Aug. 25, 1953 M. E. LAUTNER ET AL 2,650,019

FAN STRUCTURE

Filed Sept. 15, 1951 3 Sheets-Sheet 1

Fig. 1

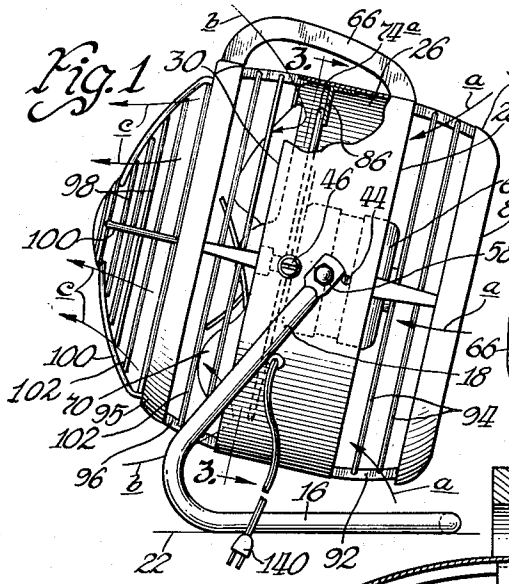


Fig. 2

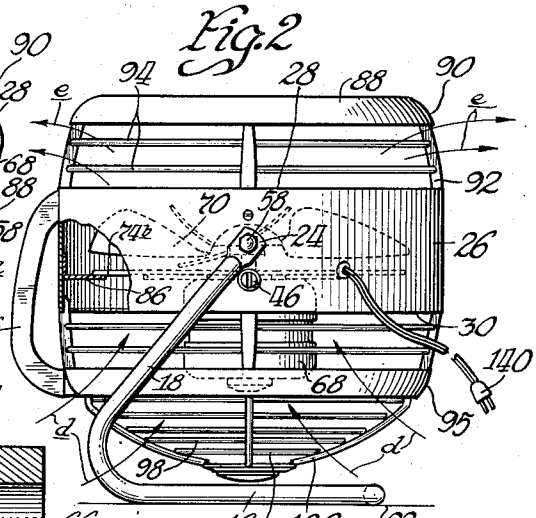
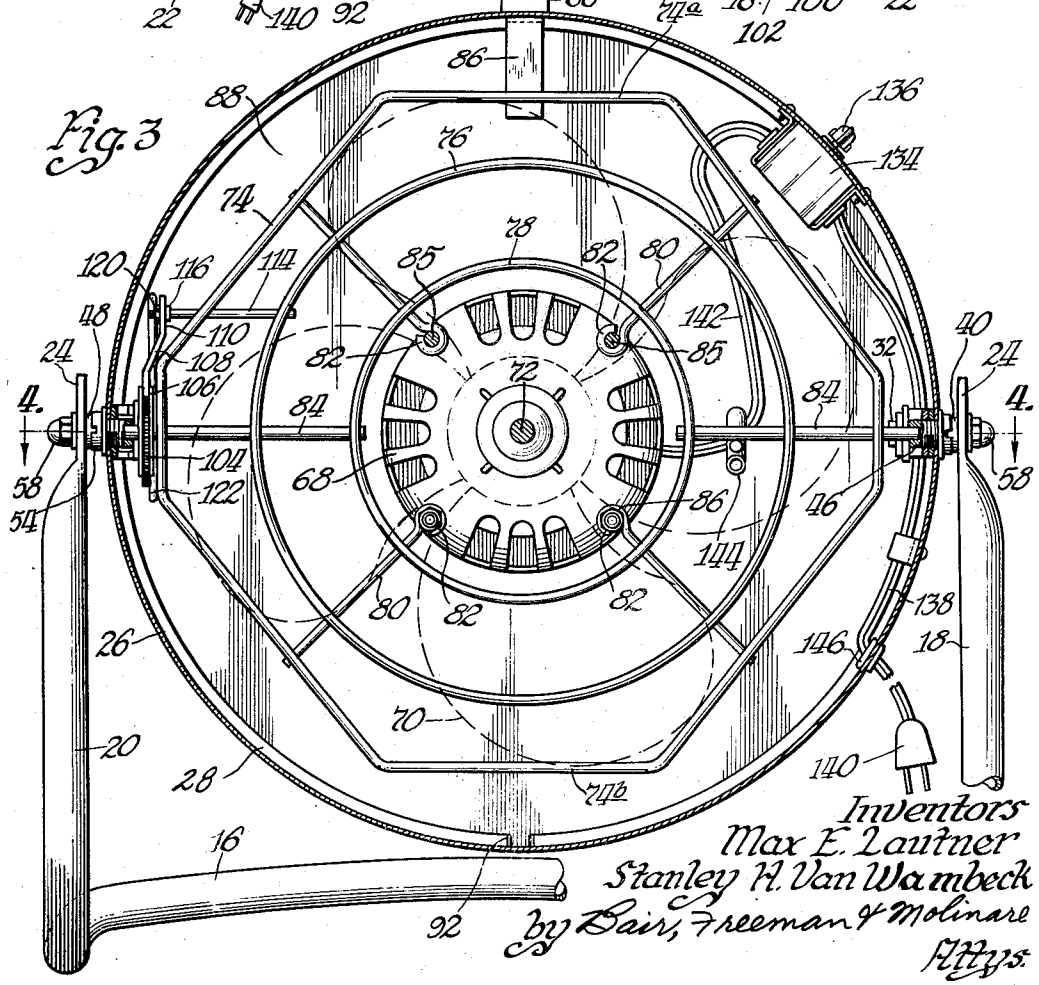


