

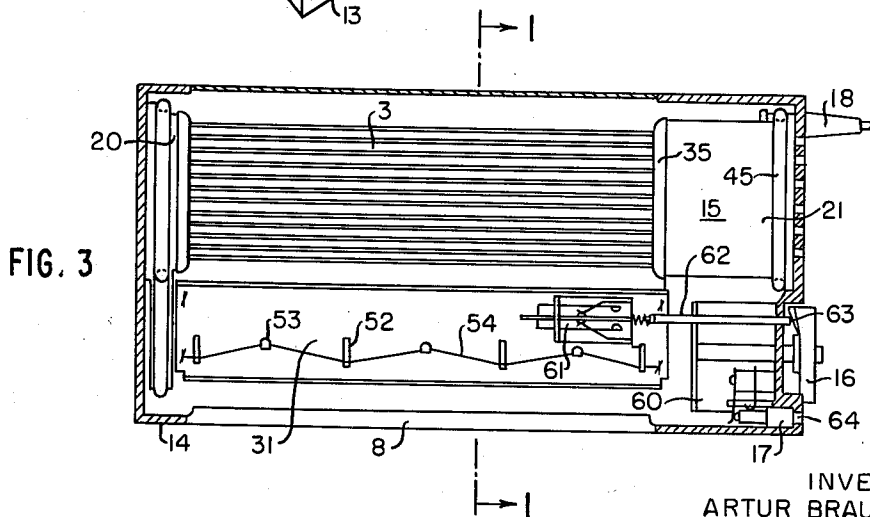
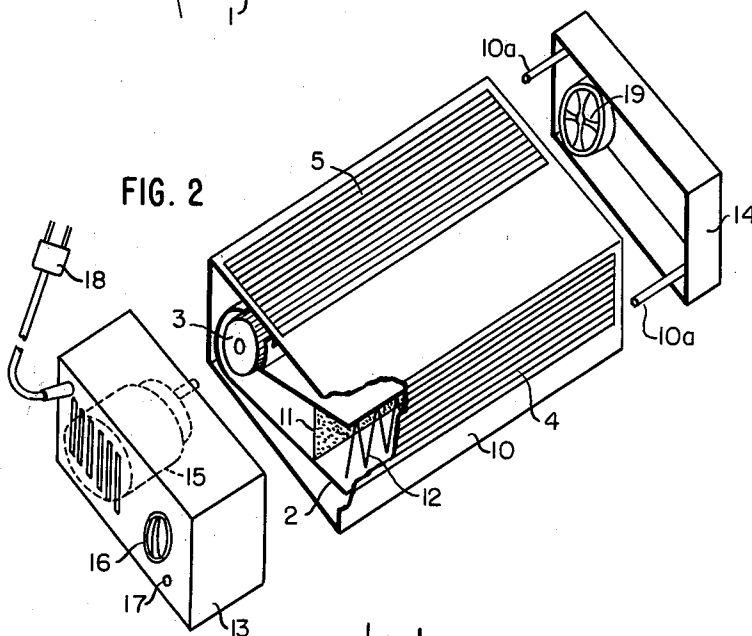
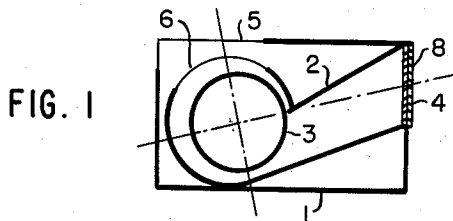
Nov. 5, 1963

A. BRAUN ETAL
PORTABLE SPACE VENTILATORS

3,109,582

Filed June 6, 1960

3 Sheets-Sheet 1



INVENTORS
ARTUR BRAUN
ROLF MAYER
NIKOLAUS LAING
BY *Kenway, Jenney & Hildreth*
ATTORNEYS

