accomplished which will resist vibration and will consequently be quiet and substantially vibrationless in operation.

To compensate for relatively high speeds of commercially available electric motors, the belt pulley 26 will preferably be relatively smaller than the belt pulley 23, and thus the speed of rotation of the fan will be reduced. Of course, any desired variations in proportionate speed of rotation can be accomplished.

With the structure as thus described, and as is perhaps best shown in Fig. 4, the motor 24 is on the same side of the front plate 1 as the venturi-ring 2 and any projecting portion of the fan 22, and the belt drive portions are substantially enclosed within the marginal flange 3, so that a very thin or flat assembly is accomplished. Thus, our fan assembly can be very conveniently mounted in a wall opening of a masonry or frame building without projection of the parts to any great extent on either side. Where a shutter, either manually or automatically adjusted, is desired to be used with our fan, this can be very readily and compactly fitted in place against the edge of the marginal flange 3, and since the driving belt is within the confines of this flange there will be no interference with the shutter or operation of the parts. The flange causes sufficient separation so that the shutter parts will not be too close to the fan, and vibration will thus be avoided.

In Figure 1 we have shown a mounting of our fan in a ceiling opening and here the opening is framed as at 43. The front plate 1 serves to support our fan upon this framing, and strips 44 may be secured in place to retain the fan. It may be found advisable to insert rubber or other insulating pads 45 at each corner or at other points around and between the plate 3 and the framing 43. In this illustration, a ceiling shutter is indicated at 46.

From the foregoing it will be seen that we have provided a ventilating fan which can be mounted in a wall of a building or the ceiling of a room, or a window of a building or in almost any other manner and position that may be desired; and, it is of compact and simple construction for convenient and ready installation, and which at the same time is extremely rigid in its supporting structure and is fully adjustable with respect to the fan and motor mountings, so that the fan will be adjacent and substantially vibrationless and thus quiet in operation and use. Further, the parts are all associated and assembled in such manner that the motor and the fan are freely available for adjustments and repairs.

While we have herein shown and described only certain specific embodiments of our invention and have set forth only possible modifications, it will be apparent that many changes and variations can be made in the form and construction and assembly of the parts, as well as in the manner of installing, without departing from the spirit and scope of our invention.

We claim:

1. A ventilating fan for installation in buildings, comprising a substantially rectangular plate having a circular central opening with a venturi ring extending outwardly on one side and having a marginal flange on the opposite side of said plate, a pair of straight, parallel, elongated supports mounted flat on said plate on the side opposite said venturi ring, said supports extending diagonally across said central opening and being attached to said rectangular plate adjacent diagonally opposite corners

thereof, said supports being parallel to and lying on opposite sides of a line joining said diagonally opposite corners, a rotatable fan supported on said elongated supports substantially coaxially of said opening, an electric motor mounted on said plate adjacent a corner thereof between said elongated supports and on the same side of said plate as said venturi ring, said motor having a motor shaft extending through a hole in said plate, and means on the same side of said plate as said elongated supports drivingly connecting said fan with said motor shaft.

2. The invention of claim 1, and means adjustably mounting said motor on said plate for location of said motor in any of a plurality of positions radially of said circular central opening, said hole having the shape of an elongated slot disposed radially of said circular central opening.

3. A ventilating fan for installation in buildings, comprising a substantially rectangular plate having a circular central opening with a venturi ring extending outwardly on one side and having a marginal flange on the opposite side of said plate, a pair of straight, parallel, elongated supports mounted flat on said plate on the side opposite said venturi ring and extending across said central opening, a fan shaft supported for rotation between said elongated supports coaxially of said circular central opening, a fan mounted on one end of said fan shaft and a first pulley mounted on the other end of said fan shaft, an electric motor mounted on said plate on the same side of said plate as said venturi ring and between said elongated supports, said motor having a motor shaft extending through a hole in said plate, a second pulley mounted on the end of said motor shaft on the side of said plate opposite said venturi ring, said motor and second pulley being disposed on opposite sides of said plate, and a drive belt disposed on the side of said plate opposite said venturi ring and motor and drivingly interconnecting said first and second pulleys.

