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Pielkenrood

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[54] **ASSEMBLY FOR SEPARATING A PART OF A SPACE**

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[52] **U.S. Cl.** ..... **98/36**; 98/115 R

[51] **Int. Cl.** **F24f 9/00**

[58] **Field of Search** ..... 98/36, 115 R

[56] **References Cited**

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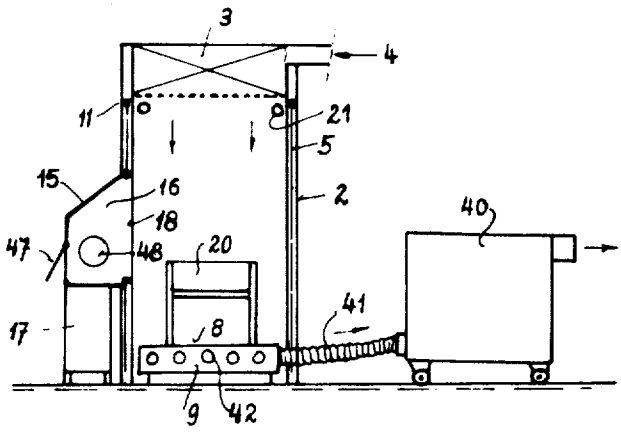
[57] **ABSTRACT**

An assembly for separating a part from a space, adapted to keep the air inside this part separated from the air outside that part, which assembly comprises an upper wall which is pervious for air and which is supported on a framework, and further comprises side walls which consist, at least partially, of a transparent plastics foil or plate material, and which extend to the vicinity of the bottom. A raised floor is provided inside the separated space with suction channels in the raised floor communicating with suction openings in the side walls of the floor and with suction units connected or connectable to the suction channels. The suction units are provided with fine dust filters which are adapted to remove disease germs from the air which is exhausted from the separated part of the space.