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3 Sheets-Sheet 2

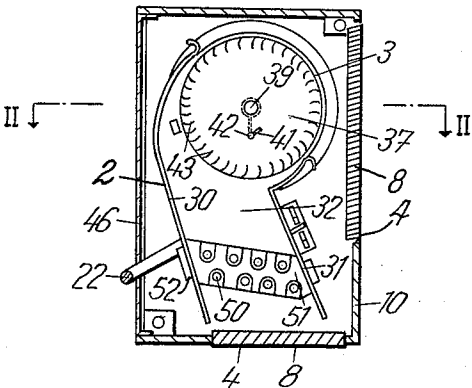


Fig. 4

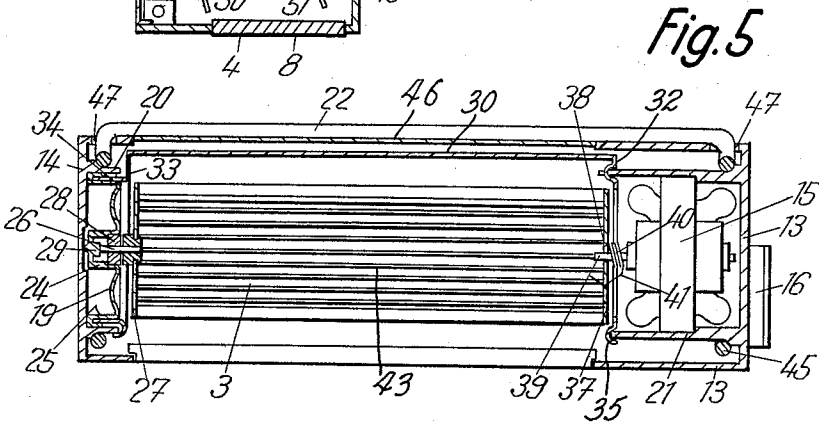


Fig. 5

INVENTORS

ARTUR BRAUN
ROLF MAYER
NIKOLAUS LAING

BY

KENWAY, JENNEY, WITTER & HILDRETH
ATTORNEYS

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A. BRAUN ET AL

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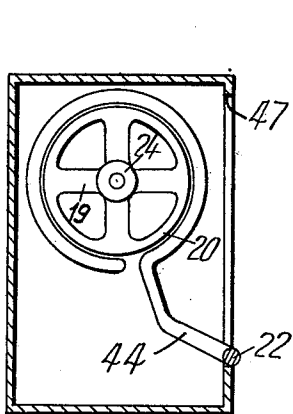


Fig. 6

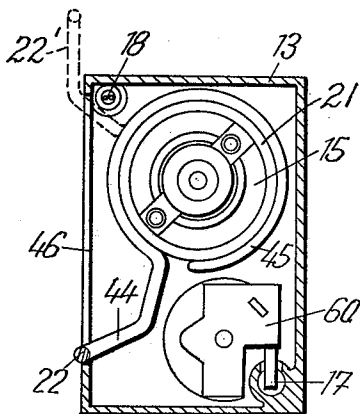


Fig. 7

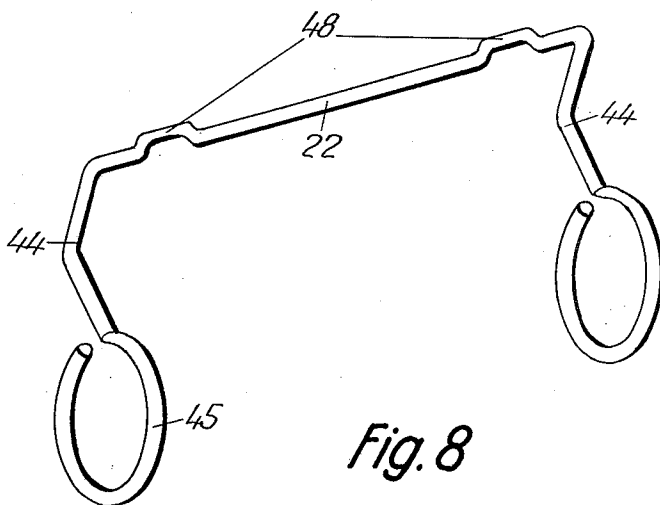


Fig. 8

INVENTORS

ARTUR BRAUN
ROLF MAYER
NIKOLAUS LAING

BY

KENWAY, JENNEY, WITTER & HILDRETH
ATTORNEYS

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PORTABLE SPACE VENTILATORS

Artur Braun and Rolf Mayer, Frankfurt, and Nikolaus Laing, Stuttgart, Germany, assignors, by mesne assignments, to Braun Aktiengesellschaft, Frankfurt am Main, Germany, a corporation of Germany
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10 Claims. (Cl. 230-117)

In recent times air blowing machines of the rotary drum type of construction have become known, whose rotor is traversed at least twice at offset peripheral regions by the air which is being conveyed. In comparison with the previously known blowers these machines have high pressure and throughput values and a substantially more favourable degree of efficiency, so that with the same output essentially smaller constructional sizes are obtained (see U.S. Patent No. 2,942,773, which corresponds to German patent specification No. 963,809). Lower motor output and lower speed of rotation both reduce the development of noise.