4. The invention of claim 3, and means adjustably mounting said motor on said plate for location of said motor in any of a plurality of positions radially of said circular central opening, said hole having the shape of an elongated slot disposed radially of said circular central opening.

5. A ventilating and cooling fan for installation in buildings comprising, a substantially rectangular front plate having a central opening with a venturi-ring turned up and around on one side and said front plate being provided on its opposite side with a marginal flange, a pair of supporting rods spaced apart and rigidly secured at their ends with the marginal flange and also rigidly secured to the front plate, a fan supporting mounting slidably mounted on said supporting rods, means to secure said fan mounting in fixed adjusted position upon the supporting rods, fan shaft bearings adjustably carried on the fan supporting mounting to be adjustable substantially at right angles to the extent of the supporting rods, a fan shaft revolvably mounted in said bearings, a fan mounted on one end of said fan shaft within the venturi-ring opening, a belt pulley on the opposite end of the fan shaft, an electric motor carried by said front plate at one corner thereof substantially between the supporting rods with the axis of the motor parallel with the axis of the fan shaft, a belt pulley on the motor shaft, and a belt fitted over said belt pulleys.

6. A ventilating and cooling fan having a mounting comprising, a rectangular front plate with an opening substantially centrally therethrough surrounded on one side by a venturi-ring and said rectangular plate being provided with an upstanding marginal flange on its opposite side, two supporting rods spaced apart extending across the central opening within the confines of the marginal flange secured at their ends to said flange and also secured to the front plate adjacent to the central opening, a fan supporting mounting extending across between said supporting rods having adjustable movement endwise of said rods, means to secure said fan supporting mounting in desired fixed adjustments, said fan supporting mounting being provided with two spaced apart crossbar portions each having elongated bolt receiving slots, fan shaft bearings fitted on said crossbar portions, clamp bolts securing said fan shaft bearings adjustably upon the crossbar portions, a fan shaft rotatably mounted in said fan shaft bearings, a fan secured on one end of said fan shaft within the venturi-ring, a belt pulley secured on the opposite end of the fan shaft, an electric drive motor, said rectangular front plate having an elongated slot at one corner intermediate the securement of the supporting rods through which the motor shaft is received and is adjustable, clamp bolts mounting said motor on said rectangular front plate on the same side as the venturi-ring, a belt pulley on the motor shaft substantially aligned with the belt pulley on the fan shaft, and a belt fitted upon said pulleys.

7. A ventilating and cooling fan having a mounting comprising, a rectangular front plate with an opening substantially centrally therethrough surrounded on one side by a venturi-ring and said rectangular plate being provided with an outstanding marginal flange on its opposite side, two spaced apart supporting rods extending diagonally across the rectangular front plate rearwardly of said venturi-ring and secured at their ends to said marginal flange and also secured to the front plate adjacent to the central opening, a fan supporting mounting extending across between said supporting rods having sleeves slidable on said supporting rods, means to secure said sleeves in adjusted positions, said fan supporting mounting being provided with two spaced apart crossbar portions and said crossbars being spaced apart axially with respect to the venturi-ring, fan shaft bearings fitted on said crossbar portions, clamp bolts securing said fan shaft bearings upon the crossbar portions to be adjustable longitudinally thereof, a fan shaft rotatably mounted in said fan shaft bearings, a fan secured on one end of said fan shaft within the venturi-ring, a belt pulley secured on the opposite end of the fan shaft, an electric drive motor, said rectangular front plate having an elongated slot at one corner intermediate of the supporting rods through which the motor shaft is received and is adjustable, clamp bolts mounting said motor adjustably on said rectangular front plate on the same side as the venturi-ring, a belt pulley on the motor shaft substantially aligned with the belt pulley on the fan shaft, and a belt fitted upon said pulleys.

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