Sept. 1, 1953 P. E. HORD 2,650,535

VENTILATING AND AIR CIRCULATING DEVICE

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Fig. 1.

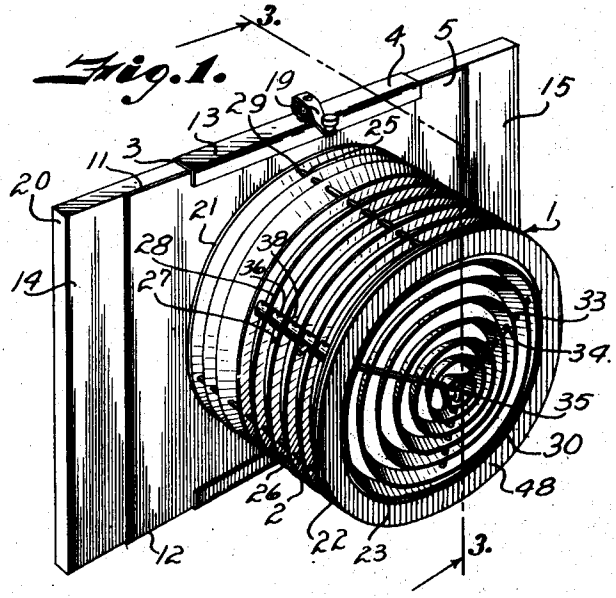


Fig. 2.

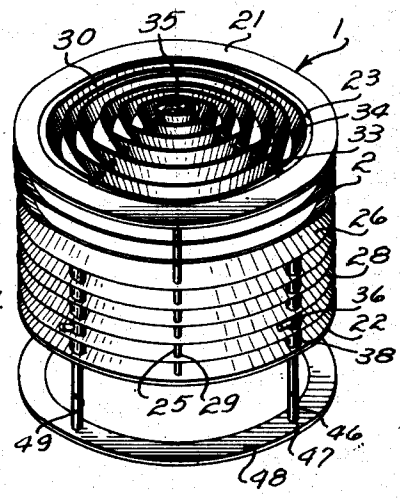


Fig. 3.

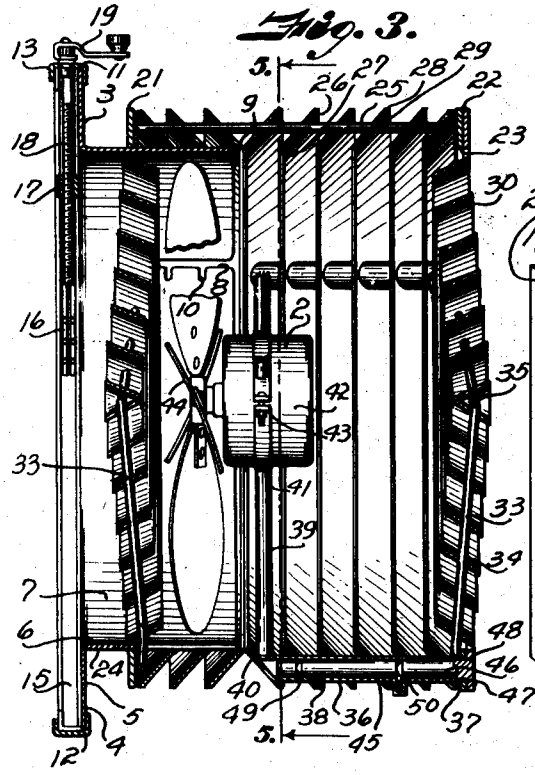
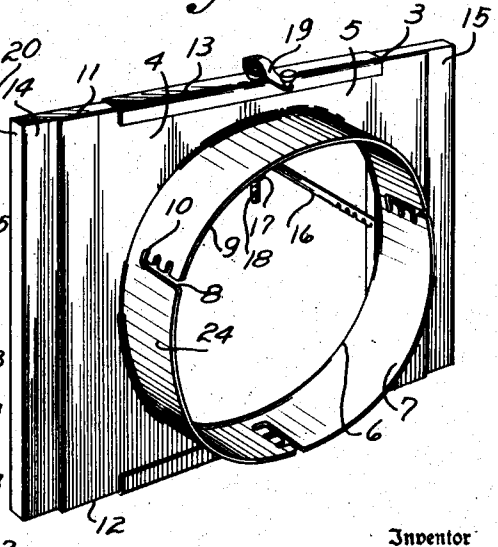


Fig. 4.