The invention is based on appreciation of the fact that such a machine designated shortly in the following specification as a "cross-flow blower" is especially suitable for a space ventilator of particularly small and compact construction. Known space ventilators operate mainly with conventional blade or propeller blowers which, with larger outputs, produce a considerable volume of noise by reason of the high peripheral speed and which then only have a small effective range in the space. They are mostly provided with a resistance heating body which is disposed in the discharge flow in order that they may also be suitable for use on cold days for space heating, and are usually capable of being switched to different temperature and volume outputs.

The invention concerns such a space heating ventilator and is directed to the problem of providing an apparatus which is of simple construction and hence easy to manufacture, but of reliable operation, with as diversified as possible application possibilities, hence an apparatus which can be used in the house but, by reason of its light weight and small space requirement, which may also be taken on journeys and, if desired, can be placed on surfaces such as the table or floor, or can be suspended from a wall, which, moreover, is characterised by a definite directive effect and which lastly is favourably controllable in its cooling or heating action.

This problem is solved in accordance with the invention in that the space heating ventilator, departing from the previously customary constructions, comprises a parallelepiped-shaped case on the upper side of which are disposed the induction apertures and on whose front face commencing at the upper casing edge are disposed the discharge apertures of a cross-flow blower, which is arranged in the rearward half of the case with a diffusor directed obliquely forwardly and upwards against the discharge apertures. This arrangement has the advantage that light objects such as paper disposed in front of the discharge face of the ventilator on its positioning surface are not whirled forwardly by the air pressure, as would be the case if the discharge apertures were disposed lower down. Hence this ensures that the air stream is applied to the positioning surface at a small spacing from the discharge point, where its speed is already sufficiently small that the aforementioned eddying can no longer occur; this is important for the construction of a slender jet of long range. This effect can with advantage be still further enhanced by arranging guide plates in the discharge aperture parallel to the rotor axis, which (plates) impart a horizontal velocity component to the air stream which is directed at an upward inclination. The invention permits the provision of space ventilators with a sup-

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ply output of 20 litres per minute and a range of up to 6 metres and which, with a length of less than 30 cm., have a volume of only 3 litres and a motor output of 20 w. In order that there is an intensive effect, in spaces of normal size, whether it be for cooling or heating, which can be adjusted to all requirements and always maintained pleasant, the ventilator is adjustable in known manner by stepwise control of the blower throughput and/or heating. The apparatus with its small dimensions can also be conveniently placed on furniture with horizontal surfaces such as tables or dressers.

In order to select the angle of adjustment of the air stream in accordance with requirements, and in order to be able to suspend the rotor, if necessary even from a wall, for example in the bathroom, the invention further contemplates a U-shaped stirrup on the case capable of being used as an adjustment foot or suspension device displaceably mounted in the case side walls or checks, slots disposed at right angles to the longitudinal axis being arranged in the case bottom for the passage of the stirrup limbs. Advantageously, the mounting collars or spigots for this stirrup simultaneously serve as support elements for motor and rotor, for example as the motor housing or bearing shell, whilst the limbs are bent around through an obtuse angle in such a way that, in the extended position of the stirrup, the limbs lie parallel to the bottom wall of the case, and at their ends are constructed as lugs surrounding the bearing collars, and the yoke of the stirrup is bent once or several times into a plane which lies parallel to the bottom of the case when the stirrup is lowered. In this way the stirrup disappears completely in its retracted condition when being transported or if the ventilator is to stand with its base surface on a positioning surface, the stirrup limbs disappearing into the slots whilst the yoke fits on the bottom of the case. On the other hand, the twisting of the yoke prevents slipping on wall hooks or the like.