Fig. 3



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FAN STRUCTURE

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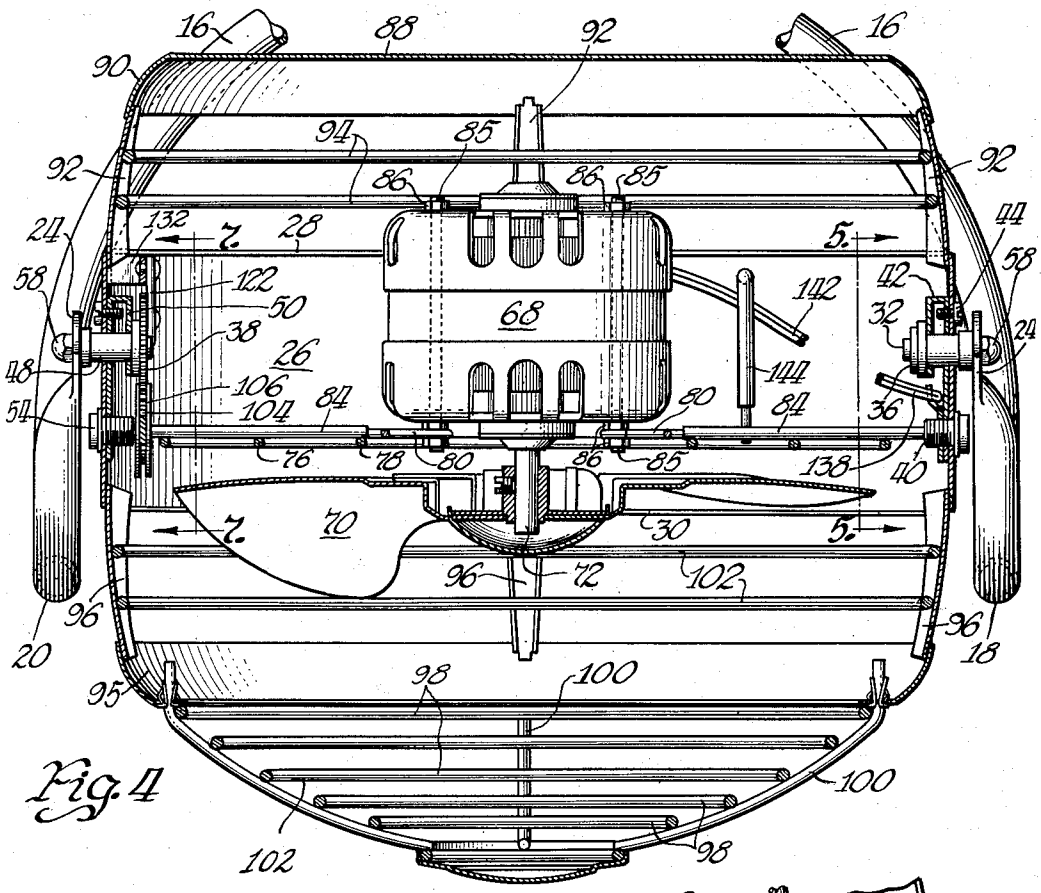