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Fig. 7.

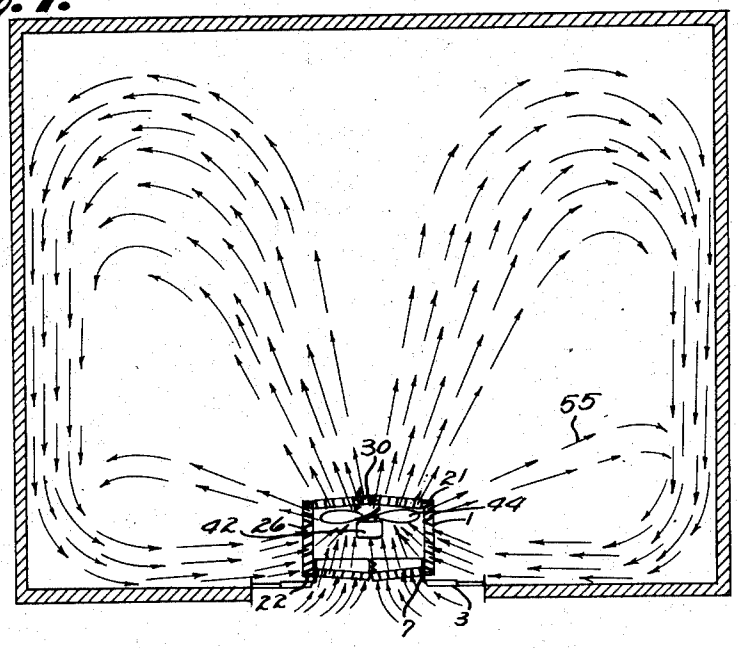
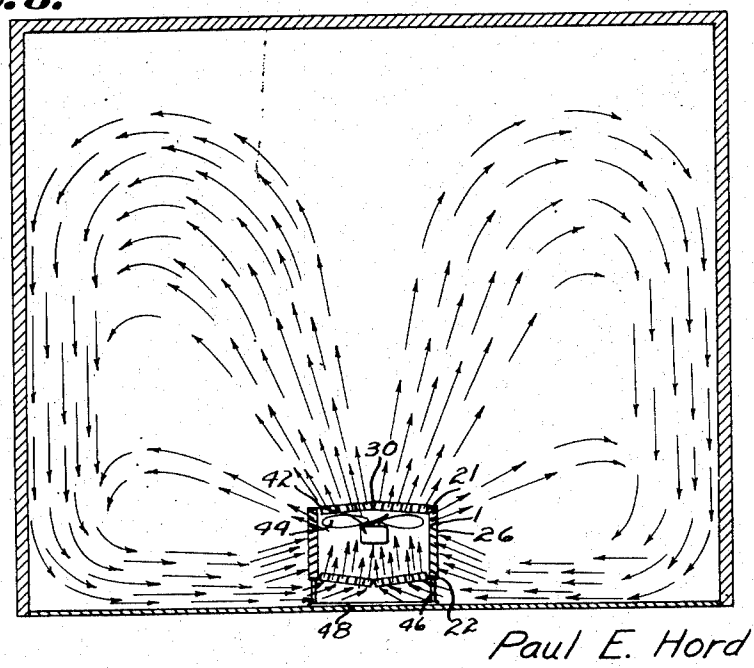


Fig. 8.



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Fig. 5.

