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(54) Displacement ventilation device and filter device therefore

(57) A device for displacement ventilation (1;13;52) including a filter for filtering of supply air supplied to the device, is distinguished by a filter housing module (6;14;19) with at least one opening in its wall for placement of the filter (7;15;20) and thereby form a closed structure, wherein the filter housing module includes at least one connection (11,12) for a supply air conduit, and fastening means (3,4) for fastening the filter housing module to the device. The invention also concerns a filtering device for use therein.

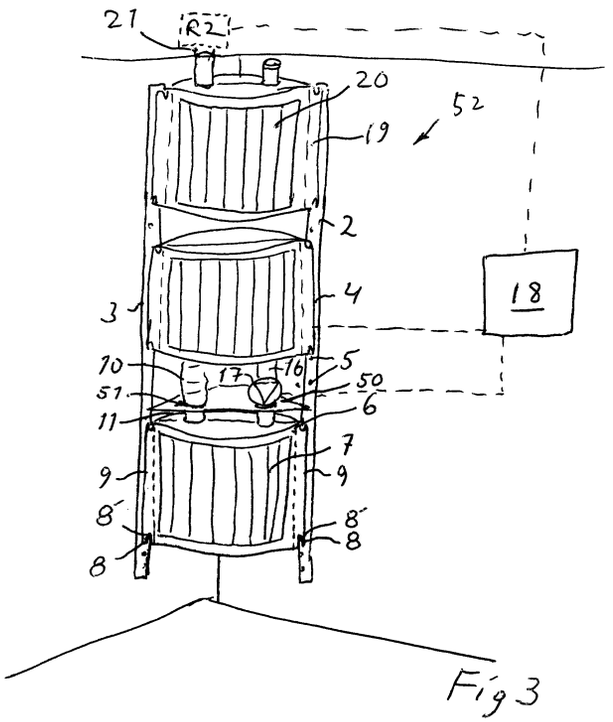

Fig 3

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Description

FIELD OF THE INVENTION

[0001] This invention concerns a displacement ventilation device according to the preamble of claim 1.

[0002] It also concerns a filter device therefore according to the preamble of claim 14.

DESCRIPTION OF PRIOR ART

[0003] In previously known air supply means for displacement ventilation, supply air is delivered from a central ventilation system including air filter. A housing of the air supply means includes a cone shaped air distributor and a permeable wall allowing supply air to flow with low velocity into the room to be ventilated.

[0004] The previously known air supply means for displacement ventilation functions well, but because of its construction the filters that are used have to be a adapted to each space being part of the system, which often results in that over-dimensioned filters are included in the system.

THE AIM AND MOST IMPORTANT FEATURES OF THE INVENTION

[0005] It is an aim of the invention to provide a device for displacement ventilation wherein the problem of the prior art may be solved and wherein service is simplified and less expensive. It is also an aim of the invention to provide a solution, which is simple to adapt to different applications.

[0006] These aims are obtained in a device as above through the features of the characterising portions of claim 1.

[0007] By including into the device a filter housing module having the filter placed in an opening in its wall for forming a closed structure and by its filter housing module being fastenable to the device through fastening means, several advantages are obtained. Firstly the modular construction allows simple and efficient adjustment of the device for different applications. This may be obtained with a limited number of filter housing modules and yet provide a plurality of variations with respect to function, output etc. As concerns the desired air-quality in different spaces, the invention provides great flexibility. The filter housing module is simply replaceable and may be produced at low costs resulting in economically advantageous service and low manufacturing costs for the device. It should be noted that by "closed structure" is not intended hermetically tight, since the filter surface is air permeable. With this limitation, however, the structure formed by the filter housing module and the filter (filters) is to be regarded as a confined vessel.

[0008] When the filter housing module is a disposable detail which is replaceable together with a filter, the service possibilities are enhanced and need of cleaning minimised. In the event that particles collected inside the filter housing module are categorised as hazardous waste, this is simply taken care of through this aspect of the invention.

[0009] The filter housing module is preferably manufactured economically advantageously from a synthetic material through for example vacuuming forming or through any other suitable method.

[0010] Preferably the filter housing module is manufactured in two halves which are sealingly attached to each other so as to form a closed chamber. This makes it possible to make the filter housing module without leaks, which is important for the function. In particular in applications where the filter is comprised of an high effective particle filter (HEPA-FILTER). The filter housing module may be modified with respect to its construction, and when mounting the device along a wall it is preferred that one half is provided with a filter whereas the other half is closed. When a device according to the invention is placed freely in a room, both halves may be equipped with filters.