Fig. 4

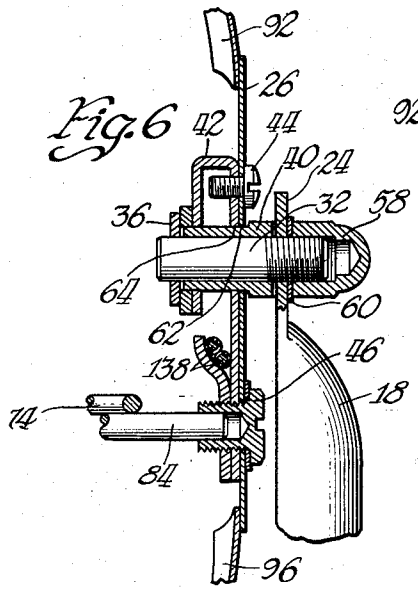

Fig. 6

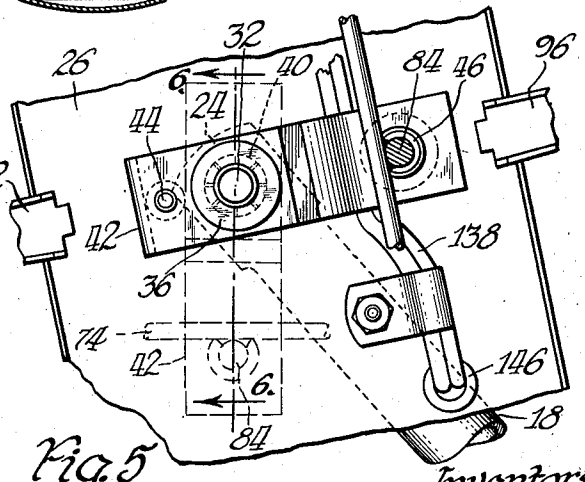

Fig. 5

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FAN STRUCTURE

Filed Sept. 15, 1951 3 Sheets-Sheet 3

Fig. 7

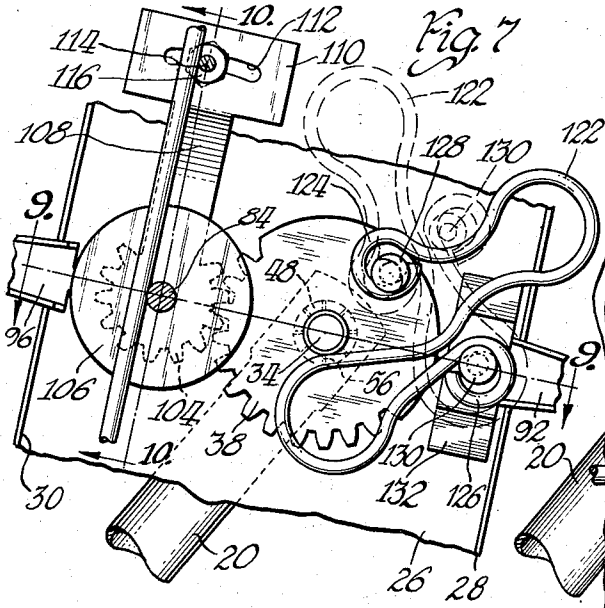


Fig. 8

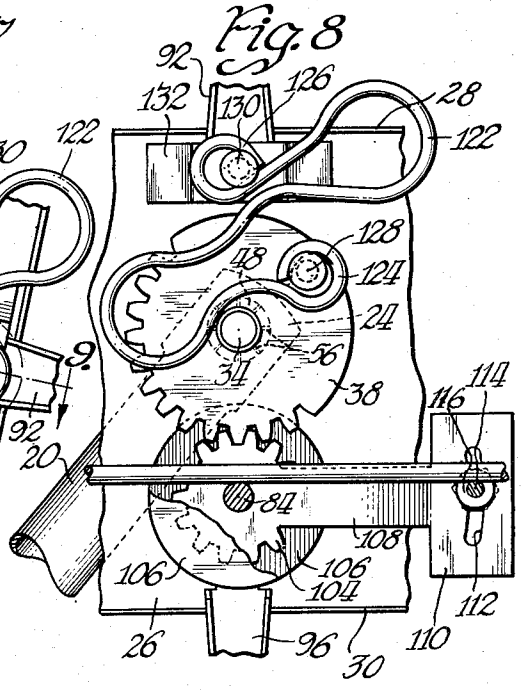


Fig. 9

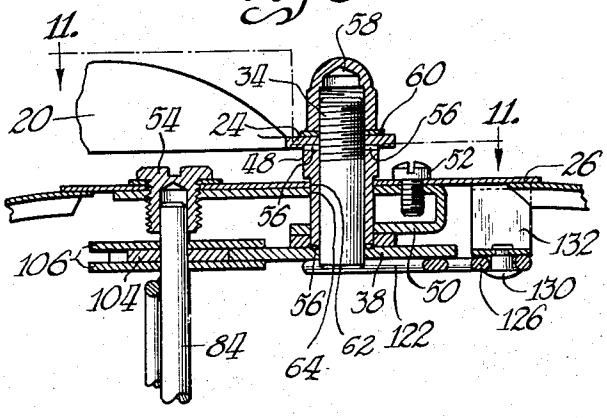


Fig. 10

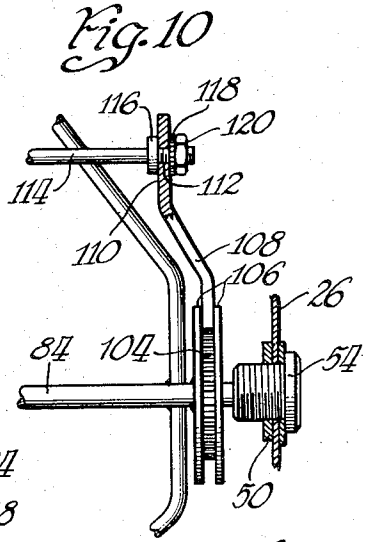


Fig. 11

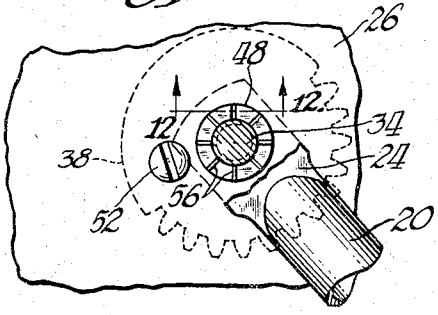
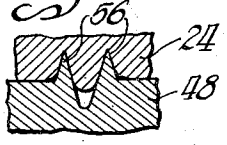


Fig. 12



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UNITED STATES PATENT OFFICE

2,650,019

FAN STRUCTURE

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Application September 15, 1951, Serial No. 246,744

16 Claims. (Cl. 230—259)

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This invention relates to a fan structure which is a combination floor type circulator and stream or blast type fan.

One object of the invention is to provide a single fan that may be quickly and readily adjusted to perform the function of either type of fan specified in the last paragraph.

Another object is to provide a fan structure wherein there is a support, a shroud and a motor, the shroud being pivotally supported on the support so that the shroud may be directed with its cylinder axis either vertical or substantially horizontal, and the motor being pivotally supported within the shroud so that an operative connection between the support and the motor may be provided for turning the motor end-for-end within the shroud so that air can be directed in one direction through the shroud when the motor is used as a floor type circulator, and can be directed in the opposite direction when it is used as a stream or blast type fan.

Another object is to provide in a fan of the kind herein disclosed, a means to automatically reverse the motor end-for-end when the shroud is turned from one position to the other. In this connection a floor-type circulator has certain advantages such as drawing cool air from the floor level and discharging it in radial direction in a substantially horizontal plane, the resulting air pattern being desirable in that people sitting in any position around the fan structure may have the benefit of direct air movement from the circulator. When used in an office, the greatest air movement is then about knee high and therefore will not disturb papers on the desk top. On the other hand, the advantages of a stream or blast type fan are that a relatively high velocity air blast may be directed where desired for concentrated air movement, and the unit may be placed in front of an open window or doorway to either expel stale air from the room or draw fresh air in with a directional blast pattern.

It is therefore a further object of our invention to provide a double-purpose fan to take the place of two fans ordinarily designed for each of the separate uses just enumerated.

