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CA 2481760 C 2010/11/23

(11)(21) 2 481 760

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2003/03/12
(87) Date publication PCT/PCT Publication Date: 2003/10/16
(45) Date de délivrance/Issue Date: 2010/11/23
(85) Entrée phase nationale/National Entry: 2004/10/07
(86) N° demande PCT/PCT Application No.: AT 2003/000071
(87) N° publication PCT/PCT Publication No.: 2003/084638
(30) Priorité/Priority: 2002/04/09 (AT A 546/2002)

(51) Cl.Int./Int.Cl. *B01D 46/52* (2006.01), *B01D 39/16* (2006.01), *B01D 39/18* (2006.01), *B01D 53/02* (2006.01)

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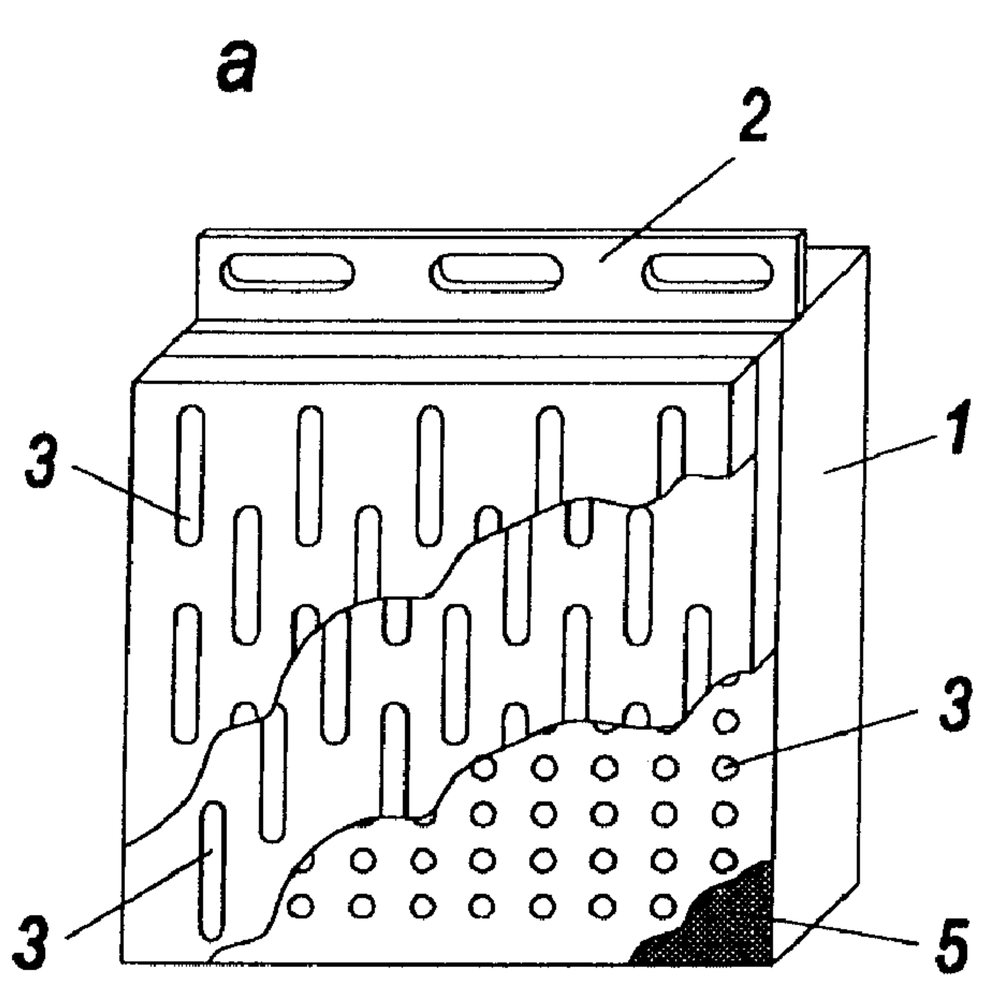
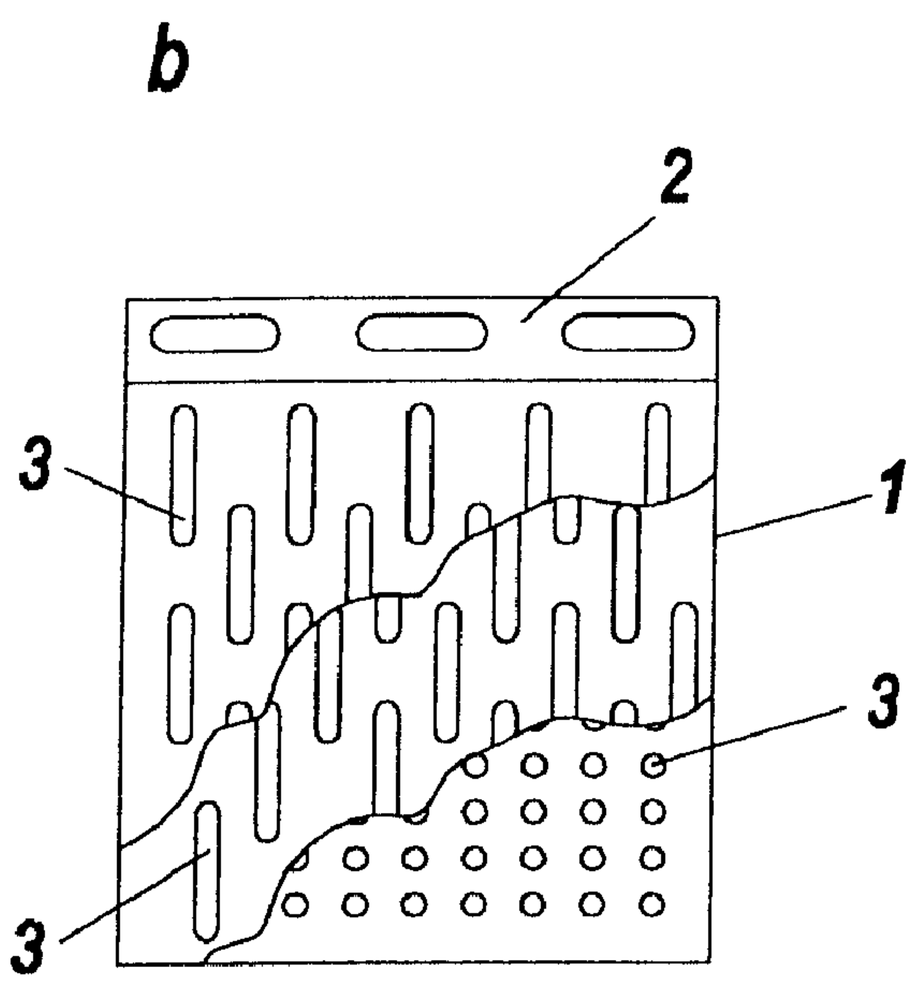
(54) Titre : MODULE FILTRANT
(54) Title: FILTER MODULE