[0011] By the fastenings means including a body having fastening elements distributed along its length, it is possible to fasten filter housing modules as desired along this length. It is also possible to fasten of number of filter housing modules in one and the same device.

[0012] By providing a covering of the device with elements for co-operation with the fastening means, manufacture is simplified as well as mounting. Mutually cooperating suspension, snap or hook means for particularly simple and fast mounting and demounting of the covering could be used.

[0013] In a preferred application of the invention the devising includes at least one exhaust air module being comprised of a filter housing module with an inserted exhaust air filter. This way it is simple to integrate the functions of delivering supply air and to suck away exhaust air from the room. Normally the exhaust air module will be placed at a higher level than the supply air module, whereby in a per se known manner, displaced warm air with a contents of small particles is advantageously disposed of through said exhaust air module.

[0014] In a particular preferred application of the invention, the device includes at least one circulating module being comprised of a filter housing module having an inserted circulating filter. Hereby that great advantage is achieved that the displacement ventilation is supplemented with circulation of indoor air as well as cleaning of this air. This gives the possibility of using filters being adapted for taking care of the impurity mix in the in-door air in a particular room. It is preferred that circulation is achieved through a fan, and in particular it is preferred that the fan is adjustable with respect to flow, which enhances the possibilities of adaptation to the application and also to different time periods when different impurity mix situations prevail.

[0015] Corresponding advantages are obtained ac-

cording the invention through a filter device including a filter housing module for provision in a device according the above.

BRIEF DESCRIPTION OF DRAWINGS

[0016] Further advantages are achieved according to the invention and will become clear from the following description of embodiments in conjunction with the drawings, wherein:

Fig. 1 shows diagrammatically in a perspective view a device according to the invention in a first embodiment,
fig. 2 shows diagrammatically in a perspective view a device according to the invention in a second embodiment
fig. 3 shows diagrammatically in a perspective view a device according to the invention in a third embodiment,
fig. 4 shows a section through a filter device according to the invention,
fig. 5 shows in a diagrammatical perspective view a differently embodied filtered device according to the invention,
fig. 6 shows a section through a differently embodied filter device,
fig. 7 shows in a perspective view a device according to the invention as seen in a use position in a corner of a room, and
fig. 8 shows a section through the device in fig. 7.

DESCRIPTION OF EMBODIMENTS

[0017] Similar details have been allotted the same reference numerals.

[0018] A device for displacement ventilation is shown in fig. 1 in a condition without a covering. The device for displacement ventilation 1 includes a body 2, which includes two fastening means 3, 4 in the form of two vertical rails for fastening against the walls of a room. The shown device for displacement ventilation 1 is intended to be mounted with the body 2 in a corner of a room, which is intended to be ventilated. The fastenings means 3, 4 are provided with distributed fastening holes 5 along their vertical length for positioning, as desired, of a filter arrangement including a filter housing module 6, which carries a filter 7 in a portion of its wall.

[0019] The filter housing module 6 together with a filter 7 is comprised of a closed hollowed body which is fixed to the fastenings means 3, 4, firstly with the aid of a number of fastening elements 8, 8', which are adapted to co-operate with the fastening holes 5 of the fastening means 3, 4. This is achieved in such a way that open slots 8 at the ends of sideward directed flange portions 9 on the filter housing module 6 co-operate with pins, screws or the like, 8', which are inserted in the fastening holes 5. Secondly a pipe portion 11 (see below) co-operates with a hole 51 in a fastening console in the form of a plate 50 for the fixation of the second end of the filter housing module. Fastening is simply achieved by the pipe portion 11, and possibly also a second pipe portion, is inserted into the hole 51, and possibly also into a second hole, whereupon the filter housing module is fixed by said co-operation between the fastening elements 8 and 8' being provided.

[0020] In the shown example the device for displacement ventilation is a supply air terminal device and the filter housing module 6 is a supply air terminal module, which is fed with supply air through a supply air conduit 10 from a supply air channel, (not shown), which is arranged in the building, said supply air channel possibly being provided in the building and being drawn in various ways. The supply air conduit 10 adjoins to the filter housing module 6 through an outgoing supply air pipe portion 11. In the shown example the filter housing module 6 has also a second pipe portion which in this case is not used and therefore sealed.

[0021] The filter housing module with its filter 7 form a closed chamber wherein a slight overpressure prevails, so as to ensure an even outflow of supply air through the entire filter surface 7 to the surrounding room.

[0022] In the supply air conduit 10 there is preferably a control valve which is included in a valve unit R1, which may be adjustable manually or power-driven, possibly automatically adjustable as a response to signals from a control unit 18 of a ventilation system including the device for displacement ventilation 1.