The arrangement of the mounting collars for the stirrup fitting in the side walls of the case to act as the support element for the internal structure, adds to the advantage of using a cross-flow blower and the combination results in a ventilator having the desired features of smallness and attractive appearance whilst meeting the basic requirements of the utmost simplicity of construction and of mounting.

A further feature of the invention is that the ventilator case is constructed of three interengaging shells arranged adjacent one another in the direction of the longitudinal axis. The three parts may be held together by screws or bolts extending right through, or by tension springs suspended in the two cheeks or front portions. The motor and switches are advantageously arranged in one of the cheeks, whilst the outer rotor bearing fits in the other cheek.

In such an arrangement with overhung bearings, special precautions for a friction-free and jam-free mounting of the rotating parts in the case must be taken. According to a further feature of the invention the drum rotor on the motor side is mounted with its end disc on the motor shaft stub, and the edge of the aperture receiving the shaft stub is constructed with a knife edge. This kind of mounting is simple in production and assembly and provides ample play in case the motor and rotor axis should be out of alignment, even if the rotor disc should be made of synthetic material and of substantial thickness. It is advantageous in this case for the motor shaft and the rotor to be connected by way of a tension or compression spring which exerts a force in the radial and, if necessary, also in the axial direction and, since a certain clearance is unavoidable between the axle and the aperture in the disc, produces a contact connection

between both parts at one point only without permitting constraint.

In order also to be able to provide a certain adjustability for the other rotor bearing, with the simplest form of this bearing, the drum rotor is mounted in the end face or the cheek of the case in a membrane of thermoplastic synthetic material. Thrust and radial bearings fit in a boss of this membrane.

This adjustability can be increased in each case, according to the material, by a spoke-shaped construction. The membrane is advantageously provided at its periphery with a sleeve or collar which is inserted in a recess, preferably of cylindrical shape, in one of the case cheeks and is pressed against this by a spreading retention ring. A centered bearing inserted in the boss of the membrane has been found convenient as the radial bearing, whilst the thrust bearing of the boss can be shaped into the form of a peg.

Further details and advantages of the invention are illustrated in the following in one embodiment, which is shown in the drawings.

The drawings show first of all in FIG. 1, the cross section of a prismatic ventilator case, and the arrangement of the blower of its air inlet and discharge apertures.

In FIG. 2 an apparatus is shown in perspective view wherein the three main constructional blocks are shown separated from one another.

FIG. 3 is a view into the interior of the apparatus seen from above with case cover lifted away;

FIG. 4 is a cross section through the apparatus along the line I—I of FIG. 3;

FIG. 5 is a longitudinal section through the apparatus along the line II—II in FIG. 4;

FIG. 6 is a view of the left case cheek;

FIG. 7 is a view of the right case cheek from within; and

FIG. 8 shows the adjustment foot of the case in perspective.

In the cross section shown in FIG. 1, the essential details of the ventilator, namely, the case shell 1, the diffuser 2, and the drum rotor 3, of the cross-stream blower are indicated schematically. The induction aperture 5 and the outflow aperture 4 of the case which may be latticed or divided into several apertures, lying, with reference to the rotor axis, substantially perpendicular to one another as is shown by means of the chain-dotted lines. The induction aperture 6 of the diffuser lies below the induction aperture 5 of the case, the outlet of the diffuser lies behind the outlet aperture 4 or coincides with it.

The apparatus in accordance with FIG. 1 has the form of a parallelepiped-shaped case by which the air stream is directed slightly upwards, and in which the discharge aperture 4 commences at the upper case edge. Plate-shaped guide sheets 8 can be disposed in the discharge aperture 4, as is the case of FIG. 1, with which a velocity component disposed at an angle to the diffuser axis is imparted to the air stream.