(57) Abrégé/Abstract:
The invention relates to a filter module provided in the form of an at least one-chamber hollow body, whereby the walls of the hollow body (1) are made of a non-metallic material that can be comminuted and/or disintegrated in a recycling process. This material that can be comminuted and/or disintegrated is one made of paper pulp, preferably cardboard, paper or paperboard, or is a fibrous material, preferably wood or pressboard material.

ABSTRACT

The invention relates to a filter module provided in the form of an at least one-chamber hollow body, whereby the walls of the hollow body (1) are made of a non-metallic material that can be comminuted and/or disintegrated in a recycling process. This material that can be comminuted and/or disintegrated is one made of paper pulp, preferably cardboard, paper or paperboard, or is a fibrous material, preferably wood or pressboard material.

Filter module

The present invention relates to a filter module in the form of a hollow body with at least one chamber.

Filter devices have for some time been known in particular for spraying cabins in which the large portion of the spray material which has not adhered to the object being sprayed contaminates the air in the spray cabin. US 6162270 discloses for example a filter system into which filter modules can be inserted to clean the air removed from the spray cabin. The filter modules used can be removed as required and chemically or thermally cleaned. Depending on the type of cleaning used the filter modules consist of high-temperature-resistant (for example metals) or chemical-resistant (for example glass-fibre reinforced plastic) material. In this context, it is problematic that separate devices are to be provided to clean the filter modules, which is expensive both technically and economically.