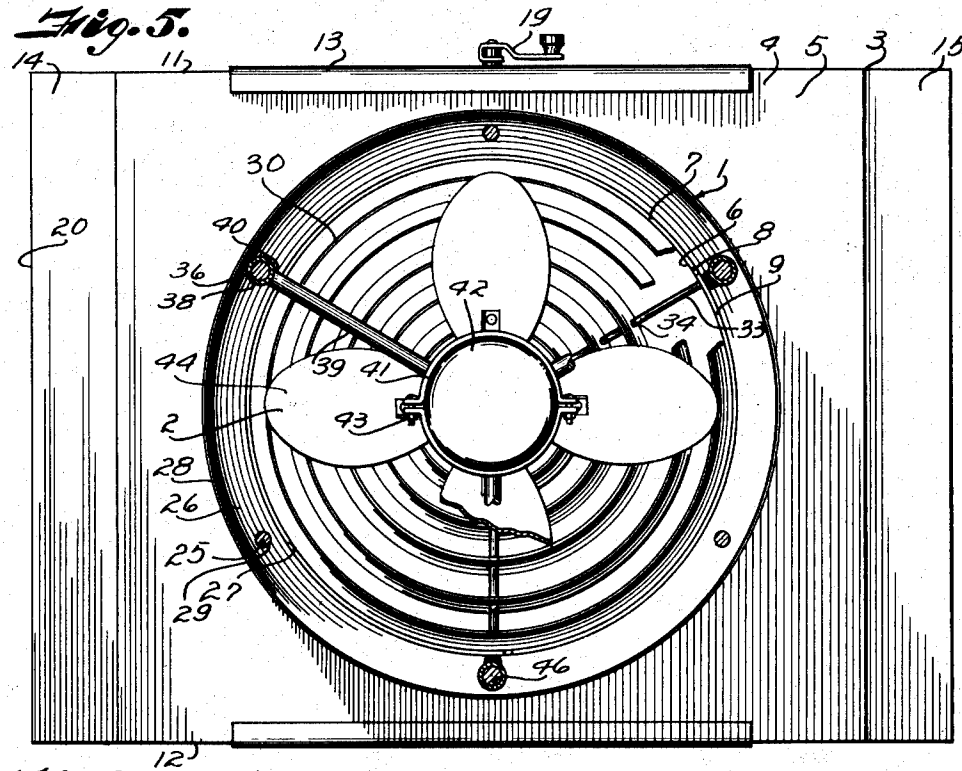
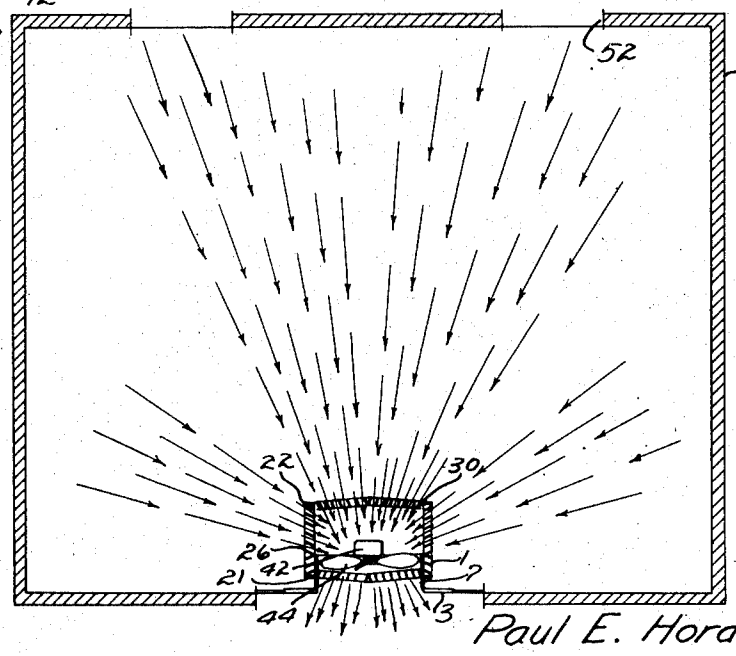


Fig. 6.