Still a further object is to provide a design of fan structure wherein there is a circulation deflector acting as such when our fan structure is serving as a floor type circulator, and a directional blast orifice ring which acts when the fan structure is serving as a stream or blast type fan, these parts being so designed and related to a shroud for the motor and fan that they act in their respective capacities by reversing the motor

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end-for-end in the shroud when adjusting the fan structure from one type of circulator to the other.

Still a further object is to provide an operative connection between the support and the motor for changing the direction of the shaft of the motor in respect to the shroud as a result of manually shifting the shroud from one position to the other.

An additional object is to provide a novel supporting and pivoting arrangement for the motor which is in the form of a wire guard structure, and a novel stop arrangement coacting with the support so that the motor is stopped at either of two opposite limit positions, and the guard structure as well as the stop cooperate to serve as a resilient stop means.

Another additional object is to provide a positive connection between the support and one of the gears of the gearing connection between the support and the motor for securing the desired reversing of the motor without having to provide protuberances on the shroud or support outside of the shroud, mechanical connections and the stop arrangement for the motor in its two limit positions thus being provided entirely inside the shroud.

Still another additional object is to provide an over-center spring arrangement for tending to move the motor and shroud to either of its limit positions after the shroud has been manually moved past the over-center position.

With these and other objects in view, our invention consists in the construction, arrangement and combination of the various parts of our invention, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in our claims and illustrated in the accompanying drawings, wherein:

Figure 1 is a side elevation of a fan structure embodying our invention and showing it in the position used for stream or air blast operation.

Figure 2 is a similar side elevation showing the fan structure adjusted to the position where it acts as a floor type circulator.

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1 showing particularly the wire guard structure that serves as a support for the fan motor and the stop arrangement coacting therewith.

Figure 4 is a sectional view on the line 4—4 of Figure 3 showing the pivoting and gearing arrangements for the shroud and the motor.

Figure 5 is an enlarged sectional view on the line 5—5 of Figure 4 showing one of the pivots

for the shroud relative to the support, a solid line position and a dash line position of certain motor supporting elements being shown.