[0023] In fig. 2 the device of fig.1 has been supplemented in such a way that the device for displacement ventilation 13 here is comprised of a device providing supply air as well as air circulation. For that purpose, besides the supply air module also a further filter housing module 14 is provided, which in this case is comprised of a circulating module 14 having an inserted air filter 15. From the circulating module 14, an air circulating conduit 16 emanates which adjoins to the supply air module 6. Further, a fan 17 is arranged in the air circulating conduit 16, said fan being arranged to provide an under-pressure inside the circulating module 14 and feed the air which is sucked into the circulating module 14 to the supply air module 6. The fan 17 is adjustable so that the degree of air circulation may be controlled. This is preferably obtained with the aid of the control unit 18.

[0024] The layout of the circulating module 14 corresponds with that of the supply air module 6, and also this module may be fastened on the body 2 in a manner corresponding to what is described above with respect of fastening of the filter housing module 6 in connection with the explanations of fig. 1. For reasons of clarity, no element corresponding to the fastening console 50 is illustrated. Possibly fastening may be made with the aid of slots corresponding to the open slots 8, which are arranged in vertically separate positions, directed up-

wards and downwards.

[0025] The device 52 shown in fig. 3 is further supplemented with respect of the device in fig. 2 by also being provided with a filter housing module 19, which is included in an exhaust air module being provided with an exhaust air filter 20 and from where an exhaust air conduit 21 leads to a central exhaust air system. In the exhaust air conduit 21 in the shown embodiment there is provided an adjustment valve being included in a valve unit R2, which is controlled by the control unit 18. Also the exhaust air module 19 is, like the other modules, fastened to the body in the manner described above.

[0026] Fig. 4 shows a horizontal section of a filter device 22 which includes a filter housing module with a rear half 23 and a front half 24. In the front half 24 there is provided a filter seat 25 for receiving a filter 26. The filter seat 25 is in the shown example arranged along a part of the curved cylindrical surface and the filter 26 is comprised of a highly effective repeatedly folded particle filter having a very large effective filter surface as compared to the opening in the surface of the filter housing module defining the filter seat 25. In more detail the filter seat has surrounding flanges for assuring secure holding of the filter and increased sealing action between the seat and the filter.

[0027] It should be noted that kinds of filters used for the placing in a filter housing module depends on the application, which means the kind of room the device is intended to be used in and which function the filter is intended to have, that is i.a. if supply air, circulated air or exhaust air is intend to be filtered.

[0028] The filter housing module together with the filter 26 comprises, as has been indicated above, a closed chamber, which in this case has been obtained by providing the two halves 23 and 24 with protruding flanges 27 which are connected to each other around the perimeter of the filter housing module in order to achieve a tight joint. Possibly an extra sealing element 31 is used so as to guarantee this sealing joint.

[0029] Different methods of manufacture may be used for the elements of the filter housing module, firstly different plastic manufacturing processes. In particular vacuum forming of the parts has been considered advantageous. The halves which are shaped in such a way are subsequently preferably connected to each other through gluing, ultrasound welding or the like.

[0030] An alternative filter device 28 is shown in fig. 5 having double filters 29 and 30 arranged axially along each other. A filter device having a filter housing module formed in this way allows a greater air-flow with maintained velocity of the air to be filtered passing through the filter material.

[0031] The filtering device 32 of fig. 6 includes a filter housing module made up from two halves each being equipped with a filter seat 33 and 34 respectively, in turn being equipped with a filter 35 and 36 respectively. This construction of a filter housing module is suitable for example in a free standing device for ventilation, since here, in use, there will be air flowing to the left as well as to the right as seen in fig. 6. The filter housing module 32 is made closed by flanges 37, possibly with a sealing element 36 being jointed in a manner corresponding to the method described with respect of fig. 4.

[0032] Fig. 7 shows the exterior of a deviser according to the invention placed in a corner of a room which is intended to be ventilated. Hereby only a covering 38 is shown which covers the inside filter housing modules, and which as an example is comprised by a formed metal plate having a perforated surface so as to be easily permeable to air.

[0033] Fig. 8 shows a horizontal section of the device in fig. 7 with the covering 38 which protects and conceals a filter housing module 39, which is provided with a filter 42. The covering 38 is fastened to a body 38 which includes fastening means being comprised of vertical rails 40, 41. In more detail the covering could preferably be fastened to these rails with the aid of snap acting resilient metal tongues co-operating with snap fasteners being arranged along the rails 40 and 41 or with hook or suspension means of a kind which is known per se.