Case shell and inserts are, as shown in FIG. 2, conveniently composed of three constructional blocks; the centrepiece 10 with the case 2, 3 and if necessary a dust filter 11, and a heating grid 12, and the two cheeks 13 and 14. In FIG. 2, the left side wall of the diffuser has been removed in order to provide a view into its interior. The driving, servicing and control elements are installed in the left cheek 13, such as the motor 15, the switch 16 for the various feed and heating outputs, and the control lamps 17. The electrical connection conduit 18 is also introduced directly here, or by way of a plug connection, so that all electrical parts are combined in this case cheek 13. In the right cheek 14 fit the thrust and radial bearings 19 for the rotor 3. Its coupling with the motor 15 will be described later. The filter 11 can also be arranged in the induction aperture 6 of the diffuser 2; it is conveniently exchangeable, and can be constructed in such a way that it may be moistened with aromatic

substances, or can be dipped in or be dusted with carriers of such substances, which it gives off slowly to the induction air for improvement of the air. The case parts 10, 13 and 14 can be injected in metal or drawn, or pressed or injected in synthetic material. With heating ventilators the central case jacket 10 is conveniently made in sheet material, since, if the blower failed to respond to the temperature safety device, high temperatures could occur in the region of the heat resistances 12; the jacket 10 may be made from material which is either cut off from a profiled tube, or wound from sheet metal strip. In a heating ventilator, the edge and grid of the outflow aperture 4, at least, should be in metal.

The blower parts, namely diffuser 2 and drum rotor 3, could likewise be made in sheet metal or synthetic material. In heating ventilators again, at least the mouth of the diffuser in the vicinity of the heat conductor should consist of metal. The mounting and bearing of these parts are described in full later.

The three constructional blocks are plugged together after mounting of all parts, care being taken, by means of rebates and overlaps on the dividing joints, to ensure a neat and tight joint. The connection can be effected non-positively by tension springs which are anchored in the cheeks, or positively by concealed preground parts, threaded bolts passing right through or the like.

With reference to FIGS. 3 to 8 details of one construction are described below, which is constructed on the principle of the simple plugging into one another of the individual parts and extensive avoidance of screws as the connection elements.

FIG. 3 shows a view of the interior of the case with the case cover lifted off, whilst FIGS. 4 and 5 show sections through the apparatus. It will be seen that each case shell forming the side cheeks 13 and 14 is shaped into substantially cylindrical collars 20 or 21, which form the receiver or the fixed bearing for all the main built-in components, namely motor 15, diffuser 2 and drum 3, and a membrane 19 comprising the outer bearing thereof, as well as for a stirrup 22 acting as an adjustment foot. The collar 21 receives the motor 15 (FIGS. 3, 5 and 7); the collar 20 receives the membrane 19 of synthetic material, which is formed with a cup-shaped boss 24 and a collar-shaped turned-over edge 25. In order to attain the greatest possible flexibility, the membrane is recessed in the form of spokes (FIG. 6); it forms the automatically adjustable outer bearing for the drum rotor 3 which penetrates by means of an axle bolt 26 in its front disc 27 into the boss 24. A centered ring 28 inserted in the boss serves as the radial bearing, whilst a thrust bearing is formed by a peg 29 moulded into the boss.

The diffuser consists of the guide sheets 30 and 31 (FIG. 4) which partially enclose the drum rotor 3 and the front sheets 32 and 33. The whole structure can be moulded integrally in synthetic material. A cylindrical ring 34 is fitted on to the front sheet 33 or moulded into it, which is pushed into the turned-over edge 25 of the bearing sleeve 19 and simultaneously presses the sleeve edge against the collar 20 and holds the diffuser and centres it on this case cheek 14. The other front sheet 32 is formed with an outwardly drawn cylindrical ring 35 engaging the collar 21, and holds and centres the diffuser also on to the case cheek 13. By registering deviations from the circular symmetry on collar 21 and ring 35 the direction of the diffuser axis is also defined relative to the outflow aperture 4 (with segments 8).

The mounting of the rotor 3 on the motor side and its connection with the motor shaft are shown in FIGS. 4 and 5. The front disc 37 of the rotor fits with a central conically sunk aperture 38 on to the shaft stub 39 of the motor 15. In this way, even if the axes of the motor and rotor do not align with one another, jamming at this bearing point cannot occur. A helical spring 40 (FIG. 5) acts as the connection, which fits frictionally on the shaft stub and is suspended with an arm 41 (FIG. 4) of

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hairpin shape and bent round radially and axially into a slot 42 of the front disc 37. In this way the spring produces a non-positive connection between the front disc and the shaft stub, at one point only, and simultaneously exerts a light thrust on a rotor in the direction toward the thrust bearing 29, so as to eliminate all radial and axial bearing play which could lead to chattering and premature wear. At the same time, the ring 35 presses the motor 15 firmly into its recess 21 by way of the pressure spring 40, as a compensation for the longitudinal tolerances.