The object of the invention is to create a filter module which can be exchanged with little technical expenditure and at low cost.

According to the invention this is achieved in that the walls of the hollow body consist of a non-metallic material which can be reduced or dissolved in a recycling process, the reducible and/or soluble material being a paper product - preferably board, paper or cardboard - or a fibrous material - preferably wood or pressboard material.

It is economically advantageous that recycling systems already operating in accordance with current economics can be used for these materials, so that no additional costs are incurred for the creation of recycling plants. It is technically advantageous that filter modules according to the invention can be produced at low cost.

If the whole filter module is made from recyclable material, it can be returned complete after use, in returnable packaging advantageously provided when it was sold, to the producer of the filter box, and then sent for recycling complete by him. This reduces the danger of contamination of the environment by toxic material from the filter module.

The use of paper product has the advantage that a filter module produced in this way has a very low intrinsic weight and can be sent for recycling in the already existing system for waste paper.

Fibrous materials are characterized by advantageous mechanical properties combined with low prime costs. Due to its high calorific value the wood preferably used can be used in the recycling process to generate long-distance energy, which further increases the environmental friendliness of a filter module according to the invention.

A further advantageous version of the invention results from the fact that the reducible and/or soluble material is a biologically degradable material. This allows the use of existing devices for the biological degradation of a filter module according to the invention after use.

A further advantageous version of the invention results from the fact that the hollow body is roughly square. This form is particularly suitable for production by a folding procedure. Filter modules produced in this way can be sent folded from the producer to the consumer, which saves on transport costs.

A further advantageous version of the invention results from the fact that the hollow body is roughly cylindrical. Space-saving storage is also possible with this version.

A further advantageous version of the invention results from the fact that the smallest side of the hollow body is roughly half the size of its largest side. This means that the filter module has sufficient volume for the full unfolding of its filter action.

A further advantageous version of the invention results from the fact that on at least one surface of the hollow body at least one handle is attached and/or developed countersunk and able to be swung out. This simplifies the replacement of filter modules after use. Because the handle is attached and/or developed countersunk, it is secured against damage and makes a simple stackable storage possible.

A further advantageous version of the invention results from the fact that at least one wall of the hollow body is at least partially impregnated. This lengthens the life of a filter module according to the invention.

A further advantageous version of the invention results from the fact that at least one chamber of the hollow body is able to be opened. This makes it possible to replace filter material in the chamber, and thus increase the life of the whole filter module.

A further advantageous version of the invention results from the fact that at least two consecutive walls, arranged roughly parallel to each other following each other directly in the direction of the incoming air flow have filter openings which become smaller in the direction of the incoming air flow on successive walls and/or are arranged offset vis-à-vis one another (labyrinth system). The so-called screen effect, in which the material filtered out from the air blocks filter layers attached entry-side and thus reduces the overall filter capacity of the filter module, is prevented.

A further advantageous version of the invention results from the fact that at least one bag with filter material can be introduced into at least one chamber of the hollow body. Because of the introduced filter material the filter module acquires a fine-filter function. These filter bags can be produced in different variants. Conceivable as an example, but not exclusively, are filter bags which contain filtering plates, filter balls, loose filter material, filtering charcoal, wood wool or biological filter material.

A further advantageous version of the invention results from the fact that at least one bag with filter material is able to be introduced into at least one chamber arranged in the direction of the air flow after the at least two walls arranged roughly parallel to each other. This combines the coarse-filter function achieved by the labyrinth system with the fine-filter function achieved by the filter bag, thus resulting in an optimum filtering procedure.

A further advantageous version of the invention results from the fact that at least one chamber of the hollow body is at least partially filled with filter material. Filter material, supplied for example in standardized sacks, can thereby be removed from same and introduced into the filter module in the desired quantity.

In conventional, large-scale filter systems, there is the problem that filter material developed in one piece is unevenly contaminated. If the contamination value in a restricted area of the one-piece filter material has exceeded the predetermined limit value, all of the filter material must be replaced.

A further object of the present invention is therefore to create a filter system which operates at lower cost.

This is achieved according to the invention in that the body of the filter system has plug-ins for filter modules.

The economic advantage of this is that only the heavily contaminated filter modules need be removed from the filter system and be disposed of.

