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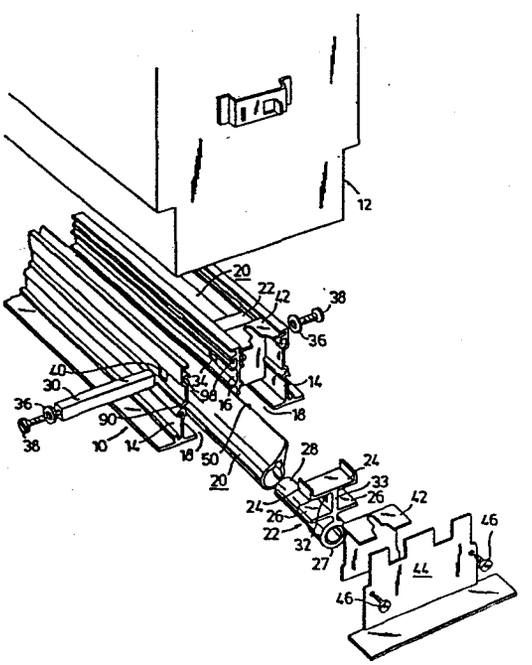
(54) An air ventilation device.

(57) An air ventilation device (10), which is functional as both an air supply terminal device and an air exhaust terminal device, comprises one or more slot-like openings (18) which extend in the longitudinal and/or transverse direction of the device. These openings (18) are intended for the through passage of a gaseous ventilation medium and each opening co-acts with a pivotable guide vane assembly (20), such as to alter the flow conditions in the openings (18). The guide vane assembly comprises an elongated hollow body section (69) which has an appreciable thickness along the whole of its length and a guide fin (76). The guide fin (76) is flanked on both sides by longitudinally extending profiled side elements (14, 16). Extending along the whole length of the hollow thickened body section (69) of the assembly (20) and facing associated through passage openings (18) are guide vane setting means (62). The side elements (14, 16) are substantially planar and are provided with angled base surfaces (82, 106) which define the opening or openings (18).

Fig.1



EP 0 142 834 A2

An air ventilation device

The present invention relates to an air ventilation device, or air terminal device, of the kind set forth in the preamble of Claim 1.

In one known air ventilation device of this kind the side members extend parallel with respective edges of a guide vane assembly and together form in the region of the vane assembly, when seen in cross-section, a broken circular chamber which exhibits a downwardly facing air-outlet opening and an upwardly facing air-inlet opening. In the region of the inlet opening, the side members are provided with abutment surfaces for supporting the free edge of the guide vane assembly. The guide vane assembly comprises a thick body section, which is located centrally of the circular space, and an air control fin which extends outwardly from said body section. When the control fin is positioned centrally between the side members, the exiting air flow is directed substantially straight out through the slot-like outlet opening. When the fin is moved to one side of the circular chamber, the exiting out-flow will be deflected accordingly.

This arrangement only affords limited deflection of the airflow, due mainly to the circular shape of the side walls, the small dimensions of the vane assembly, and the positioning thereof. When the guide vane assembly is rotated to its limit, so that it abuts the aforesaid abutment surface, the exiting air flow will move substantially tangentially to the outlet opening. Consequently, in the case of a ceiling mounted ventilating device of the aforesaid kind, an air stream which has been deflected to the maximum possible extent will only move a short distance along the ceiling, at quite a considerable distance therebeneath. Thus, such a device cannot be said to direct a stream of ventilating air close to the ceiling, in the actual meaning of the word close. Neither is it possible with such a device to deflect respective control fins of

a multiplicity of such devices arranged side by side in one and the same direction, so as to obtain a stronger and farther reaching flow of ventilating air across the ceiling and immediately therebeneath. The air streams issuing from these additional ventilation devices will instead be directed down into the room, or the so-called occupied zone.

The object of the present invention is to provide an air ventilation device, or air terminal device, of the aforesaid kind, which is of simple and stable construction; which can be readily adjusted externally without the aid of special tools herefor; which is not affected by disturbances in operational conditions; which is not easily damaged and is thus highly reliable; which can be assembled to form longitudinal and transverse modules; and which constitutes a step forward in this art.

Accordingly, this invention consists in an air ventilation device of the aforesaid kind having the characterizing features set forth in the characterizing clause of the following Claim 1.

Thus, the air ventilation device, or air terminal device, according to the invention is provided with positional setting means which enables the angular setting of each guide vane to be readily adjusted. One important feature of the invention is that the body section of the guide vane has an appreciable thickness, since this body section influences the flow conditions in the outlet opening, and particularly contributes towards providing a possibility of creating a strong flow of ventilation air closely adjacent the ceiling of the room being served, with a long throw. Because of the appreciable thickness of the guide-vane body, it is possible to deflect the exiting air flows of a plurality of mutually adjacent air ventilation devices, or air terminal devices, in one and the same direction, close to the ceiling of the room being served. This is also assisted by the fact that the side members are substantially planar and have base surfaces which are

inclined to the outlet openings. These angularly positioned base surfaces cooperate with the body section of the guide vane in a manner to produce the flow conditions which determine the direction in which the stream of ventilation air travels.