The rotor 3 of the cross-flow blower consists of blades 43 which are pushed into notches on the periphery of the discs 27 and 37, or are inserted in perforations in the discs in the region of their edges and caulked or riveted. The blades could also be produced in synthetic material in accordance with the strand-pressing process, and be welded to the discs.

The outer surfaces of the collars 20 and 21 act as rotary mountings for a U-shaped stirrup 22, which forms an adjustable supporting foot (FIGS. 4 to 8). The limbs 44 of this stirrup are bent over twice, and terminate in large eyes 45 which are disposed around the collars 20 and 21. The bends or folds are so selected that the limb parts connected to the stirrup yoke 22 lie in the extended position of the stirrup (FIG. 7), shown at 22', parallel to the case bottom 46. The limbs enter through slots 47 in the case bottom into the interior of the case. The stirrup yoke also has two cranks 48 disposed in the plane of the adjacent limb parts, which serve to hold the apparatus securely when suspended on the wall.

In the construction as heating ventilator, as shown in FIG. 2 heating wires or a net-like heating element are disposed in the diffusor passage. In FIG. 4 two rows of heating spirals 50 are provided which are maintained at a spacing by heat resistant supports 51 of ceramic material. These supports are inserted (see also FIG. 3) with lugs 52 into the corresponding recesses (not shown) in the diffusor guide sheets 30 and 31 before the sheets are joined together. The play in this mounting is eliminated by means of a spring wire 54 (FIG. 3) inlaid between the lugs and outwardly pressed flaps or pins 53 on the guide sheet. Instead of stretching the heating spirals horizontally in the diffusor passage they could also be suspended perpendicularly between the sheets 30 at the mouth of the diffusor; in this kind of suspension the danger of sagging is less.

Speed of rotation of the motor and hence output of the blower, as well as if necessary the heating output and thereby the temperature of the air which is supplied, are controlled by means of a rotary switch 60 whose switch knob 16 lies in a depression of the case cheek 13 (FIGS. 2 and 3). Apart from its zero or cut-out position, this switch can have, for example, two or three cold stages in one direction of rotation and correspondingly two or three heat stages in the other direction of rotation. The circuit is so selected that a definite speed of rotation of the motor is simultaneously associated with each heating stage, the highest speed of rotation therefore being associated with the hottest stage. The advantage relative to the customary separated controllability of air speed and heating output consists in the fact that only one operating element is necessary, so that no mix-ups are possible and it is ensured that a definite limiting temperature cannot be exceeded at the discharge aperture 4.

In order to protect the heating ventilator against excessive temperatures on failure of the blower, a thermoswitch 61 is installed on the upper diffusor guide sheet 31, whose temperature sensor is arranged to receive radiation from the heating resistances through a perforation (not shown) in the sheet, and whose switch bar 62 is connected with the switch knob 16 non-positively. The head of the switch bar abuts in such a way against a tappet 63 on the lower face of the switch knob that the

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bar, if the thermoswitch 61 has responded, can only be pressed back by a rotation of the switch knob into one of the cold stages (and therewith the switch cut in again). In this way it is ensured that the ventilator, if excessive temperatures occur, can only be switched in again if first allowed to cool; the case is therefore intensively cold before it is also possible to switch in the heating again.

A small incandescent or glow-lamp 17 (FIG. 3) fits, in the region of the switch knob 16, into a recess of the cheek 13 and is observable from outside through the aperture 64 in the wall. It is situated in the motor circuit and is illuminated when the apparatus is switched on, as long as the motor runs.

The invention is not limited to this embodiment but includes modified constructions and in particular also the use of individual subcombinations thereof, as defined in the appended claims, in connection with further known components.