[0034] Referring to the above, the invention allows great flexibility with respect to adaptation of a device according the invention to different applications and different desires with respect of ventilation. A device according to the invention may be varied further, so that a plural filter housing modules having filters for the intended purpose and with the same function may be placed in one and the same device if necessary so as to achieve a suitable ventilation in the space in question.

[0035] As has been indicated, besides being placed in a corner of a room the device may also be placed directly against a wall, wherein the device may have a general horizontal section which is semi-circular, semi-elliptic, rounded, rectangular or having any other suitable shape. The device may also be built-in into a wall or be free-standing in a room with in that case circular or any other suitable section.

[0036] The fastening devices for filter housing modules may simply be adapted for the application and with different consoles, reinforcements and the like, rails corresponding to the ones that are shown in figs. 1-3 may be brought to be fastened at a distance from the rails themselves or be made self-supporting, which could be suitable in case of the device according to the invention being placed free standing.

[0037] Through flexibility, it is simple to deal with considerable problems with in-door air in rooms through control through demand so as to adapt supply air, circulated air and exhaust air.

[0038] A filter housing module may be manufactured differently from what has been shown. As an example the halves may be made unlike, that is for example so that the filter housing modules are unsymmetrical with respect of the joint plane. Further, also filter housing modules which are constructed in any other way than through joining of halves, as has been shown above, is

within the scoop of the invention and within the definition of the claims. The filter seat of a filter housing module may be adapted for the filter which is intended to be inserted therein and it may also comprise means for obtaining an efficient seal between the filter and the filter seat.

[0039] Fastening of filter housing modules on fastening means at a body may be made differently from what is shown. For example, the filter housing modules may be provided with hook-means, holes, pins or the like for direct co-operation with corresponding elements on the fastenings means. Simple assembly and disassembly enhances mounting and service of the device.

Claims

1. Device for displacement ventilation (1;13;52) including a filter for filtering of supply air supplied to the device, **characterised in**

   - a filter housing module (6;14;19) with at least one opening in its wall for placement of the filter (7;15;20) and thereby together therewith form a closed structure, wherein the filter housing module includes at least one connection (11,12) for a supply air conduit, and
   - fastening means (3,4) for fastening the filter housing module to the device.

2. Device according to claim 1, **characterised in that** the filter housing module (6;14;19) is a disposable item which is replaceable together with a filter after completed use.

3. Device according to claim 1 or 2, **characterised in that** the filter housing module (6;14;19) is manufactured from a synthetic material.

4. Device according to any of the previous claims, **characterised in that** the filter housing module comprises two essentially tray-shaped halves (23,24), which are jointed at their respective edges so as to form a closed chamber.

5. Device according to any of the previous claims, **characterised in that** the tray-shaped halves (23,24) have essentially surrounding flanges (9;27; 37), which are fastened to each other.

6. Device according to any of the previous claims, **characterised in that** at least one half (24) of the filter housing module includes a filter seat (25;33; 34) for receiving a filter (26;35;36).

7. Device according to any of the previous claims, **characterised in that** the fastening means (3,4) include body elements having fastenings elements (5) being distributed along their length for allowing chosen fastening of at least one filter housing module.

8. Device according to any of the previous claims, **characterised in** an air permeable covering (38) which carries elements for fastening co-operation with the fastening means (41,41).

9. Device according to any of the previous claims, **characterised in that** it further includes an exhaust air module (19) which is comprised of a filter housing module having an inserted exhaust air filter (20).

10. Device according to any of the previous claims, **characterised in that** it further includes a circulating module (14) which is comprised of a filter housing module with inserted circulating air filter (15).

11. Device according to claim 10, **characterised in that** the circulating module (14) over an air conduit (16) is connected to the filter housing module (6) for filtering supply air.

12. Device according to 11, **characterised in that** a motor-powered fan (17) is placed in the air conduit between the circulating module and the filter housing module (6) for supply air for obtaining a controlled flow.

13. Device according to claim 12, **characterised in that** the fan (17) is adjustable with respect to its flow.

14. Filtering device (6;14;19;22;28,32) for a device for displacement ventilation according to any of the previous claims, **characterised in**

   - **that** it includes a filter housing module having at least one opening in its wall where a filter is intended to be inserted so as thereby to form a closed structure,
   - **that** the filter housing module includes at least one connection for an air conduit, and
   - **that** the filter housing module is adapted for fastening to fastening means (3;4;40;41) being included in the device.