An advantageous version of this variation of the invention results from the fact that a fan is attached to the body of the filter system. By means of the suction effect created by the fan the amount of air passing through the filter system increases.

A further advantageous version of this variation of the invention results from the fact that the body of the filter system has two chambers, one of the tow chambers being connected to the fan. This allows filter modules to be inserted into the one chamber while the other of the two chambers is connected to the fan. A further advantageous version of this invention results from the fact that the filter modules can be inserted into one chamber up to the stops and the other chamber is connected to the fan. This prevents the filter modules from moving too far into the filter system as a result of the suction effect of the fan. Because further securing is not necessary, the replacement of individual filter modules is simplified.

In accordance with this invention, there is provided a filter module in the form of an at least single-chambered hollow body, the walls of the hollow body consist of a non-metallic material which can be reduced or dissolved in a recycling process, the reducible material being a paper product or a fibrous material, wherein at least two successive inner walls arranged substantially parallel to each other inside the hollow body have filter openings arranged to be smaller or arranged offset relative to each other in a direction of flow of the medium to be filtered, wherein at least one chamber of the hollow body is openable.

Further features and details of the present invention are found in the following description of drawings. There are shown in

Figs. 1a and 1b a filter module according to the invention in perspective view and top view,
Fig. 2a a lateral section through a filter module according to the invention,
Figs. 2b, 2c and 2d top views onto the planes identified in Fig. 2a,
Fig. 3 a lateral section through an embodiment of a filter module according to the invention,
Fig. 4a a filter system with filter modules inserted
Fig. 4b a lateral section through the filter system shown in Fig. 4a and
Fig. 5 a further version of a filter system according to the invention with a filter module inserted.

Fig. 1a shows in perspective view and in a partial exposed profile a filter module according to the invention, in which the multi-chamber structure of the hollow body 1 can be seen. The filter openings 3 on successive filter layers change in size and are arranged offset vis-à-vis one another. Filter material 5 introduced loose into a filter chamber and a swung-out handle

2 can also be seen. In Fig. 1b, the offset position of the filter openings 3 on the individual filter layers is once again to be seen.

Fig. 2a shows a lateral section through a filter module according to Figs. 1a and 1b. The handle 2 that can be swung out and the filter material 5 introduced loose into a filter chamber are also to be seen.

Fig. 2b shows a top view, identified as view A-A in Fig. 2a. Fig. 2c shows an analogous view along B-B and Fig. 2d shows an analogous view along C-C. The offset arrangement of the individual filter openings 3 as well as their adjustable size are again to be seen.

Fig. 3 shows a lateral section through an embodiment of a filter module according to the invention, from which the multi-chamber structure can again be seen. It can also be seen that one chamber of the filter module is able to be opened using the handle 2 and access to this chamber is thus possible. Three filter bags 4 are introduced into the chamber.

Fig. 4a shows in perspective view a modular filter system in which the individual filter modules according to the invention can be inserted into the body of the filter system in the plug-ins 7 up to the stops 11. A fan 8 is attached to the filter system. The filter system has a bicameral structure in this embodiment. The filter modules are inserted into the one chamber 9, while the other chamber 10 is connected to the fan, as can be seen from Fig. 4b. The air flow is indicated by arrows here.

Fig. 5 shows a further version of a filter system according to the invention, in which the filter system is developed horizontal and the filter modules are inserted vertical into the plug-ins 7. The plug-ins 7 are again limited by stops 11.

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CLAIMS:

1. A filter module in the form of an at least single-chambered hollow body (1), the walls of the hollow body (1) consist of a non-metallic material which can be reduced or dissolved in a recycling process, the reducible material being a paper product or a fibrous material, wherein at least two successive inner walls arranged substantially parallel to each other inside the hollow body have filter openings (3) arranged to be smaller or arranged offset relative to each other in a direction of flow of the medium to be filtered, wherein at least one chamber of the hollow body (1) is openable.

2. The filter module according to claim 1, wherein the paper product is board, paper or cardboard.

3. The filter module according to claim 1, wherein the fibrous material is wood or pressboard material.

4. The filter module according to claim 1, wherein the reducible or soluble material is a biologically degradable material.