Further advantageous characteristic features of the invention are set forth in the depending claims.

The invention will now be described in more detail with reference to a number of embodiments thereof illustrated in the accompanying drawings, in which

Figure 1 is an exploded perspective view of an air ventilation device according to the invention;

Figure 2 is a bottom plan view of the device illustrated in Figure 1;

Figure 3 is a vertical sectional view taken on the line III-III in Figure 2, illustrating an end-holder means;

Figure 4 is a vertical sectional view taken on the line IV-IV in Figure 2, illustrating a central holder means;

Figure 5 is a cross-sectional view taken on the line V-V in Figure 2, illustrating the air control and distributing means in its various stages;

Figure 6 is a cross-sectional view of the air ventilation device, taken on the line VI-VI in Figure 2, incorporating baffle plates;

Figure 7 is a cross-sectional view of the control and distributing means;

Figure 8 illustrates in cross-section an air ventilation device according to the invention mounted on a fixed angle fitting in an air injection/extraction box having a pipe connector mounted thereon; and

Figure 9 illustrates in cross-section an air ventilation device according to the invention having four slots, and shows the direction of air flow at different settings of the air control and distributing means.

Figure 1 illustrates an air ventilation device, or air terminal device 10 connected to an air injection/extraction box 12. The illustrated device comprises side

profiled elements 14 and an inner profiled element 16 which embraces throughway or ventilation passages 18 having arranged therein air control and distributing devices 20 in the form of guide vane assemblies. As will be seen more clearly from Figures 2-5, the devices or guide vane assemblies 20 are mounted in two end holders 22, each of which is provided with holding flanges 24 and abutment flanges 26 for abutment with the profiled elements 14,16 and/or engagement in grooves 90,98 provided in said flanges, and a journal shaft 28 upon which the device 20 is mounted for rotation. The profiled elements are held together by cross struts 30, which pass through a hole 32 in the end holder means 22 and a corresponding hole 34 in the inner profiled element 16, said holes preferably being of non-round configuration. The cross struts 30 are assembled with the aid of washers 36 and screws or bolts 38 arranged in screw holes 40 in the profiled side elements 14. Arranged at the ends of the ventilation slots are mounting fittings 42 and end covers 44 having securing screws 46. Perforated air-flow equalizing plates 48 or permanent baffles 49, (Figure 6) may be arranged in that side of the air ventilation device 10 facing the air injection/extraction box 12.

Figure 2 illustrates the air ventilation device 10 from beneath. As is clearly shown in this figure, the air control and distributing device 20 is provided with position setting means in the form of setting grooves 62 by means of which the setting of the device 20 can be adjusted, by rotating said device about the journal shafts 28 with the aid of a suitable tool herefor, or simply with the aid of the fingers and finger nails of one hand. The figure also illustrates screws 64 for securing the device 20 to a fixed support, the necks of said screws passing into a respective slot 56 in a fixed angle fitting 66 covered with cellular plastic insulation. The embodiment illustrated in Figure 2 also includes a lead bush 58 having an outwardly protruding portion over

which a hose or pipe encapsulation can be fitted, said bush being intended to receive therethrough a selected pipe or line, for connecting supply and/or control devices, for example, to the air ventilation device 10.

Figure 3 illustrates the manner in which the air control and distributing device 20 is secured in a ventilation slot with the aid of the aforesaid end holder means 22. As shown, the journal shaft 28 is mounted in an annular mounting part 27 connected to a web section 33 of the holder means 22, the aforementioned flanges 24,26 extending from this web section 33. These flanges 24,26 engage in the grooves 90,98 provided in the profiled side elements 14 and the profiled inner elements 16. The journal shaft 28 extends into a through-passing shaft bore 68 arranged in the air control and distributing device 20. Extending from the periphery of the bore 68 is a groove 70 in which there is arranged a tension spring 72. This tension spring is arranged to hold the device 20 in an adjusted position relative to the journal shaft 28, by means of friction. A channel 74 or like cut-out extends from the groove 70 into a guide fin 76 arranged on the air control and distributing device 20.

In a corresponding manner, Figure 4 illustrates a central holder means 60 which is very similar to the end holder means 22, but which is provided with a pivot pin 80 which projects outwardly in both directions. The central holder means 60 supports on both sides the ends of the air control and distributing device 20 and is preferably used in conjunction with long ventilation slots 18, or when desiring to divide a slot longitudinally into an air injection and an air extraction part. The tension spring 72 also in this case holds the device 20 in its adjusted position relative to the shaft journal 80.