Figure 6 is a vertical sectional view on the line 6—6 of Figure 5 with the motor supporting elements in the dash position of Figure 5.

Figure 7 is an enlarged sectional view on the line 7—7 of Figure 4 showing the gearing connection between the support and the motor in the position of the parts when the fan structure is adjusted for the stream or blast type operation of Figure 1.

Figure 8 is a similar sectional view showing the parts in the position assumed when the fan structure is adjusted for floor type circulation as in Figure 2.

Figure 9 is a sectional view on the line 9—9 of Figure 7.

Figure 10 is a sectional view on the line 10—10 of Figure 7 showing an adjustable connection between a wire guard structure for supporting the fan motor and the gearing of Figure 7.

Fig. 11 is a detail sectional view on the line 11—11 of Figure 9; and

Figure 12 is an enlarged sectional view showing details on the line 12—12 of Figure 11.

On the accompanying drawings we have used the reference numeral 16 to indicate a U-shaped support formed of tubular steel or the like and having a pair of upstanding supporting arms 18 and 20. The U-shaped part 16 is adapted to rest on a floor or other supporting surface indicated at 22 in Figures 1 and 2, and the upper ends of the arms 18 and 20 are flattened as indicated at 24.

A cylindrical shroud 26 is provided having open ends indicated at 28 and 30 provided with narrow inturned flanges for reinforcement of the shroud. This shroud is pivotally mounted with respect to the support 16—18—20 as shown best in Figures 6 and 9 wherein studs 32 and 34 have a washer 36 and a gear sector 38 respectively welded or otherwise rigidly secured thereto. The stud 32 extends through a bushing 40 (see Figure 6) which in turn is rotatable in a reinforcing bar 42 secured to the shroud 26 by a screw 44 and a bearing sleeve 46, each of which is threaded into the bar 42 after passing through the shroud. The stud 34 (see Figure 9) extends through a similar sleeve 48 rotatable in a reinforcing bar 50 secured by a screw 52 and a bearing sleeve 54 to a diametrically opposite portion of the shroud 26.

As will hereinafter appear, it is desirable to lock the gear sector 38 relative to the support arm 20 and this may best be accomplished by radial serrations 56 on the ends of the sleeve 48 which sleeve is hardened and thereby bites into the gear sector 38 and the flattened end 24 of the support arm 20 (see Figure 12) when a nut 58 on the stud 34 is tightened down against a lock washer 60 and the end 24. In a similar manner, the stud 32 also has a nut 58 thereon against a lock washer 60 and the end 24 of the support arm 18. The ends of the sleeve 40 may have the serrations like the sleeve 48 in Figure 9 omitted if desired, since it is unnecessary to lock the washer 36 against rotation relative to the support arm 18.

From the construction of the parts thus far described, it is obvious that the shroud 26 is pivotally mounted on the sleeves 40 and 48 by reason of openings 62 in the shroud and openings 64 in the reinforcing bars 42 and 50. By reason of this construction the shroud may be

rocked, for instance, from the position shown in Figure 1 counter-clockwise to the position shown in Figure 2 through about 112° of movement, a handle 66 being mounted on the shroud for convenience in this operation.

Within the shroud 26 we provide a fan motor 68 with a fan 70 mounted on the shaft 72 of the motor. The motor 68 is supported by a wire guard structure comprising the wires 74, 76 and 78, the shape of which is shown in Figure 3 and to which radial wires 80 are spot welded or otherwise suitably secured. The wires 80 terminate in eyes 82 secured as by bolts 85 and nuts 86 to the motor 68, these being the bolts that hold the end housings and the field laminations of the motor assembled. This wire guard structure further includes somewhat heavier pivot wires 84 also spot welded to the wires 74, 76 and 78, and having their ends extended into the pivot sleeves 46 and 54 as shown herein and also in Figures 6 and 9.

The wire guard structure 74—76—78—80—84, due to its formation as just described, serves to minimize the transmission of vibrations from the motor 68 and the fan 70 when operating to the shroud 26, and the wire 74 and particularly its opposite sides 74*a* and 74*b* provide a resilient stop against a stop bar 86 for the motor in its two opposite positions as will hereinafter appear. The stop bar 86 is of relatively thin metal and therefore resilient.

In a fan structure suitable to act as an air blast type as in Figure 1 or a floor circulator type as in Figure 2, a circulating deflector 88 is required and as disclosed in Figure 4 this is in the form of a flat plate with a shallow inclined peripheral flange 90. It is supported by four posts 92 formed of sheet metal or the like and spot welded to the end 28 of the shroud 26 and to the flange 90. A pair of circular guard wires 94 are spot welded to the posts 92 to avoid having a relatively wide opening through which a hand or other foreign objects might be inserted and possibly damaged by the blades of the fan 70. The circulation deflector 88—90 and the wires 94 thereby act as a guard for the open end 28 of the shroud 26.