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Patented Sept. 1, 1953

2,650,535

UNITED STATES PATENT OFFICE

2,650,535

VENTILATING AND AIR CIRCULATING DEVICE

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Application July 28, 1950, Serial No. 176,401

6 Claims. (Cl. 98—94)

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This invention relates to ventilating and air circulating devices and more particularly to such a device including an electrically driven fan which in its use as a ventilator for exhausting air from or delivering air into a room is mounted on a supporting panel structure adapted to be placed in a wall opening or window of a room, and which in its use as an air circulator is removed from and used independently of the panel structure as a portable electric fan or floor circulator fan.

There have been ventilating fans adapted to be mounted in window openings and there are various types of fans used for stirring up or creating a current of air in a room. Each type of fan has its advantages, but due to differences or changes in atmospheric conditions, one type of air circulation will provide more comfort for the person at one time and another type of air circulation will be more comfortable at another time. For example, in the summer time during the day frequently it is cooler inside of a house than outside and merely providing air circulation in the room provides more comfort as well as a current of moving air over the person to provide a cooling effect. As the air inside becomes warmer and also stale due to the room being closed, there is usually more comfort if a fan in a window is used to draw air into the room and create a current thereacross and also re-recirculate a portion of the air in the room. At night when the air is cooler on the outside and the house tends to retain its heat, particularly when it is desired to sleep in the rooms and drafts are to be avoided, it is advantageous to place a fan in the window and exhaust the air from the room which causes a flow of air through other openings into the room, thereby drawing the cool outside air into the room to cool same without having objectionable drafts in the room.

The objects of the present invention are to provide a ventilating and air circulating device which will permit use to obtain the air circulation or movement that is most advantageous; to provide an adjustable panel structure for contacting a window frame and a fan unit reversibly and adjustably mounted on said panel structure so as to adapt said fan unit for either exhausting air from a room or for blowing air into a room and selectively recirculating a portion of the air in said room; to provide a fan unit with a plurality of louvers in the shell thereof that cooperate with the fan in directing flow of air therethrough; to provide a housing on a frame

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structure for surrounding the fan, said fan unit being adjustable relative to the housing whereby the louvers and housing control the circulation of air; to provide louver supporting means adapted to engage the housing to adjustably and removably mount the fan unit on the panel structure without auxiliary fastening means; to provide a fan unit with adjustable, telescoping legs or supports whereby the unit may be supported on end independently of the panel structure for use as a floor circulator or the like; and to provide a portable ventilator structure that is economical to manufacture, simple, and easy to move to various positions for different air flow conditions, efficient in operation and attractive in appearance.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the ventilating device with the fan unit mounted on the panel structure.

Fig. 2 is a perspective view of the fan unit with the leg structure extended for supporting said unit as a floor circulator.

Fig. 3 is a transverse sectional view through the ventilating device on the line **3—3**, Fig. 1.

Fig. 4 is a perspective view of the panel structure, particularly illustrating the housing or venturi thereon.

Fig. 5 is a transverse sectional view through the fan unit on the line **5—5**, Fig. 3.

Fig. 6 is a diagrammatic view illustrating the ventilating device in a wall opening and operating as an exhaust fan with arrows showing the movement of air from other openings and through the room.

Fig. 7 is a diagrammatic view of the ventilating device in a wall opening and positioned for blowing air into the room and recirculating a portion of said air, the directions of movement of the air being shown by arrows.

Fig. 8 is a diagrammatic view showing the fan unit used as a floor circulator with arrows indicating the direction of flow of the air.