As will be seen from Figure 5, each profiled element 14,16 has a substantially planar web section which extends upwardly from a base part 82 and 106 respectively. Figure 5 illustrates the left-hand side of a fully closed slot 128

between the edge 50 of the control and distributing device 20 and the side element 14, whereupon the total air flow passes out through the gap 54 between the device 20 and the inner profiled element 16. The air flow strikes against the upper surface 130 of the base part 106 of the inner element 16 and is deflected to the left. Under the influence of the choanda-effect, the air stream 134 will follow the wall surface or ceiling surface in which the air ventilating device is mounted. In the right-hand portion there is located between the edge 50 and the side element 14 a gap 136 which is narrower than the gap between said edge 50 and the inner element 16. A minor part of the air stream will pass through this gap 136 and is deflected by the upper surface 132 on the base part 82 of the side elements. This minor air stream will disturb the major air stream passing through the wider gap 54 between the device 20 and the inner element 16, such as to deflect this air stream downwards when it has passed through the opening 18. The direction of the air flows is indicated by the arrows 138.

Figure 6 illustrates in the right-hand part thereof how the normally open ventilation slot can be closed by means of an angular baffle plate 140.This baffle plate is arranged in a manner which enables it to be fitted through the ventilation slot 18 from outside the ventilation device without needing to dismantle the same. It is also possible to remove the plate, by inserting a tool between the plate 140 and the adjacent profiled element. In the left-hand part of the figure it is shown how the normally open ventilation slot can be closed fully by means of a planar baffle plate 49 inserted into an upper groove 102, 124 in respective profiled elements 14,16. This planar plate 49 can only be removed by dismantling the ventilation device. Planar baffle plates 49 are used solely to permanently shut-off the whole of the ventilation slot, or a part thereof, while angular baffle plates 140 are used for temporarily closing a ventilation slot,

for example to satisfy changing ventilation requirements at different times of the year.

As will best be seen from Figure 7, each guide vane assembly 20 includes a hollow body section 69 which extends along the whole of the length of said vane assembly and which has an appreciable thickness. The cavity 68 is of substantially cylindrical configuration, to permit rotation of the guide vane relative to the shaft journals 28,80, wherewith a groove 70 is provided for receiving the aforedescribed tension springs. The reference 74 identifies a cut-out, while the reference 76 identifies a guide fin which forms part of the guide vane assembly in the ventilation device and which is directed away from associated opening 18. The reference 50 identifies the outer edge of the guide fin, while the reference 62 identifies a groove for facilitating angular adjustment of the guide fin.

Figure 8 illustrates an air ventilation device 10 mounted on air injection/extraction box 12 provided with a coupling sleeve 146. The box 12 is provided with a connection collar 148, in which the device 10 is mounted. The connection collar has a double-folded edge portion 150 which supports the end portions of legs 152 of an angular fitting 154. The air ventilation device is secured by means of screws 156, which connect the mounting fittings 42 to the angular fitting 154. The screws 156 have a length which enables them to secure the ventilation device at mutually different distances from the air injection/extraction box, depending upon the position of the wall or the ceiling on which the device is to be mounted. Sealing strips 158, for example cellular plastic sealing strips, are arranged in the folds of the double-folded edges 150.

Figure 9 illustrates an air ventilation device or air terminal device in the form of a module comprising profiled elements 14,16, and having four parallel slots or openings 18. The air control and distributing devices 20 are adjusted to different positions, such that their

free edges 50, when seen from the left of the figure, define a narrow gap 52, and a slightly wider gap 136, gaps 142 of substantially equal width, while the gap 128 on the extreme right is fully closed. The directions in which the resultant air streams travel is indicated by arrows. The left-hand ventilation gap creates an air stream 135 which follows along a ceiling or a wall 143 on which the ventilation device is mounted. The throw is comparatively short and the ventilation air stream reaches relatively far out from the surface 143. The next following ventilation slot or opening creates an obliquely downwardly directed air stream, as indicated by the double arrows 138. The third ventilation slot, in which the air control and distributing device 20 is located in a central position, creates an air stream which passes vertically downwards, as indicated by the double arrows 144. The right-hand ventilation gap or slot, in which the edge 50 of the device 20 lies against the side element 14, produces a ventilation air stream which has a long throw and follows closely adjacent the surface 143, as illustrated by the arrow 134. By setting the edges 50 of a number of devices 20 in one and the same direction, close into a profile element, ventilation air can be directed from a plurality of mutually adjacent outlets 18 along the surface on which the devices are mounted. In this way, it is possible to cause the air flows from four such ventilation outlets to pass along a ceiling or a wall.