15. Filtering device according to claim 14, **characterised in that** the filter housing module is a disposable detail, which is replaceable together with the filter after completed use.

16. Filtering device according to claim 14 or 15, **characterised in that** the filter housing module is manufactured from a synthetic material.

17. Filtering device according to any the claims 14-16 **characterised in that** the filter housing module in-

cludes two essentially tray-shaped halves (23,24), which are fastened at the edges of each other so as to form a closed chamber.

18. Filtering device according to any of the claims 14-17, **characterised in that** the tray-shaped halves have essentially surrounding flanges (9;27; 37), which are jointed to each other.

19. Filtering device according to any of the claims 14-18, **characterised in that** at least one half (24) of the filter housing module includes a filter seat for reception of a filter (26).

20. Filtering device according to any of the claims 14-19, **characterised in that** the filter housing module is included in a supply air module.

21. Filtering device according to any of the claims 14-19, **characterised in that** the filter housing module is included in an exhaust air module.

22. Filtering device according to any of the claims 14-19, **characterised in that** the filter housing module is included in a circulating module.

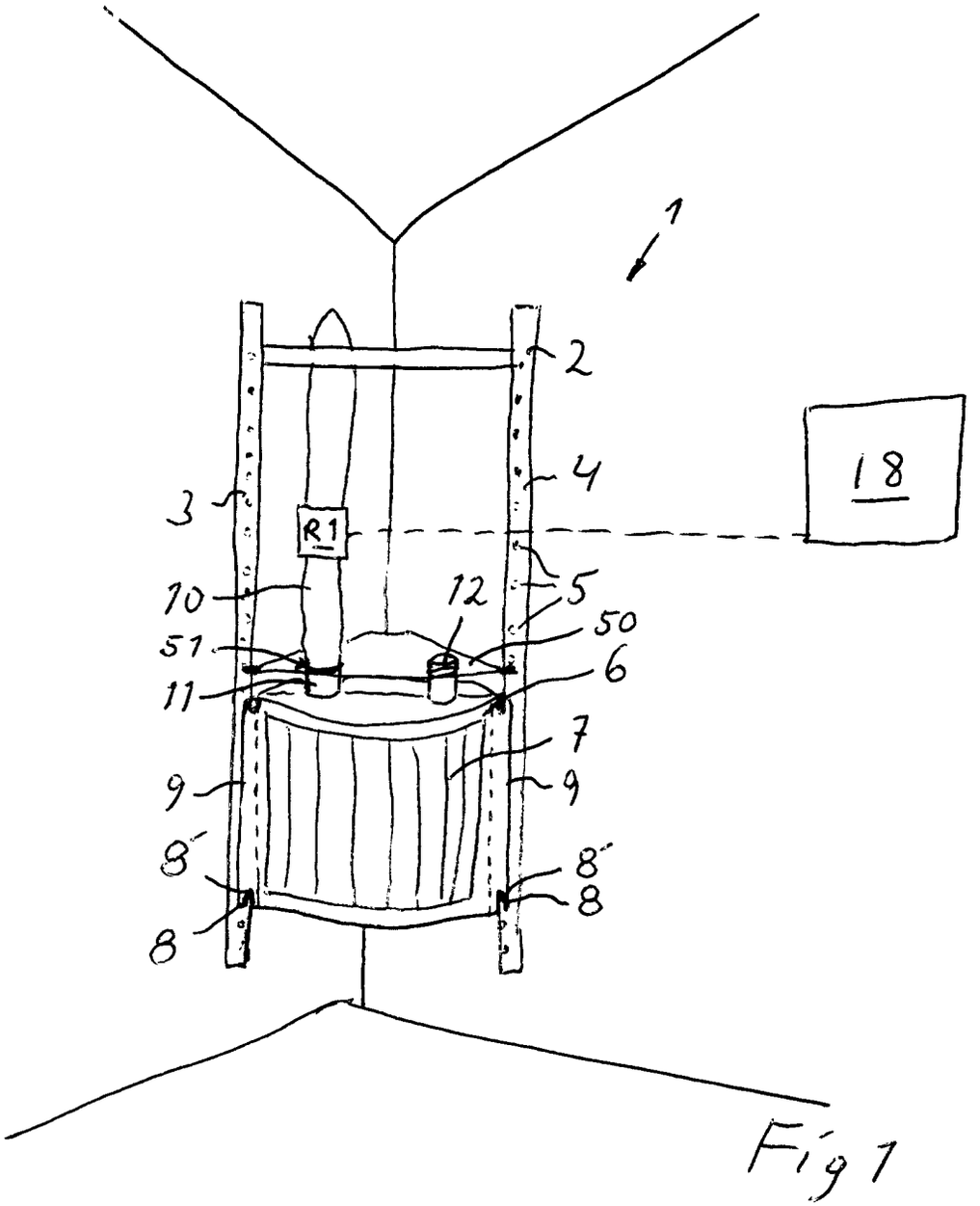

Fig 1

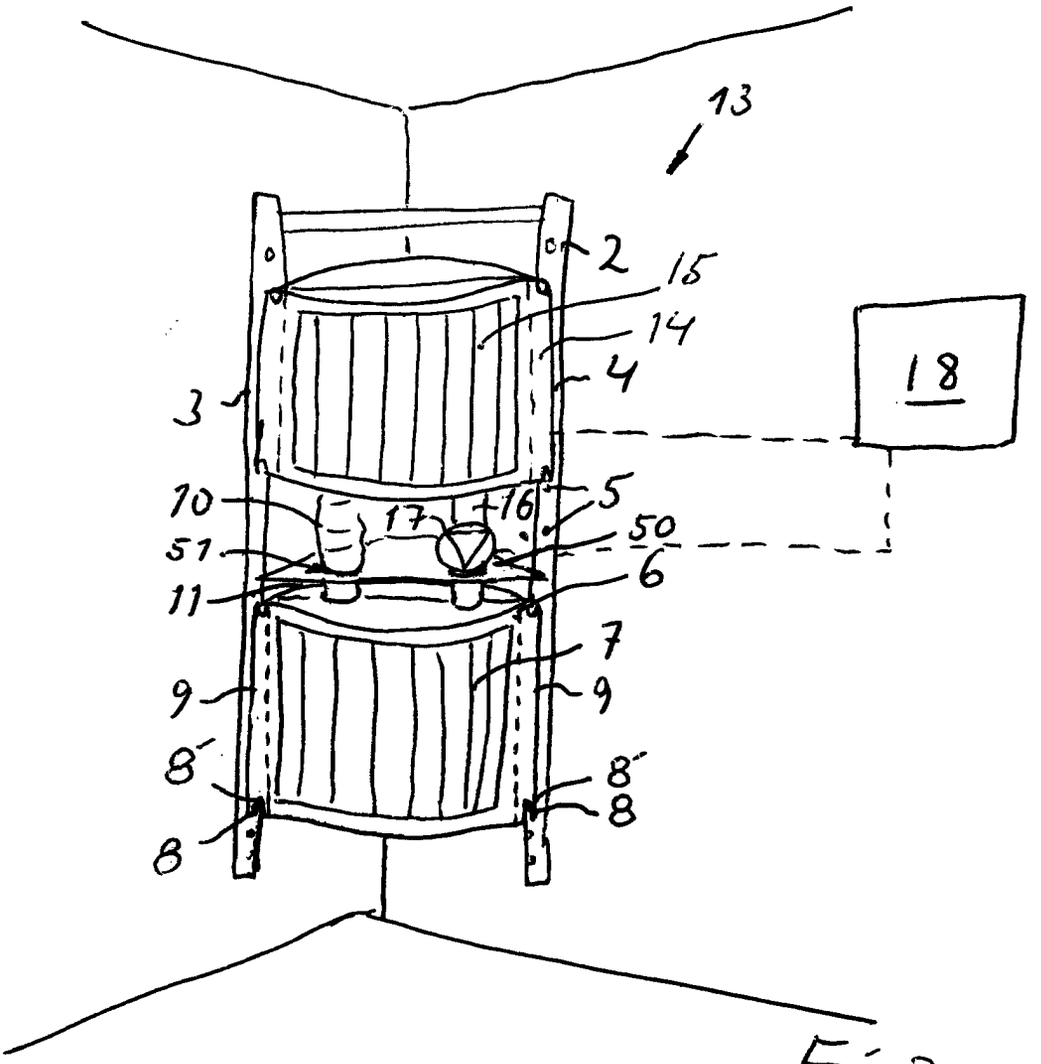

Fig 2

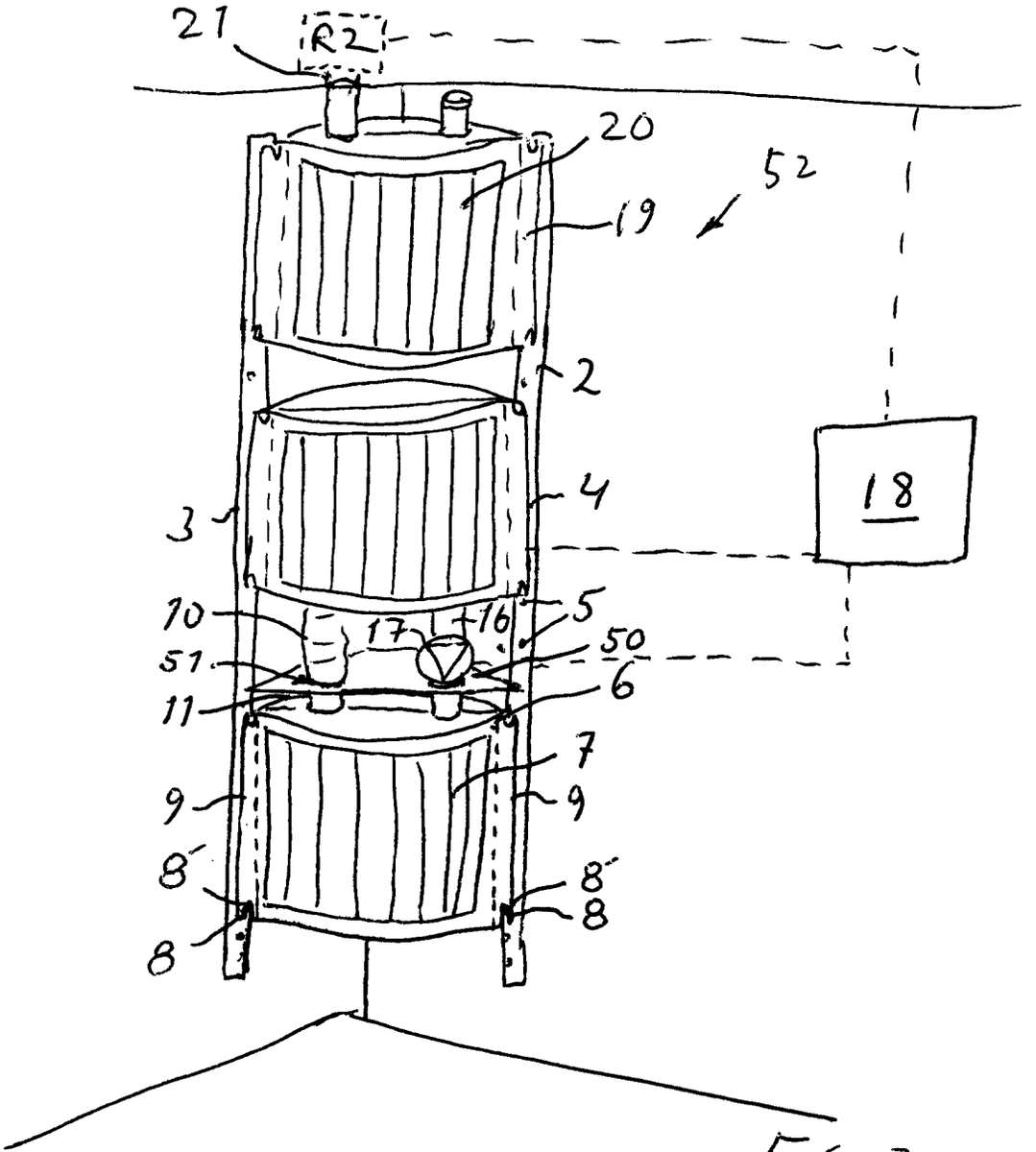

Fig 3