The opposite end 30 of the shroud 26 has a directional blast orifice ring 95 spaced therefrom and supported relative thereto by posts 96. Outside of the ring 95 we provide a series of circular wires 98 and radial wires 100 to form a guard structure for the blades of the fan 70 when in the position of Figure 1. Circular wires 102 are also supported on the posts 96 to serve as a guard similar to the wires 94 already referred to.

We have described how the motor 68 is pivotally mounted with respect to the shroud 26 by reason of the wires 84 extending into the bearing sleeves 46 and 54, the purpose of which is to permit the fan and motor to be reversed end-for-end as between the two positions of the shroud 26 as shown in Figures 1 and 2. It will be remembered that the shroud is to be manually adjusted to either of the two positions desired utilizing the handle 66 for this purpose. It is also desirable to have the motor 68 reversed end-for-end automatically when the shroud is moved from one position to the other and this we accomplish by securing to one of the wires 84 a pinion sector 104 (see Figure 9) to mesh with the gear sector 38. A pair of discs 106 can be provided secured to each side of the pinion sector 104 to insure proper meshing of the two at all times.

Referring to Figure 7, it will be noted that the pinion sector 104 has an arm 108 terminating in a T-head 110 having an arcuate slot 112 therein. A rod 114 (see also Figures 3 and 10) is welded to the wires 74 and 76 and has thereon an enlarged shoulder 116 to engage against the inner side of the head 110 while a lock washer 118 and a lock nut 120 engage against the outer side, the arcuate slot 112 thereby permitting adjustment of the angle of the support 16—18—20 relative to the motor 68 so that when the motor is stopped with the side 74b of the wire 74 against the stop bar 86 as in Figure 2, the circulating deflector 88 is in the horizontal plane instead of the shroud being tilted which would give an undesirable appearance thereto and likewise change the plane of radial air discharge. This is normally a factory adjustment.

In order to take up the backlash in the meshing teeth of the gear sector 38 and the pinion sector 104, we provide an over-center spring 122 having eyes 124 and 126 surrounding studs 128 and 130 of the gear sector 38 and a bracket 132 of the shroud 26 respectively. The spring 122 is so tensioned as to normally tend to spread the eyes 124 and 126 apart.

A control switch 134 is mounted on the shroud 26 and provided with a control handle 136. A supply cord 138 extends from a plug 140 to the switch 134 and further wiring 142 extends from the switch to the motor 68, an intermediate support 144 being provided for the wire 142. This support is welded to one of the pivot wires 84 and therefore swings with the motor and is so positioned as to permit minimum flexing of the wire 142 during the change of the fan from the position of Figure 1 to the position of Figure 2 and vice-versa. The supply wire 138 enters through a bushing 146 in the shroud 26 and the position of this bushing is such as to prevent interference of the supply cord with the support arm 18.

Practical operation

In the operation of our fan structure, it may be adjusted as in Figure 1 for operation as a stream or blast type fan. In this position, air may partially enter as indicated by the arrows *a* through the circumferential opening between the circulating deflector 88—90 and the open end 28 of the shroud 26. Additional air may enter as indicated by the arrows *b* through the circumferential opening between the open end 30 of the shroud and the directional blast orifice ring 94. The air is then forced out through the ring as indicated by the arrows *c*, the ring serving to concentrate the air blast in the desired direction.

In this position of the parts, the blade profile extends about 60% to 80% past the open end 30 of the shroud. This proportion, together with the use of the directional blast orifice ring 94 and the arrangement of the circumferential openings between 90 and 28 and between 94 and 30 provide for concentrating the air blast pattern without excess air dispersion as it leaves the fan structure, and provide the desired directional air blast pattern.

When it is desirable to use the fan as a floor type circulator, the handle 66 is grasped and moved counter-clockwise from the position of Figure 1 to the position of Figure 2 through about a 112° arc. Referring to Figure 7, this causes the pinion sector 104 to rotate planetary fashion around the gear sector 38 to the position of Figure 8 which results in about 180° of rotation of the motor on its transverse pivot axis 84 relative to the shroud 26 (from the position in Figure 1 with 74a stopped against 86 to the position of Figure 2 with 74b stopped against 86) but the total rotation of the motor on its pivot axis is approximately 292° because of the shroud 26 rotating approximately 112° as already mentioned. This reverses the motor end-for-end in the shroud so that the fan 70 then directs air toward the circulating deflector 88 as in Figure 2 whereupon air that flows inwardly through the guard structure 98—100 (instead of outwardly as in Figure 1) as indicated by the arrows *d* in Figure 2 is discharged from the fan structure, taking the path indicated by the arrows *e* and being deflected by the deflector 88—90 in the desired radial directions in a substantially horizontal plane.