Referring more in detail to the drawings:

1 designates a ventilating and air circulating device consisting of a fan unit **2**, and a panel structure **3**. The panel structure **3** is adjustable to fit in a window frame and is constructed in substantially the same manner as the frame structure shown in my Patent No. 2,448,671, issued September 7, 1948, on "Frame Structure for Ven-

tilating Fans." The panel structure 3 as illustrated consists of a center section 4 having a flat sheet 5 provided with a center opening 6 defined by a cylindrical wall 7 extending laterally of the sheet 5 to form a cowling for a fan as later described. The cylindrical wall preferably has a plurality of circumferentially spaced slots 8 opening from the free edge 9 and extending toward the sheet 5, each of said slots having a plurality of notches 10 opening therein, as illustrated in Fig. 4, for mounting a fan unit on the panel structure as later described.

The upper and lower edges 11 and 12 of the flat sheet 5 are preferably secured to channel track members 13 which form guides for receiving portions of side panels 14 and 15 to slidably mount said panels relative to the center section. Arms 16 are adjustably connected to each of the side panels and have one end connected to a collar 17 threadably mounted on a shank of an adjusting screw 18 which is rotatably mounted in the upper channel member 13, a crank 19 being secured to the upper end of the screw 18 whereby turning of the crank adjusts the sliding panels 14 and 15 relative to the center section to move the outer edges 20 of said side panels into engagement with the faces of a window frame or the like to mount the panel member therein without auxiliary fastening devices.

The fan unit 2 preferably includes a shell consisting of spaced coaxial end rings 21 and 22 having circular bores 23 adapted to slidably engage the peripheral face 24 of the cylindrical wall 7. A plurality of radially spaced columns 25 formed of rods or the like extends between the rings 21 and 22 and have their ends suitably secured thereto to maintain the rings in spaced relation, said columns preferably being located between the inner and outer peripheries of the rings. A plurality of louvers 26 is preferably arranged between the spaced rings 21 and 22 and said louvers may be formed in a shell wall or the like, however, the louvers preferably have the form of an annulus of tapered form, each having a bore or inner diameter 27 concentric with and substantially the same size as the bores 23 in the rings 21 and 22, said bores forming one lateral edge of each louver. The other lateral edge 28 of each louver preferably substantially conforms to the size and shape of the outer periphery of the rings 21 and 22. A portion of the louvers preferably slopes outwardly toward the end ring 21 and the other portion slopes outwardly toward the end ring 22. In the illustrated structure one-third of the louvers are in the group adjacent the end ring 21 and slope toward same as illustrated in Fig. 3, the other two-thirds of the louvers being in a group sloping toward the end ring 22. Each of the louvers is provided with apertures 29 extending therethrough whereby said louvers are sleeved over the columns 25 and said louvers are suitably secured as by welding to said columns to form a rigid shell with oppositely directed louvers for cooperating with the cylindrical wall 7 or cowling for the fan as later described.

A series of nested louvers 30 is arranged at each end of the fan unit. Each of said nested louvers is preferably in the form of an annulus of tapered form so that the diameter of one of the lateral edges is larger than the diameter at the other lateral edge. The nested louvers are a series of annuli of successively increasing diameter concentrically arranged with the corresponding annuli at the respective ends of the fan unit having progressively greater spacing toward the axis of the bore of the fan unit whereby the lateral edges at the larger diameter of the respective annuli form the outer ends of the fan unit and lie in a conical form. The largest of the nested louvers 30 has its large diameter edge of smaller diameter than the inner diameter of the cylindrical wall 7 whereby said louver may be moved therein with said wall arranged between the edge of the largest nested louver and the bore of the rings 21 and 22.