The minor part of the air stream passing through a narrow gap 52 between an edge 50 and a side element 14 or a central element 16 greatly influences the throw and the width of the air stream following the ceiling or wall surface on which the ventilation device is mounted. The wider the gap 52 the shorter the throw and the farther the ventilation stream extends from the ceiling. In order to accurately control the ventilation air stream, the gap 52 must be adjusted accurately to fractions of a millimeter. This can be effected advantageously by inserting

a measuring instrument of some kind through the opening 18 and into the gap 52.

The aforedescribed and illustrated embodiments of an air ventilation device according to the invention are not restrictive in any way, but are merely shown by way of example. Thus, modifications can be made within the scope of the following claims.

Further advantageous embodiments of the invention are shown in Figures 10 and 11. At least one end of each guide vane 20 is cut out to form a recess 200 leaving a circumference of the hollow body 69 of slightly more than 180^{o}, e.g. approximately 200^{o}. Such a so recessed vane end is intended to snap on to a journal shaft 204, which is constituted by a leaf spring 201. The latter is preferably shaped as a pair of mirror-symmetrical claws, the openings of which are facing each other. These claws extend from a neck part 203, which in its turn connects to a common sling-like base 202. Such a journal shaft, i.e. said pair of claws or the like, is intended to become elastically compressed, when said recessed vane end is snapped on and over it, when it eventually expands somewhat inside said hollow body part and exerts a certain friction power on said vane, which in such a way is kept safely in position and yet can be easily removed again by withdrawal. As shown in Figure 10, there may be two pairs of claws in series for connecting vanes. The two pairs are spaced apart by a slot 205.

Instead of a throughgoing setting means, there can be e.g. one or several holes 206 or other means arranged anywhere in or at the hollow body. For instance any pointed tool may be used for insertion into one of said holes or the like to adjust the position of a vane.

Finally, the vanes according to the present invention must not necessarily be made of extruded aluminium. They may very well be formed of sheet metal, one end of which may form the tip of said fin, meanwhile the other end is bent around the first-mentioned one. This has proved to be a very stiff and inexpensive construction.

C L A I M S

1. An air ventilation device (10), particularly intended for supply air, comprising one or more slot-like openings (18) for through-passage of a gaseous ventilation medium and extending in the longitudinal and/or transverse direction of said device, there being co-ordinated with each opening at least one axially rotatable guid vane assembly (20) incorporating at least one guide fin (76) arranged to face the through-passing medium, and in which each guide vane assembly is flanked by longitudinally extending side members (14, 16) and includes setting means (62) for adjusting the angular setting of said guide fin, c h a r a c t e r i z e d i n t h a t each guide vane assembly (20) comprises an elongate hollow body (69) of appreciable thickness throughout the whole of its length and setting means (62) directed towards associated through-pass openings (18), for setting the position of the guide vane (20) with associated guide fin (76), and in that the side members (14, 16) are substantially planar and have angularly inclined base surfaces (82, 106) which define said opening or openings (18).

2. A device according to Claim 1, c h a r a c t e r i z e d i n t h a t the guide vane or guide vanes (20) is, or are, journalled in end holder means (22) and/or central holder means (60), each of which includes a journal shaft (28, 80, 204), inserted in the cavity (68) of the hollow vane body (69).

3. A device according to Claim 1 or Claim 2, c h a r a c t e r i z e d i n t h a t the side members comprise stationary profiled elements (14, 16), arranged to co-act with the guide vane assemblies (20).

4. A device according to Claim 1 or Claim 2, c h a r a c t e r i z e d i n t h a t said setting means (62) can be reached through said through-passage opening or openings (18), from an adjacent ventilated space, or occupied zone, for manual adjustment of said setting means.

5. A device according to Claim 3 or Claim 4, characterized in that the distance between the free edge (50) of the guide fin (76) and an adjacent stationary profiled element (14,16) can be adjusted in a controlled manner with the aid of a measuring instrument or like tool inserted through the slot-like through-passage (18).

6. A device according to any one of Claim 2-5, characterized in that the guide vane assembly (20) is held in an adjusted position by means of frictional forces produced with the aid of at least one spring means (72) acting between the vane assembly and said journal shaft (28,80).

7. A device according to any one of Claims 2-6, characterized in that said end holder means (22) and said central holder means (60) include an attachment part which engages through holding flanges (24) and/or abutment flanges (26) in grooves (98 and 90 respectively) provided in adjacent profiled elements (14,16).

8. A device according to any one of Claims 3-7, characterized in that a baffle plate (140), preferably an angled baffle plate, is arranged to be inserted through a through-passage opening (18) in a manner to shut-off the flow of medium through said opening, preferably on the side of the guide vane assembly (20) remote from said opening (18), wherewith a preferably angled leg section of the baffle plate (140) is fitted along a laterally located stationary profiled element (14,16).