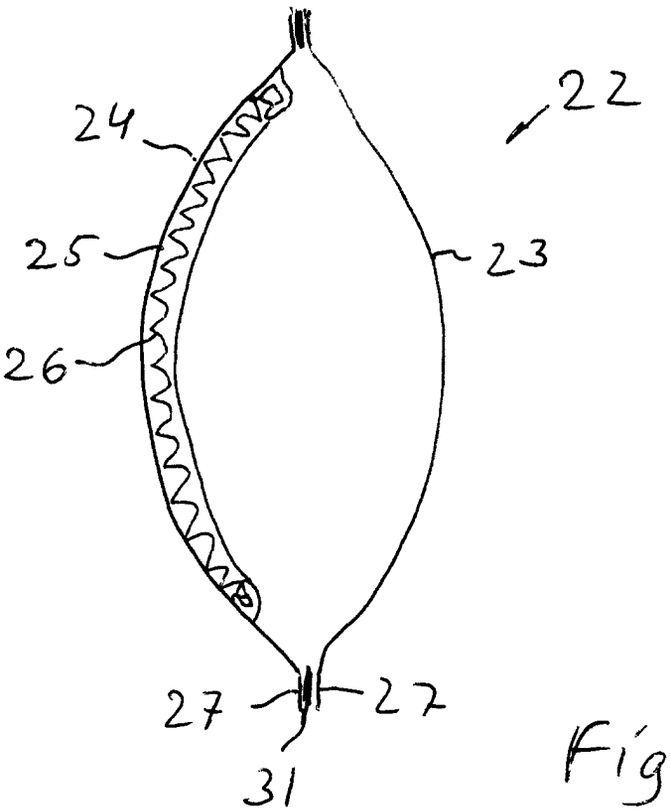

Fig 4

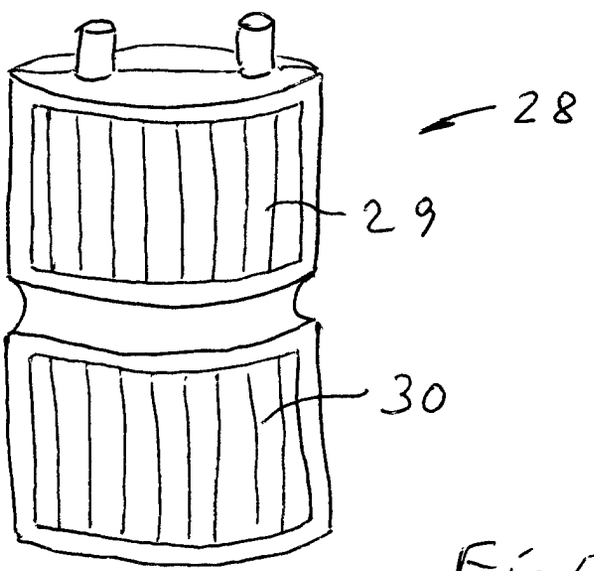

Fig 5

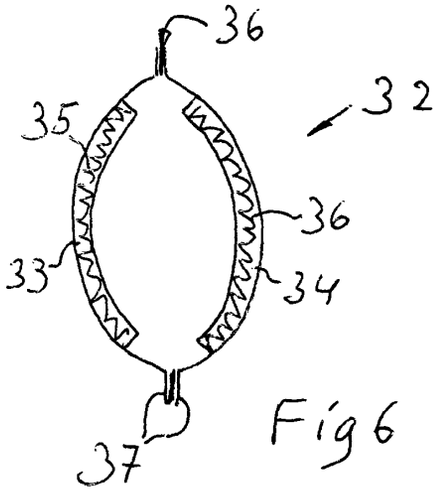

Fig 6

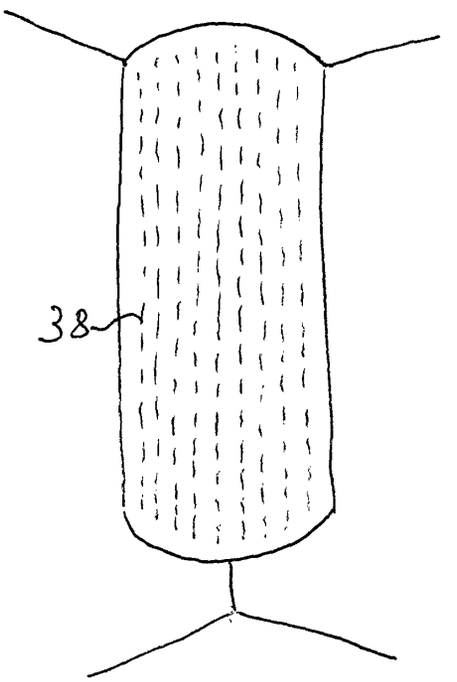

Fig 7

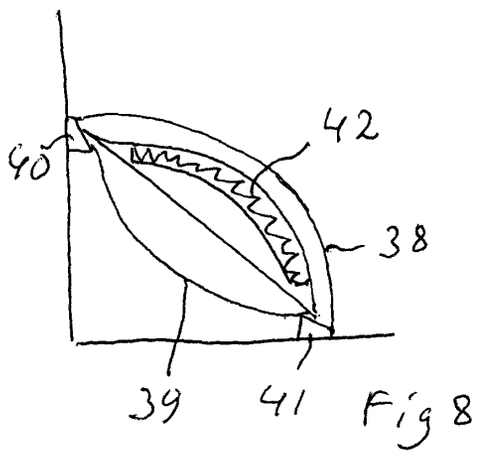

Fig 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 44 5127

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F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 January 2003	Gonzalez-Granda, C

CATEGORY OF CITED DOCUMENTS

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