Fixed to the rings 21 and 22 and preferably on the adjacent faces thereof are radially disposed cross bars 33, said cross bars preferably sloping substantially as the elements of a cone whereby they extend through aligned apertures 34 in each of the nested louvers 30 substantially midway between the lateral edges thereof, the inner ends of the bars being suitably secured together at the axis of the unit as at 35, as illustrated in Fig. 1. Each of the nested louvers is suitably secured as by welding to the bars 33 whereby the nested louvers 30, louvers 26, rings 21 and 22, columns 25 and bars 33 form a rigid structure having louvers defining a plurality of openings on the sides and ends of the fan unit 2. The bars 33 are arranged whereby when the fan unit is applied to the circular wall 7 and the bore 23 of the ring 21 slides over the periphery of said wall, the bars 33 aligning with the slots 8 whereby when the shell of the fan unit is arranged as shown in Fig. 3, it may be rotated in a clockwise direction to engage the bars in the notches 10 to secure the shell of the fan unit on the panel structure, said shell being adjustable relative to the panel section by the selective engagement of the bars with the respective notches 10 to selectively position the outer edge 9 of the wall 7 relative to the louvers 26.

Tubular posts 36 are arranged intermediate the columns 25 and extend through apertures 37 in the ring 22 and aligned apertures 38 in the louvers 26, said posts terminating at and being secured to the furthermost louver from the ring 22 that slopes toward said ring 22, the posts also being secured as by welding to the respective louvers and the ring 22. Radial tubular members 39 preferably have their outer ends secured as at 40 to the respective posts 36 and their inner ends secured to a band 41 adapted to mount a motor 42 therein, suitable fastening devices 43 being arranged on the band for clamping the motor therein with the shaft of the motor extending toward the end of the shell having the ring 21 thereon. A fan wheel 44 is suitably mounted on the motor shaft between said electric motor and the nested concentric louvers 30 at the end of said shell, the diameter of the fan wheel being such that the outer ends of the fan blades are spaced from the inner surface of the wall 7 whereby the fan may rotate therein as shown in Fig. 3.

Slidably mounted in the bores 45 of the tubular posts 36 are legs 46, said legs being adapted to extend from said bores and having their outer ends secured as at 47 to a ring member 48 preferably conforming in shape to the ring 22. Each of the legs is preferably provided with spaced annular grooves 49 adapted to be engaged by a suitable fastening device, such as a spring-pressed ball 50, for releasably latching the legs in selected positions relative to the posts whereby said legs may be telescoped in said posts to position the ring 48 in engagement with the ring 22 as shown in Fig. 3, and may be extended from the posts to

position the ring **48** in spaced relation to the ring **22** as shown in Fig. 2, whereby said ring **48** and legs **46** will support the fan unit when used as a floor circulator.

In using the device constructed as described, the panel unit **3** is arranged in a window frame and the crank **19** turned to adjust the side panels **14** and **15** outwardly to effect positive engagement of the side edges **20** with the window frame whereby said panel structure is spaced slightly from the lower sash to permit raising and lowering of same. When using the device for ventilation, as by exhausting air from a room, the fan unit **2** is arranged to align the bore **23** of the ring **21** with the outer periphery **24** of the cylindrical wall **7** whereby the unit may be moved toward the panel section and the cylindrical wall is inserted in the fan unit shell between the ring **21** and the outer edge of the outermost louver **30** with the cross bars **33** aligning with and entering the slots **8**. It is preferably to move the cross bars **33** into engagement for the full depth of the slots **8** and then the fan unit is rotated in a clockwise direction to engage the bars **33** with the respective notches **10**. This positions the fan unit as shown in Fig. 3, whereby the bore of the ring **21**, inner edges of the louvers **26** through which the wall **7** is sleeved, and the bars **33** cooperate to hold the fan unit in place. The electric motor **42** is then connected with a suitable source of electrical energy to energize said motor and rotate the fan wheel **44**. It is preferable that the fan wheel rotate in a direction which will tend to maintain the bars **33** in the particular notch **10** with which they are engaged. With a fan unit positioned as described and the lower window sash raised above the upper portion of the opening **6** and other windows or openings **52** in a room **53** arranged for entry of air, the operation of the fan motor will cause the air in the room to be drawn through the openings formed by the louvers **26** and **30** and directed through the opening **6** to the outside. This arrangement draws in outside air to cool a room and moves air from substantially every part of the room without discomfort as would be caused by a strong current of air.