9. A device according to any one of Claims 3-8, characterized in that it is provided with means for connection to one or more air injection and/or extraction boxes (12) with the aid of mounting fittings (42) and fixed angular fittings (154) mounted on the profiled elements, and in that seals (158) are preferably arranged between the profiled sections (14) and a connecting collar (148) on the box (12).

10. A device according to claim 2, c h a r a c t e r i z e d i n t h a t at least one end of each guide vane (20) is cut out to form a recess (200) leaving a circumference of the hollow body (69) of slightly more than 180^{o}, and that such a so recessed vane end is intended to snap on to a journal shaft (204) constituted by a leaf spring (201), which preferably is shaped as a pair of mirror-symmetrical claws extending from a neck part (203), which in its turn connects to a sling-like base (202), said leaf spring being arranged to become elastically compressed by said recessed vane end simultaneously exerting a certain friction power on said vane.

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Fig.1

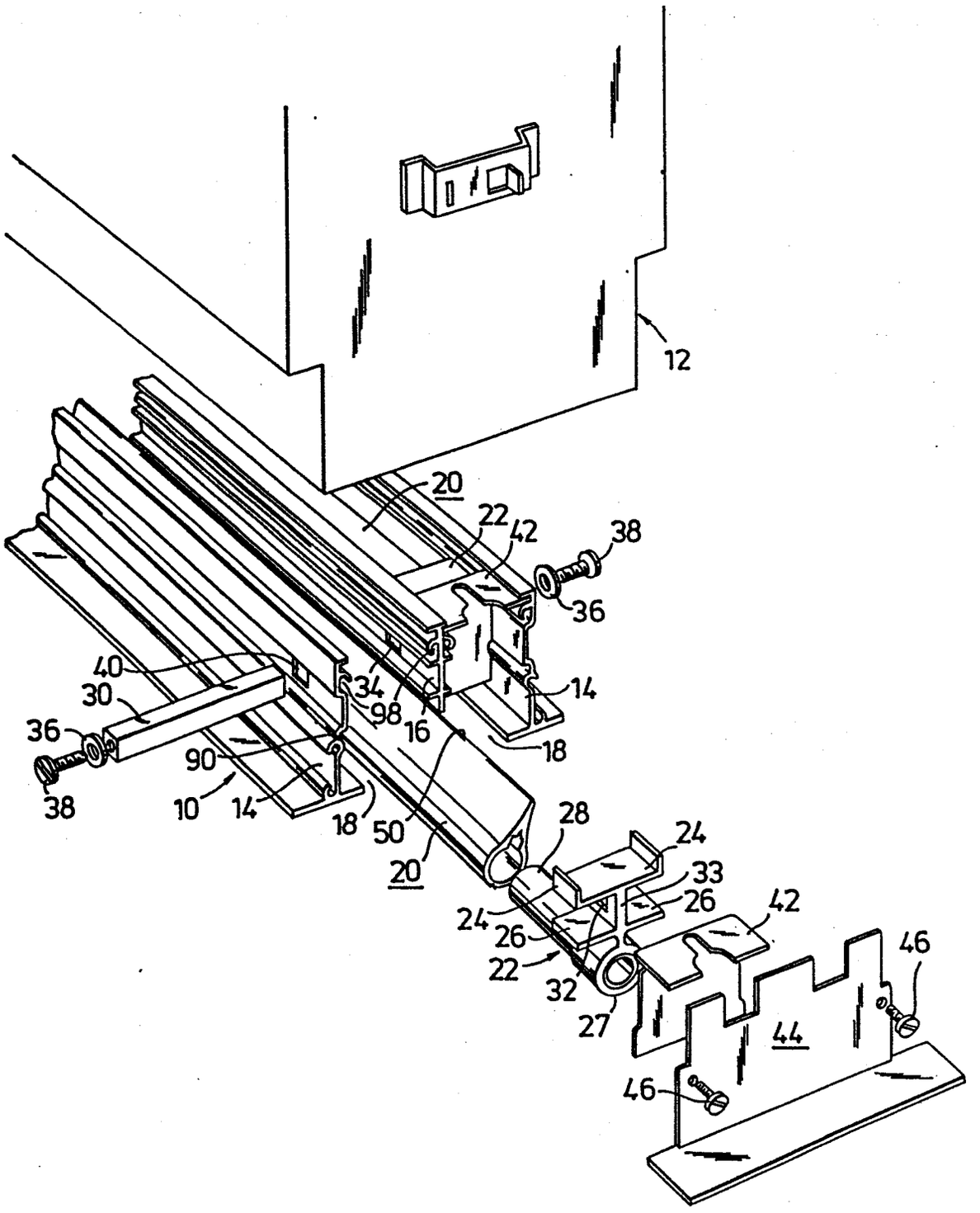

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Fig. 3

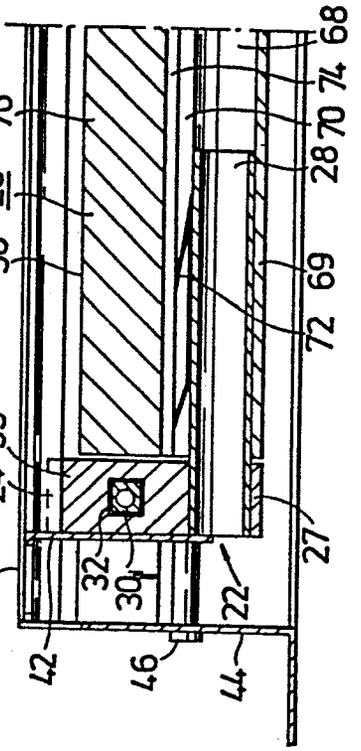

Fig. 4

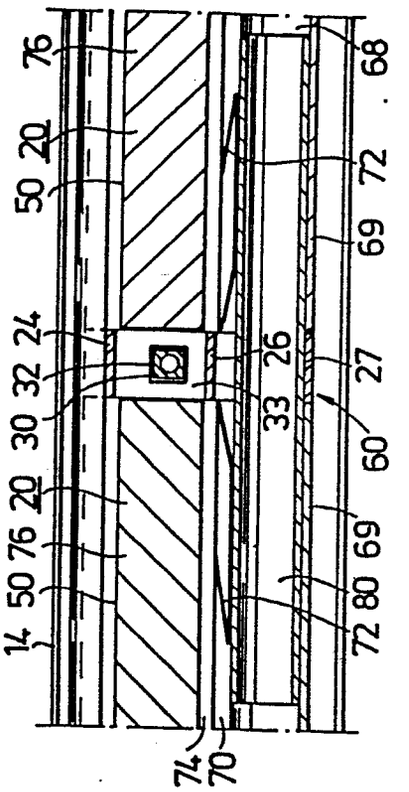

Fig. 2

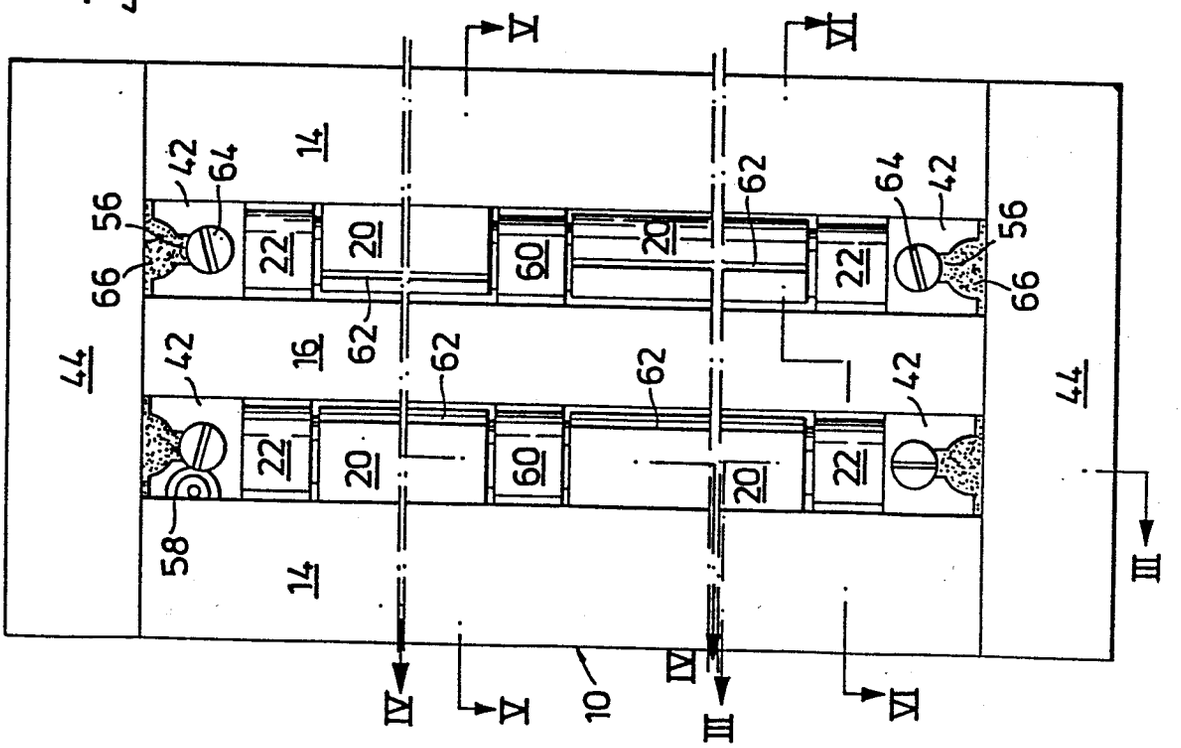