12 Claims, 6 Drawing Figures



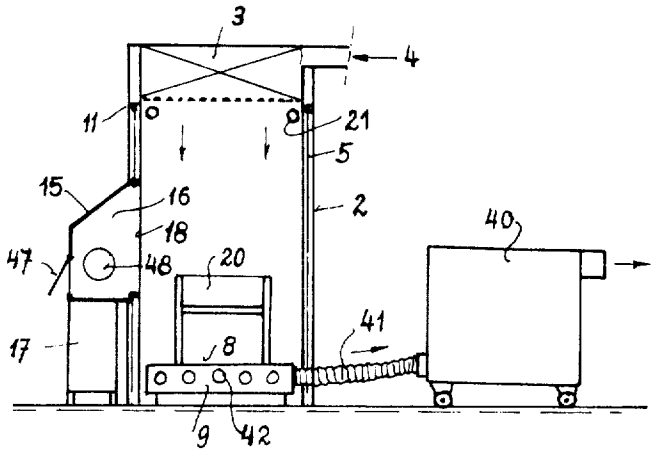


Fig. 1

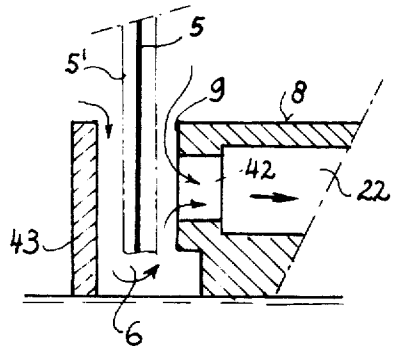


Fig. 2

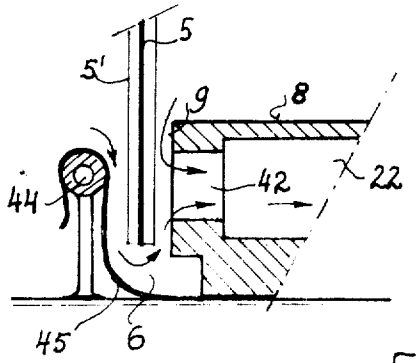


Fig. 3

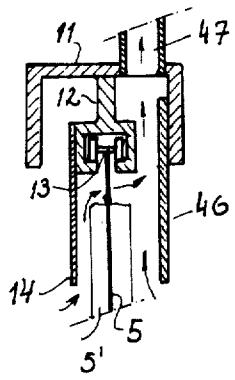


Fig. 4

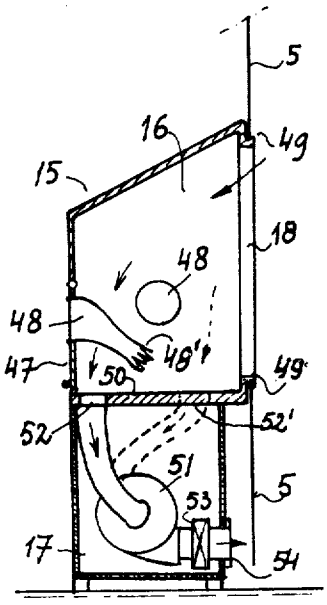


Fig. 5

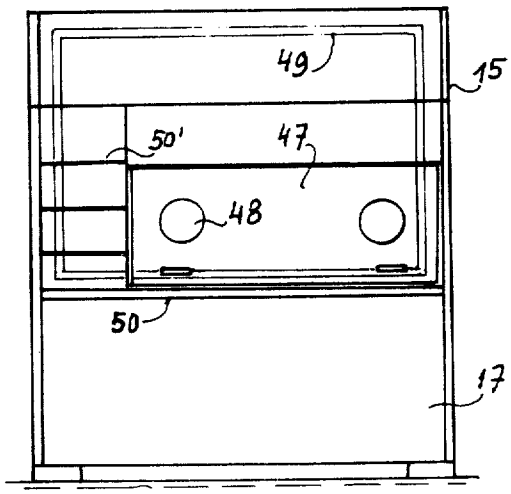


Fig. 6

ASSEMBLY FOR SEPARATING A PART OF A SPACE

In my copending United States Application Ser. No. 140,549 now U.S. Pat. No. 3,782,265, filed May 5, 1971, an assembly for separating a dust-free part of a space is described, which is intended for keeping the air inside this part separated from the air outside that part, which assembly comprises an upper wall pervious to air and supported by a frame-work, to which frame-work, moreover said walls are connected consisting, at least partially, of a transparent plastics sheet or plate material, and extending to the vicinity of the floor. This assembly is, furthermore, provided with a filter box above the upper wall which is connected to one or more blowers so as to provide a substantially vertical downwardly directed dust-free air flow inside the separated space, which dust-free air is allowed to escape at the lower side below the side walls. In particular the floor inside this space is raised, and extends to the vicinity of the side walls, so that, there, small exit gaps are provided in which the velocity of the emerging air is sufficiently high for preventing dust from penetrating.

Such an assembly is used for nursing patients which, because of an extremely low resistance against infection or because of a special sensitivity for dust, should be nursed in a dust-free and, therefore, germ-free environment. With such an assembly it is effectively prevented that unfiltered air enters this separated space, and the emerging air can freely flow off into the surroundings. Furthermore, openings with gloves fixed therein and at least one transfer cabinet are provided in the wall, so as to be able to nurse the patient and to provide this patient with food and the like from the outside, without disturbing the dust-free condition within the nursing space.

Patients suffering from very contagious diseases are, in general, nursed in isolation rooms, in which case doctors and nursing and attending personnel must be submitted to cumbersome and time-consuming disinfecting treatments when leaving such a room or hospital department, which is, of course, very objectionable. Moreover visitors cannot be allowed to the isolation rooms, so that they can have only some contact with the patient from the outside through a window, which is disagreeable for both parties.

However, the assembly described in the patent application mentioned above, which is designed for avoiding such objections, is not suitable for nursing such contagious patients, since the air which has contacted the patient can flow off to the environment. The invention provides a special embodiment of such an assembly, so that it becomes suitable for nursing contagious patients.

To that end the assembly according to the invention is characterized by suction channels in the side walls of the raised floor, and by suction units to be connected to these channels and provided with such dust filters that the disease germs are effectively removed from the air exhausted from the separated space.

Furthermore, means are provided for causing inwardly directed leak flows at the upper and lower side of the side walls, the latter, in particular, consisting of pliable transparent plastics curtains, in order to prevent any air from leaking away from the inside of the separated space.

In particular the invention provides a suitable transfer cabinet which is adapted for transferring food and the like towards the inside without contaminated air being able to flow outwards.

The invention will be elucidated below by reference to the drawings, showing in:

FIG. **1** a diagrammatic cross-section of an assembly of the invention;

FIGS. **2** and **3** partial sections at a larger scale of two embodiments of special auxiliary means at the lower side of a side wall of such an assembly;

FIG. **4** a partial section at a larger scale of the suspension of a side wall of such an assembly; and

FIGS. **5** and **6** a partial section and front view respectively of a transfer cabinet for such an assembly.

In the drawings parts which correspond, in principle, to parts of the copending Patent Application Ser. No. 140,549 now U.S. Pat. No. 3,782,265 are indicated by the same reference numerals. Furthermore, these parts will be described only in short, as, for a complete description, reference may be made to this copending application.

The assembly according to the invention shown in FIGS. **1** – **4** comprises one or more units **1**, each consisting of four columns **2** supporting a top structure constituted by a filter box **3**, to which air may be supplied by a supply duct **4**. Between these columns side walls **5** are suspended, these walls preferably consisting of transparent plastics curtains with pleats **5'**. These side walls extend to the vicinity of the floor, where an air gap **6** remains free. Inside each unit a raised floor or platform **8** with straight side walls **9** is arranged, the latter walls being situated near the side walls **5**.