In using the device for creating a current of air in a room and also recirculating said air, the fan unit is rotated in a counterclockwise direction, Fig. 1, to disengage the bars **33** from the notches **10** whereby the fan unit may be removed from the cylindrical wall **7**. The fan unit is then turned end for end and positioned as diagrammatically illustrated in Fig. 7 with the cross bars **33** on the opposite end of said fan aligning with the slots **8** whereby the cylindrical wall **7** may be sleeved through the bore **23** of the ring **22** and the bars **33** aligned with selective notches **10** whereby the fan unit may be rotated in a clockwise direction to secure same to the circular housing. The fan may be energized whereby air is drawn through the open window, through the opening **6** and directed outwardly through the louvers in the opposite end of the fan unit. Also air is directed substantially radially as shown by the arrows **55** through the louvers turned toward the end ring **21**. In this manner air is directed to substantially all parts of the room and a portion of the air in the room is drawn back through the louvers which slope toward the ring **22** for recirculation, the extent of recirculation being controlled by the particular notch **10** with which the bars **33** are engaged, the greater the extent of the cylindrical housing **7** that extends into the shell of the fan unit, the lesser the amount of the air recirculated as said cylindrical housing will close off portions of the louvers.

When it is desired to use the device as a floor circulator for circulating air in a room, the fan unit is removed from the cylindrical wall **7** by rotating the fan unit in a counterclockwise direction, Fig. 1, to disengage the bars **33** from the notches **10**, and withdrawing said fan unit from the cylindrical wall. The window sash may then be closed to prevent air flow through the opening **6** whereby the panel structure **3** may be left in the window frame. The fan unit is then turned whereby the ring **48** may be grasped to pull same away from the ring **22**, drawing the legs **46** from the post **36** until the groove **49** adjacent the end of the legs is engaged by the latch member **50** to hold the legs in extended condition relative to the posts **36**. The fan unit may then be placed on the floor or other support with the ring **48** engaged therewith and the motor **42** energized from a suitable source of electric current whereby rotation of the fan draws air from the floor through the louvers at the end adjacent same and through the louvers on the sides of the fan unit that are sloped toward the end ring **22**. This air moves into the fan unit shell and is blown by the fan through the louvers in the adjacent end thereof and through the louvers in the sides that are sloping toward the end ring **21** as illustrated in Fig. 8. When used as a floor circulator as shown in Fig. 8, the fan unit may be moved from room to room or positioned where needed to provide a circulation through the room and creating a sensible air current to persons adjacent the fan unit.

It is believed obvious that I have provided a ventilating and air circulating device which may be used for various types of ventilation and air circulation to accommodate the needs of persons during different atmospheric conditions and that the device is economical to manufacture and efficient in operation, yet of sturdy, strong construction that will withstand the frequent changing of the arrangement to accommodate the various desires for ventilation.

What I claim and desire to secure by Letters Patent is:

1. In combination, a panel structure applicable to a window opening and having a central opening, a peripheral flange around the opening and projecting from the panel structure, and a fan unit comprising a shell having a plurality of louvers in the sides thereof, said shell being adapted to engage over the peripheral flange, a plurality of louvers at the ends of the shell with the outermost louver at each end spaced from the shell and smaller than the peripheral flange for positioning of said outermost louver inside of the peripheral flange when the shell is engaged over the peripheral flange, means for supporting said end louvers in the shell, means on the peripheral flange engageable with the end louver supporting means for securing said shell on the peripheral flange, and a motor driven fan supported in the shell for movement of air therethrough, said shell being removable from the peripheral flange.