We have found that the axial location of the fan blades is rather critical in this operation as well as in the operation shown in Figure 1, their trailing edges being located approximately 30% to 50% of the blade diameter from the lower edge of the flange 99, in order to obtain optimum efficiency and desirable air patterns. With the arrangement disclosed and just referred to, the radial air pattern desired in a horizontal plane is obtained. When the peripheral diameter of the flange 90 is slightly smaller than the diameter of the shroud 26, thus bringing the fan closer to the deflector blade, the direction of the radial air discharge pattern is downwardly instead of in the horizontal plane.

As the fan structure is adjusted from the Figure 1 position to the Figure 2 position, the spring 122 will pass through a central position shown by dash lines in Figure 7 where the eyes 124 and 126 are forced relatively close together, and after this central position is passed the spreading tendency of the eyes will complete the adjusting movement started manually to either the one limit or the other thus resulting in biasing the guard wire 74 against the stop flange 86 in both positions, and at the same time take up backlash in the teeth of the gear and pinion 38 and 104. The resulting structure is one which may be adjusted from the one position to the other with a minimum of effort and with assurance that it will normally remain in either of the desired positions until adjusted to the other one. The adjustment is made in a minimum of time without the necessity of adding attachments or making adjustments by means of tools or the like. The circulating deflector and the directional blast orifice ring together with the guard wires 94, 98, 100 and 102 thus cooperate with the fan motor in its reversal end-for-end to provide the desired air blast pattern or the floor circulating pattern desired without any adjustments other than the movement of the shroud from one position to the other. A double purpose fan structure is thereby provided which can be quickly and conveniently adjusted for either purpose in but a few seconds' time.

Some changes may be made in the construction and arrangement of the parts of our fan structure without departing from the real spirit and purpose of our invention, and it is our intention to cover by our claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

We claim as our invention:

1. In a fan structure, a support, a tubular shroud, a circulation deflector carried thereby in

spaced relation to one end thereof, said tubular shroud being pivotally mounted on said support for its tube axis to extend either substantially vertically or substantially horizontally, a fan motor pivotally mounted within said shroud for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor, and a geared connection between said support and said motor for turning said motor on its pivotal axis relative to said shroud as a result of turning said shroud on its pivotal axis relative to said support.

2. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for its cylinder axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor, and an operative connection between said support and said motor for turning said motor end-for-end on its pivotal axis relative to said shroud as a result of turning said shroud on its pivotal axis relative to said support.

3. In a fan structure, a support, a shroud, a circulation deflector carried thereby adjacent one end thereof, said shroud being pivotally mounted on said support, a fan motor within said shroud for circulating air therethrough, said motor being pivotally mounted for its shaft axis to extend either toward said deflector or away therefrom, a fan on the shaft of said motor, and an operative connection between said support and said motor for turning said motor end-for-end relative to said shroud as a result of turning said shroud on its pivotal axis relative to said support.

4. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for movement to either of two positions, one position with its cylinder axis to extend substantially vertically and the other position with its cylinder axis to extend substantially horizontally, a fan motor within said shroud, a wire guard structure supporting said motor, said wire guard structure being pivotally mounted in said shroud for the shaft axis of said motor to extend either substantially vertically or substantially horizontally, a stop projecting inwardly from said shroud and adapted to be engaged by one side of said wire guard structure when said shaft is substantially vertical and by the other side thereof when said shaft is substantially horizontal, and an over-center spring to cause such engagement in either position after manual movement of said shroud to a position past the center of said over-center spring.

5. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for movement to either of two positions, one position with its cylinder axis to extend substantially vertically and the other position with its cylinder axis to extend substantially horizontally, a fan motor pivotally mounted within said shroud, and a mechanical connection between said support and said motor for reversing said motor end-for-end relative to said shroud as a result of movement of said shroud to either of said positions.

6. In a fan structure, a support, a shroud having open ends, a circulation deflector carried thereby adjacent one of said open ends, said shroud being pivotally mounted on said support for its open ends to extend either substantially vertically or substantially horizontally, a fan motor pivotally mounted in said shroud for the shaft axis of said motor to extend either substantially vertically or substantially horizontally, a stop for the pivotal movement of said motor and projecting inwardly from said shroud to stop the pivoting of said motor when said shaft is substantially vertical or substantially horizontal, and an over-center spring to cause such stopping in either position after manual movement of said shroud to a position past the center position of said over-center spring.

7. In a fan structure, a support, a tubular shroud, a circulation deflector carried thereby in spaced relation to one end thereof, said shroud being pivotally mounted on said support for its tube axis to extend in either of two directions, a fan motor within said shroud and pivotally mounted for the shaft axis of said motor to extend in either of said two directions, and an operative connection between said support and said motor to reverse said motor end-for-end with respect to said shroud when said shroud is pivoted from one of said two positions to the other.

8. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for its cylinder axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor, an operative connection between said support and said motor for changing the position of said shaft from a substantially vertical axis directing air against said circulation deflector to a substantially horizontal axis directing air through said directional blast orifice ring as said shroud is manually moved from a position with its cylinder axis substantially vertical to a position with its cylinder axis substantially horizontal, said fan in the vertical position of its fan shaft axis having its trailing edge between 30% and 50% of the blade area from the lower edge of said circulation deflector, and in the horizontal position of its fan shaft axis having between 60% and 80% of its profile located outwardly relative to said shroud.

9. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for its cylinder axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor, an operative connection between said support and said motor for chang-

ing the position of said shaft from a substantially vertical axis directing air against said circulation deflector to a substantially horizontal axis directing air through said directional blast orifice ring as said shroud is manually moved from a position with its cylinder axis substantially vertical to a position with its cylinder axis substantially horizontal, said fan in the vertical position of its fan shaft axis having its trailing edge between 30% and 50% of the blade area from the lower edge of said circulation deflector.

10. In a fan structure, a support, a cylindrical shroud, a circulation deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for its cylinder axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor, an operative connection between said support and said motor for changing the position of said shaft from a substantially vertical axis directing air against said circulation deflector to a substantially horizontal axis directing air through said directional blast orifice ring as said shroud is manually moved from a position with its cylinder axis substantially vertical to a position with its cylinder axis substantially horizontal, said fan in the horizontal position of its fan shaft axis having between 60% and 80% of its profile located outwardly relative to said shroud.

11. In a fan structure, a support, a shroud, a circulation deflector carried thereby in spaced relation to one end thereof, said shroud being pivotally mounted on said support for its axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontal, a fan on the shaft of said motor, an operative connection between said support and said motor for changing the position of said shaft from a substantially vertical axis directing air against said circulation deflector to a substantially horizontal axis directing air away from said deflector as said shroud is moved from a position with its axis substantially vertical to a position with its axis substantially horizontal, said fan in the vertical position of said shaft having its trailing edge between 30% and 50% of the blade area from the lower edge of said circulation deflector.

12. In a fan structure, a support, a shroud, a circulation deflector carried thereby in spaced relation to one end thereof, said shroud being pivotally mounted on said support for its axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontal, a fan on the shaft of said motor, an operative connection between said support and said motor for changing the position of said shaft from a substantially vertical axis directing air against said circulation deflector to a substantially horizontal axis directing air away from said deflector as said shroud is moved from a position with its axis substantially vertical to a position with its axis substantially horizontal, said fan in the horizontal position of its fan shaft axis having between 60% and 80% of its profile located outwardly relative to said shroud.

13. In a fan structure, a support, a cylindrical shroud pivotally mounted on said support for its cylinder axis to extend either substantially vertically or substantially horizontally, a fan motor within said shroud and pivotally mounted for its shaft axis to extend either substantially vertically or substantially horizontally, a fan on the shaft of said motor and an operative connection between said support and said motor for changing the position of said shaft from a substantially vertical axis to a substantially horizontal axis as said shroud is manually moved from a position with its cylinder axis substantially vertical to a position with its cylindrical axis substantially horizontal.

14. In a fan structure, a support, a cylindrical shroud, a circulating deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for movement between two limits, a fan motor within said shroud and pivotally mounted for its shaft axis to extend in either relative to said shroud, a fan on the shaft of said motor, and an operative connection between said support and said motor for changing the position of said shaft end-for-end as said shroud is moved from one of its limit positions to the other.

15. In a fan structure, a support, a cylindrical shroud, a circulating deflector carried thereby in spaced relation to one end thereof, a directional blast orifice ring carried thereby in spaced relation to the other end thereof, said cylindrical shroud being pivotally mounted on said support for movement between two limits, a fan motor within said shroud and pivotally mounted for its shaft axis to extend in either relative to said shroud, a fan on the shaft of said motor, and an operative connection between said support and said motor for changing the position of said shaft end-for-end as said shroud is moved from one of its limit positions to the other, said operative connection including an arm geared to the frame of said motor, and a sleeve having serrated ends engaging said arm and said support to prevent rotation between the support, the sleeve and the arm, said shroud having a pivot opening surrounding said sleeve.

16. In a fan structure, a support, a shroud, a circulation deflector carried thereby adjacent one end thereof, said shroud being pivotally mounted on said support, a fan motor within said shroud for circulating air therethrough, said motor being pivotally mounted for its shaft axis to extend either toward said deflector or away therefrom, a fan on the shaft of said motor, an operative connection between said support and said motor for turning said motor end-for-end relative to said shroud as a result of turning said shroud on its pivotal axis relative to said support, and a sleeve between said operative connection and said support having serrated ends engaging the two to prevent relative rotation of said support and said operative connection.

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Number	Name	Date
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