At the upper side below the filter box **3** U-bars **11** are mounted in which rails **12** for rollers **13** are fixed, on which rollers the side walls **5** are suspended. At the outer side of these rails a resilient flap **14** is attached, providing a certain sealing of the upper side of the side walls. Furthermore, in one of the side walls a transfer cabinet **15** is arranged, its inner space **16** communicating, by means of an opening **18** in the adjacent side wall **5**, with the interior of the unit **1** in question. Below this cabinet a filter-blower cabinet **17** is provided which is adapted to maintain a certain air flow inside this space **16**.

Inside the unit **1** a bed **20** is placed, by means of which a disinfectant may be sprayed into the interior space of this unit. Furthermore, a cavity **22** is provided in the raised floor, through which air may be exhausted from the unit **1**.

The purpose of the elements described above in the assembly of the copending patent application is to maintain a vertical air flow inside the unit **1**, which air flow is supplied at a given positive pressure in respect of the surroundings, and is allowed to leak away through the bottom gaps **6** and along the flaps **14**. In this manner dust is kept away from the space inside the side walls **2**, so that a patient may be nursed in a dust-free and germ-free environment. The exhaust through the cavity **22** is exclusively intended for removing harmful vapours of the disinfectant sprayed by the ducts **21**, so that these vapours cannot emerge through the gaps **6** into the adjacent space.

On the contrary, the assembly of the invention is intended, in the first place, for nursing patients having a contagious disease, so that air having contacted this patient should be prevented from emerging into the adja-

cent space. According to the invention, therefore, the air is exhausted from the unit **1** by means of a filter-blower unit **40** which is, in the case shown, constructed as a movable unit connected to the cavity **22** of the floor **8** by means of a hose **41**, apertures **42** opening in the outer wall **9** of this floor communicating with this cavity. In this manner, the air is exhausted from the inside of the unit **1** along the side walls **5**. Moreover, outside air is sucked in through the gaps **6** too, the latter air flow preventing air from leaking away from the inside of the unit. Instead of a movable unit **40** also a stationary unit may be used which may be positioned in a suitable location. In particular the latter unit may be housed in the space **17** below the cabinet **16**.

In order to prevent that by movements of the pliable side walls **5** air would escape from the inside, upstanding boards **43** (FIG. **2**) are preferably provided around the lower side of these walls. In this manner the passage for the outside air taken in through the gaps **6** is lengthened and narrowed so that this air flow obtains a sufficient velocity for completely preventing air from leaking away outwardly from the interior of the separated space. FIG. **3** shows another embodiment in which, instead of the boards **43**, horizontal bars or tubes **44** are provided around the lower extremities of the walls **5**, a plastics foil **45** being laid over these bars or tubes, which foil, furthermore, extends below the floor **8**, and prevents soiling of the bottom.

As shown in FIG. **4**, a second flap **46** may be fixed at the upper side of the walls **5** in the channel bars **11**, which flap is situated at the inner side of the wall **5** in question. At the upper side of the bar **11** suction openings **47** are provided, communicating, for instance, with the cavity **22** in the floor **8** or directly with the unit **40**, so that, at the upper side of the wall **5**, the same effect is obtained as at the lower side near the floor **8**.

The filters in the box **3** and a supply blower communicating with the supply duct **4** are, in principle, superfluous when there is no objection against outside air entering the unit **1**. However, when the upper wall of the unit **1** is open, there is a risk that air will leak away from this unit upwardly in the case of failure of the suction unit **40**. Therefore, it is always preferred to provide filters in the box **3** which may prevent contaminated air from leaking away. When the flow resistance of these filters is high, it may occur that the pressure inside the unit **1** becomes too low, and then the pliable walls **2** will be pressed inwards. It is, then, advisable to include a blower in the supply duct **4**, and a similar unit **40** may be used to that end, but it is also possible to connect the outflow side of the unit **40** to the duct **4**. An advantage of using filters **3** is that the patient to be nursed is protected against infection from the outside by other disease germs.

FIGS. **5** and **6** show a special embodiment of a transfer cabinet **15**. This cabinet has preferably transparent walls, for instance of rigid plastics plates, and, at the front side, a hinged lid **47** with holes **48** which are closed by gloves **48'** is provided. Also in at least one side wall a similar hole **48** with a glove **48'** is provided, thus enabling to take over from within an object which is introduced through the front opening after opening the lid only a little. The rear wall of this cabinet is provided with a rigid clamping rim **49** in which the edges of an opening provided in the adjacent side wall **5** of the unit **1** may be clamped. The inner space **16** of this cabinet is, at the lower side, delimited by a working surface **50**, and, if desired, shelves **50'** may be provided in a lateral part for storing certain objects.