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Fig. 5

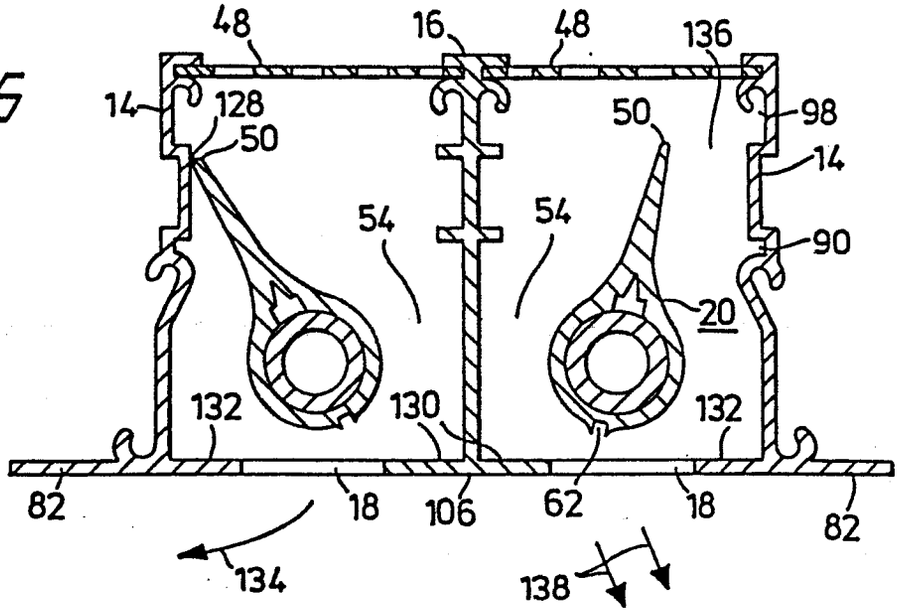

Fig. 6

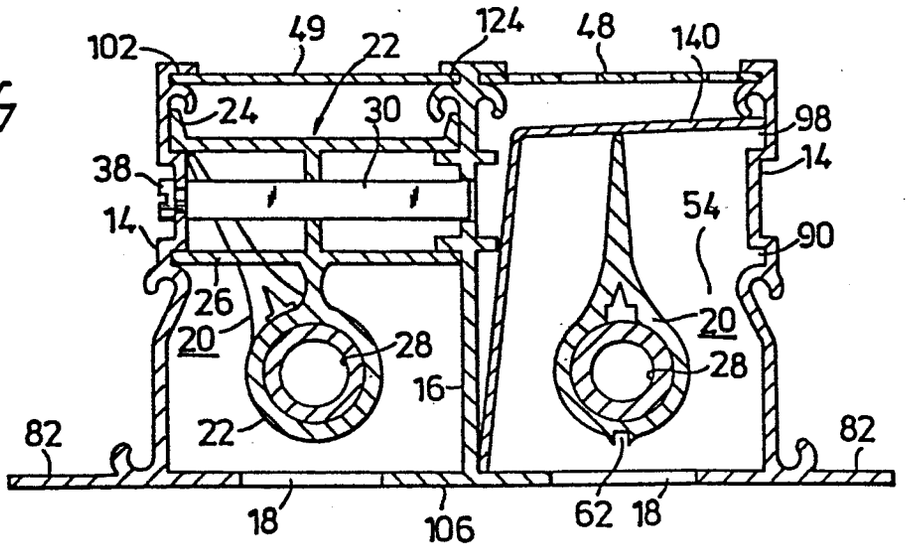

Fig. 7

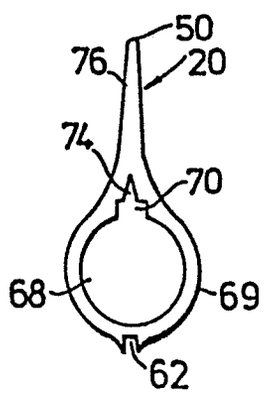

Fig. 10

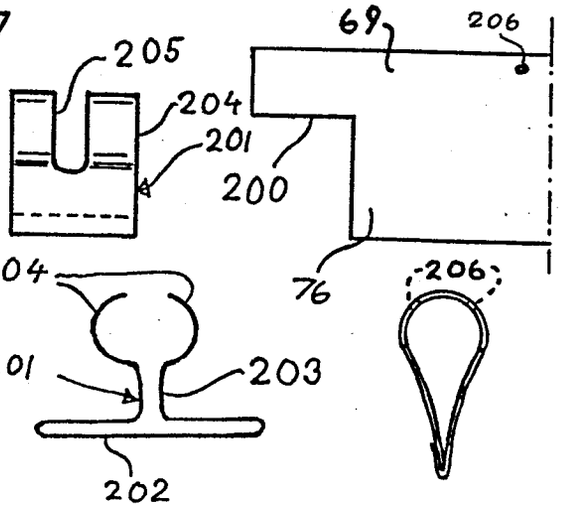

Fig. 11

Fig. 8

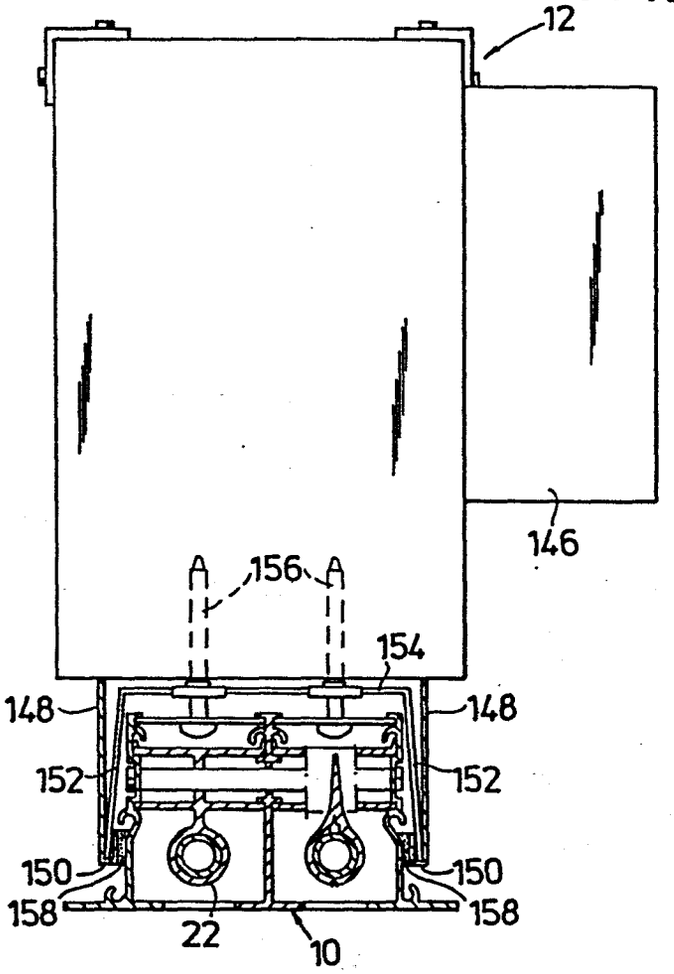
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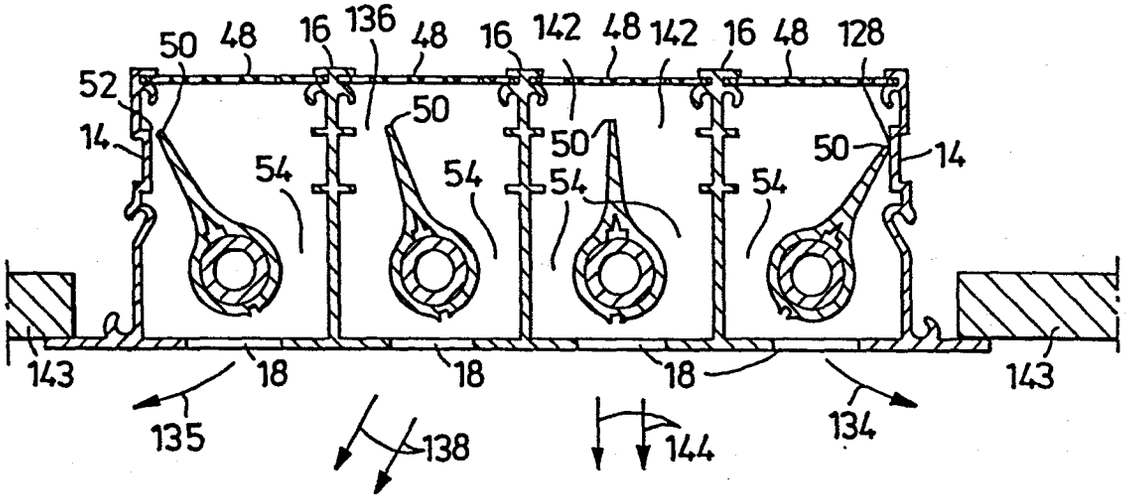
Fig. 9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