2. In combination, a panel structure applicable to a window opening and having a central opening, a peripheral flange around the opening and projecting from the panel structure, and a fan unit comprising a shell having a plurality of louvers in the sides thereof, said shell being

adapted to slidably engage over the peripheral flange, a plurality of concentric louvers at the ends of the shell with the outermost louver at each end spaced from the shell and smaller than the peripheral flange for positioning of said outermost louver inside of the peripheral flange when the shell is slidably engaged over the peripheral flange, means secured to each of the end louvers and the shell for supporting said end louvers in the shell, means on the peripheral flange engageable with the end louver supporting means for latching said shell on the peripheral flange, and a motor driven fan supported in the shell for movement of air therethrough, said shell being removable from and reversibly applicable to the peripheral flange for reversing the direction of air delivered.

3. In combination, a panel structure applicable to a window opening and having a central opening, and a fan unit comprising a shell having a plurality of louvers in the sides thereof, a plurality of concentric louvers at the ends of the shell with the outermost louver at each end spaced from the shell, means secured to each of the end louvers and the shell for supporting said end louvers in the shell, means on the panel structure and extending between the outermost concentric louver and the shell for mounting said shell on the panel structure, and a motor driven fan supported in the shell for movement of air therethrough.

4. In combination, a panel structure adjustable for mounting on a sill of a window frame inside the lower sash, said panel structure having a central opening, a peripheral flange around the opening and projecting from the panel structure, and a fan unit comprising a shell having a plurality of louvers in the sides thereof, said shell being adaptable to slidably engage over the peripheral flange, a plurality of annuli of successively increasing diameters nested one within another at each end of the shell with the outermost annulus at each end spaced from the shell and smaller than the peripheral flange for positioning of said outermost annulus inside of the peripheral flange when the shell is slidably engaged over the peripheral flange, radial bars fixed to the shell at each end and secured to the annuli for supporting same, said peripheral flange having portions for engagement by the bars for securing the shell to the peripheral flange, and a motor driven fan supported in the shell for movement of air therethrough, said shell being removable from and reversibly applicable to the peripheral flange for reversing the direction of air delivery.

5. In combination, a panel structure adjustable for mounting on a sill of a window frame inside the lower sash, said panel structure having a central opening, a peripheral flange around the opening and projecting from the panel structure, and a fan unit comprising a shell having a plurality of louvers in the sides thereof, said shell being adaptable to slidably engage over the

peripheral flange, a plurality of annuli of successively increasing diameters, each annulus having a diameter of one lateral edge greater than the diameter of the other lateral edge, said annuli being nested one within another at each end of the shell with the outermost annulus at each end spaced from the shell and smaller than the peripheral flange for positioning of said outmost annulus inside of the peripheral flange, when the shell is slidably engaged over the peripheral flange, radial bars fixed to the shell at each end and secured to the annuli for supporting same, said peripheral flange having a plurality of circumferentially spaced slots for receiving the bars for securing the shell to the peripheral flange, and a motor driven fan supported in the shell for movement of air therethrough, said shell being removable from and reversibly applicable to the peripheral flange for reversing the direction of air delivery.

6. In combination, a panel structure adaptable for mounting on a sill of a window frame inside the lower sash, said panel structure having a central opening, a peripheral flange around the opening and projecting from the panel structure, and a fan unit comprising spaced coaxial rings, a plurality of spaced louvers intermediate the spaced rings and coaxial therewith, said rings and spaced louvers being slidable over the peripheral flange, spaced means connected to the spaced rings and secured to the spaced louvers for supporting same in spaced relation, a plurality of annuli of successively increasing diameters nested one within another substantially in alignment with the respective rings with the outermost annulus at each end spaced from the respective rings and smaller than the peripheral flange for positioning of the outermost annulus inside of the peripheral flange when one of the rings is slid over the peripheral flange, radial bars fixed to each of the rings and secured to the annuli for supporting same, said peripheral flange having portions for engagement by the bars for securing the fan unit to the peripheral flange, and a motor driven fan supported in the space defined by the rings and annuli for moving air therethrough, said fan unit being removable from and reversibly applicable to the peripheral flange or reversing the direction of air delivery.

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