In the space **17** below the transfer cabinet a blower **51** is arranged, having its intake side connected to a slot **52** in the bottom **50**, which slot is situated near the lower edge of the lid **47**. In this manner an air flow is maintained originating from the vicinity of the filter box **3** and flowing along the front wall and the lid, and, in particular, also along the gloves **48'**. As the lid **47** is opened, also ambient air will be sucked in through the opening, so that possibly contaminated air is prevented from flowing out. As indicated by interrupted lines also additional openings **52'** may be provided in other points of the bottom for obtaining an additional air curtain. It is also possible to close the opening **18** with a lid or a flexible flap.

The discharge side of the blower **51** may be provided with a filter **53** for allowing the air taken in to be blown off into the environment. It is, however, advisable to connect the discharge side **54** of this filter to the intake side of the filter box **3**, in which case simple filters **53** will be sufficient, and it is also possible to omit these filters completely in that case. As mentioned before, the space **17** may also accommodate the complete filter-blower unit for maintaining the desired air flow in the separated space, in which case a separate blower **51** for cabinet **15** may be superfluous.

The suction unit **40** may be constructed in many different ways, and, in particular, the unit described in my copending patent application Ser. No. 140,549 now U.S. Pat. No. 3,782,265 may be used, in which not only dust-filters for the normal operation of the assembly may be arranged, but also special absorbing beds for absorbing harmful vapours when the interior space of the assembly is being disinfected. Moreover, it is also possible to use separate suction units **40** for the normal filtering operation and for disinfecting purposes respectively.

Of course provisions should be made to prevent air from flowing outwards from the interior of the unit **1** in the case of failure of a suction unit. When a supply blower is included in the supply duct **4**, this blower should, then, be switched off, in order to prevent an undue rise of the pressure inside the unit **1**.

I claim:

1. An assembly for providing an enclosed space to be isolated and separated from its surroundings in that direct air flow from said space to said surroundings is impeded, comprising:

a frame having a pervious top structure and side walls, having inner and outer surfaces, which extend from the top structure to the vicinity of the bottom thereof, and establishing lateral boundaries of the space as defined therewith, at least a portion of the side walls being flexible and suspended from the top structure at an upper edge and terminating in a lower edge above a floor, thereby forming a gap for permitting an air flow through the gap between a the floor and the lower edge of the suspended side walls;

a raised platform on the floor having suction channels communicating with at least one suction opening, having a lower edge, the side walls extending down, below the lower edge of the suction opening.

a suction unit connected to the suction opening for sucking air through the gap between the lower edge of the suspended side walls and the platform as well

as from the space into the suction openings through said channels, thereby sustaining a down draft from said pervious top sturcture and maintaining an air curtain through continuous air flow from the surroundings through the gap underneath at least the bottom of the suspended portion of the side walls; and

filter means included in the suction means capable of removing germs as sucked from said space.

2. The assembly of claim **1,** characterized in that additional dust filters are included in the top structure and having a sufficient flow resistance for preventing contaminated air from leaking away through the top structure in the case of failure of a suction unit.

3. The assembly of claim **2,** characterized by at least one blower as an air supply to the dust filters of the top structure.

4. The assembly of claim **3,** characterized by safety means for switching off the at least one supply blower in the case of failure of a suction unit.

5. The assembly of claim **3** characterized by similar filter-blower units for exhausting as well as for supplying air.

6. The assembly of claim **1,** characterized by a baffle arranged adjacent to the bottom at the outer side of a side wall and extending above the lower edge of this side wall, and forming an air lock together with this side wall and the raised platform situated inside this wall.

7. The assembly of claim **6,** characterized in that the baffle is formed by a plastics foil lying on the bottom and laid over bars extending parallel to the bottom.

8. The assembly of claim **1** provided with a resilient flap arranged at the outer surface of the upper edge of each side wall, characterized by a resilient flap at the inner surface of this side wall, and delimiting an air lock together with this wall and the outer flap.

9. The assembly of claim **8,** characterized by suction openings communicating with the space between both flaps and being connected to a suction unit.

10. The assembly of claim **1,** provided with a transfer cabinet, the interior of which communicates with the interior of the separated space by means of a transfer opening in a side wall, characterized by a front lid hinged supported at its upper side for closing the opening of the transfer cabinet, and by suction openings provided in the bottom of this cabinet at least in the vicinity of the lower edge of this lid.

11. The assembly of claim **10,** provided with a suction unit arranged below the transfer cabinet, characterized in that the outflow end of this unit is connected to the air supply of the upper side of the assembly so as to obtain a substantially closed circuit into which additional filters are included.

12. The assembly of claim **10,** characterized in that in at least one side wall of the transfer cabinet an opening closed by a glove is provided.

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