We claim:

1. A portable space ventilator comprising a casing of parallelepiped shape formed of three shells arranged side by side along the longitudinal axis of the ventilator, a cross flow blower having a rotor housed in said casing, electrical switch means for controlling the operation of the ventilator, and bearing means for opposite ends of said rotor, each of the outer ones of said shells constituting an end cheek of said casing and one of said cheeks supporting one of said bearing means and also supporting said switch means, and the shell between said two outer shells having induction and discharge apertures formed in adjacent faces thereof.

2. A ventilator as set forth in claim 1 wherein said cross flow blower comprises an electric motor and a coaxial drum rotor disposed adjacent the motor, said rotor having an end plate with an aperture therein the periphery of which is tapered to a sharp knife edge, the shaft of the motor extending through said knife edged aperture whereby the aperture periphery constitutes a bearing for one end of said rotor.

3. A portable ventilator comprising a casing of parallelepiped shape, a cross-flow blower housed in said casing, said blower comprising an electrical motor and a coaxial drum rotor coupled to said motor for rotation thereby and a flexible membrane of thermoplastic material disposed in said casing adjacent to the end of said rotor, said membrane having a cup-shaped boss supporting and serving as a mounting for the end of said drum rotor remote from said motor, and axle means for said rotor received within said boss.

4. A ventilator as claimed in claim 3 wherein said membrane comprises an outer peripheral collar portion and an inner annular boss portion connected to said collar portion by spoke members and wherein said casing is formed with a cylindrical recess to receive said collar portion, and a retention ring is disposed to urge said collar portion into said recess.

5. A ventilator as set forth in claim 4 wherein said boss portion of said membrane carries a centered bearing serving as a radial bearing for the shaft of said rotor and said boss has an integral peg constituting a thrust bearing.

6. A portable ventilator comprising a casing of parallelepiped shape and having front, rear, upper, lower and end faces, a cross flow blower housed within said casing, induction and discharge apertures in adjacent faces of said casing, a U-shaped stirrup member having limbs pivotally mounted adjacent to the opposite end faces of said casing, and a shaped recess in the lower face of said casing to receive said stirrup member when pivoted flat against said casing.

7. A ventilator as set forth in claim 6 wherein the limbs of the stirrup, in the position of the stirrup folded away from the casing, extend generally parallel to the bottom face of said casing, said casing being formed with collars in said end faces, and the ends of said limbs being formed as eyes supported on said collars.

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8. A portable ventilation as defined by claim 6 wherein the casing is formed with opposed collars with bearing means for said blower received within said collars, and said stirrup is formed at its ends with eyes supported on said collars.

9. A self contained portable space ventilator comprising a casing of parallelepiped shape having front and rear faces, upper and lower faces and two end faces; a cross flow blower within said casing having a rotary impeller rotatable on a horizontal axis, said blower being located adjacent the rear and lower faces of said casing; an inlet opening in the upper face of said casing extending forwardly from the rear edge of said upper face, an opening in said blower, said casing inlet opening leading to said blower opening in a generally downward direction; said blower having an outlet opening; an outlet opening in the upper portion of said front face extending downwardly from the upper edge of said front face; said openings forming a generally right-angular flow path through said blower; and a diffuser formed between divergent planar surfaces leading from said blower outlet opening in a forward and upward direction to said casing outlet opening so as to be diagonally positioned within said casing, said diffuser having a restricted throat adjacent said blower and having smooth divergent planar walls leading to said casing outlet opening, whereby in operation said blower draws an inlet stream of air only in a generally downward

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flowing direction into the top of said casing and discharges said stream in an upward and forward direction from the front of said casing.

10. A space ventilator as defined by claim 9 wherein the casing is constructed of three shells arranged side by side in the direction of the blower axis, the two outer shells forming end cheeks, including the casing end faces, and the center shell surrounding the blower and being formed with the inlet and outlet openings.

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Disclaimer

3,109,582.—*Artur Braun* and *Rolf Mayer*, Frankfurt, and *Nikolaus Laing*, Stuttgart, Germany. PORTABLE SPACE VENTILATORS. Patent dated Nov. 5, 1963. Disclaimer filed Nov. 6, 1963, by the assignee, *Braun Aktiengesellschaft*.

Hereby enters this disclaimer to claims 3, 4 and 5 of said patent.

This disclaimer supersedes disclaimer published in the *Official Gazette of Jan. 14, 1964*.
[*Official Gazette, February 25, 1964.*]