5. The filter module according to claim 1, wherein the hollow body (1) is substantially square.

6. The filter module according to claim 1, wherein the hollow body (1) is substantially cylindrical.

7. The filter module according to claim 1, wherein the smallest side of the hollow body (1) is roughly half the size of the largest side of the hollow body (1).

8. The filter module according to claim 1, wherein the filter module is produced in a folding procedure.

9. The filter module according to claim 1, further comprising a handle (2) attached to an outside surface of the hollow body (1) and whereby the handle is countersunk or swings out.

10. The filter module according to claim 1, wherein at least one wall of the hollow body (1) is at least partially fire-protection impregnated.

11. The filter module according to claim 1, wherein at least one filter element (4) is introducible into at least one chamber of the hollow body (1).

12. The filter module according to claim 11, wherein the filter element (4) is introducible into at least one chamber downstream of the at least two successive inner walls with respect to a direction of flow of the medium to be filtered.

13. The filter module according to claim 11, wherein the filter element is a bag filled with filter material.

14. The filter module according to claim 1, wherein at least one chamber of the hollow body (1) is at least partially filled with filter material.

Fig. 1a

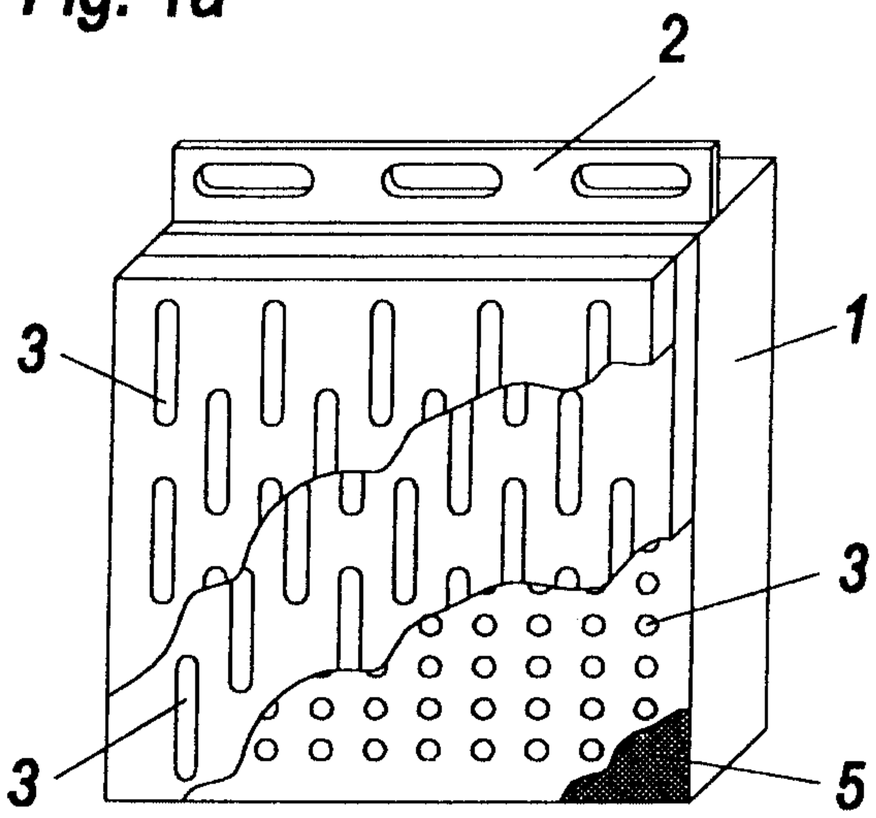


Fig. 1b

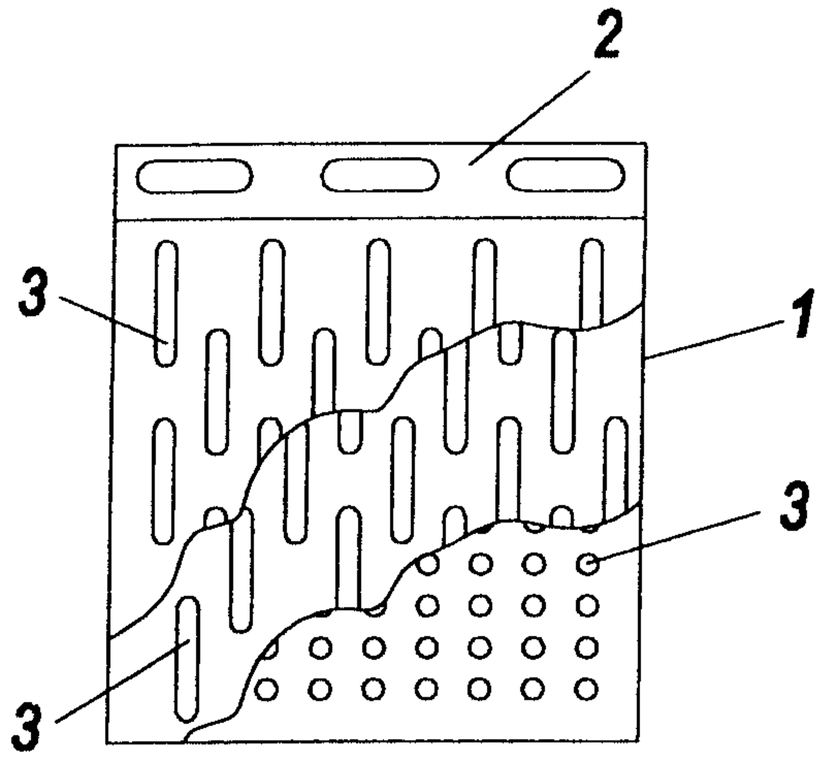


Fig. 2a

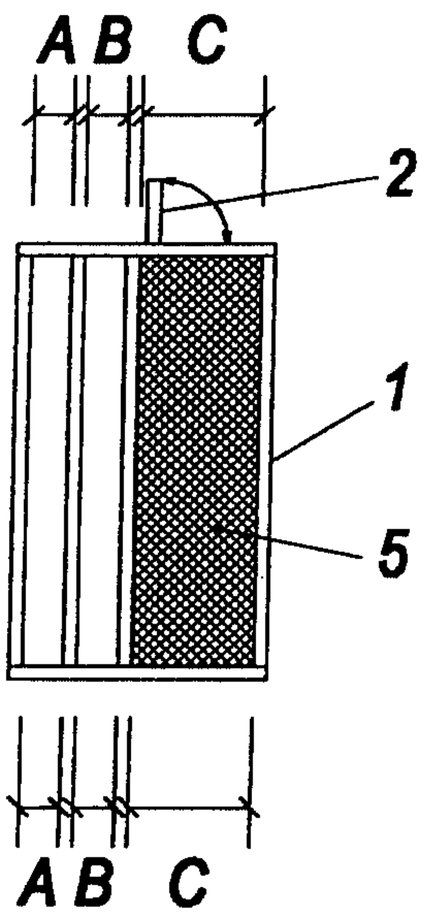


Fig. 2b

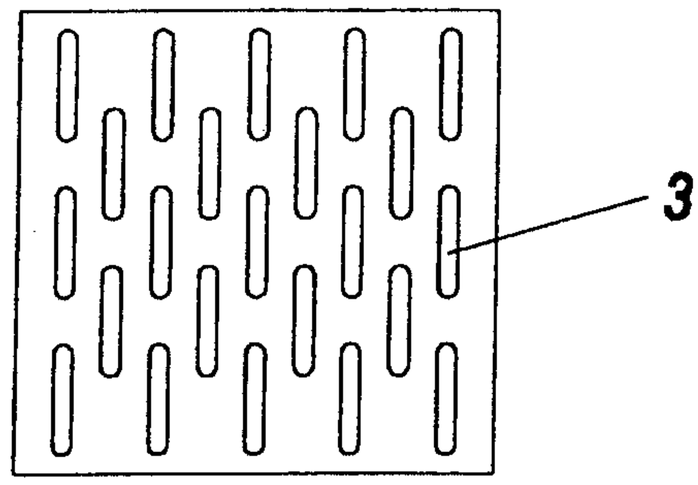


Fig. 2c

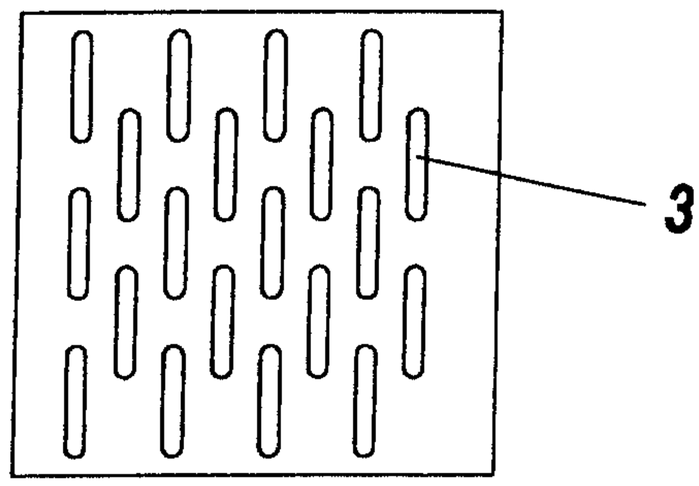


Fig. 2d

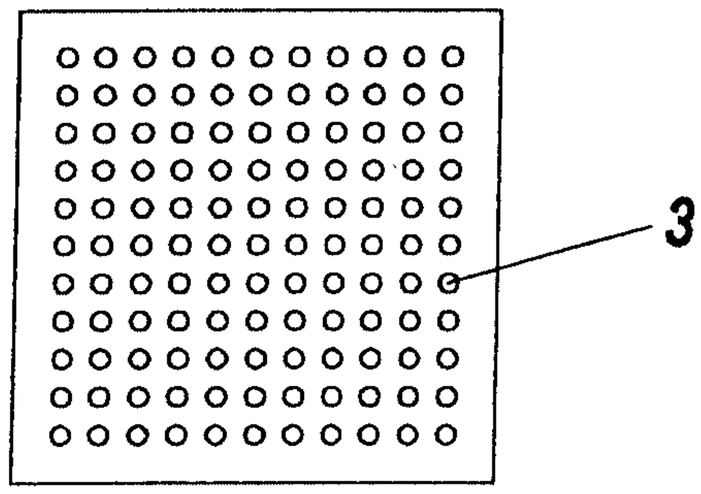


Fig. 3

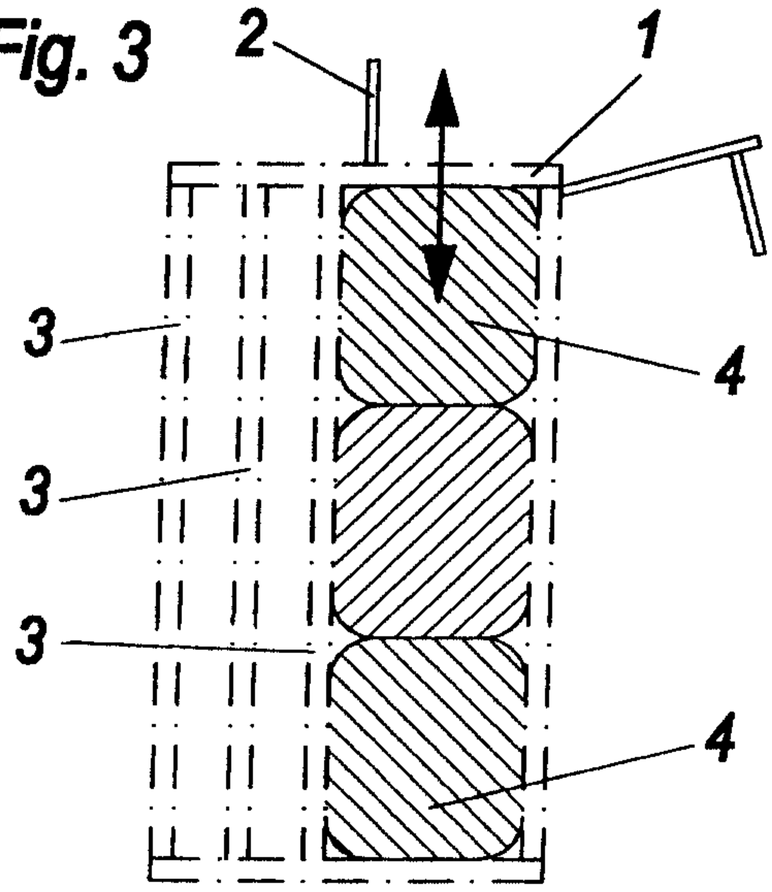


Fig. 4a

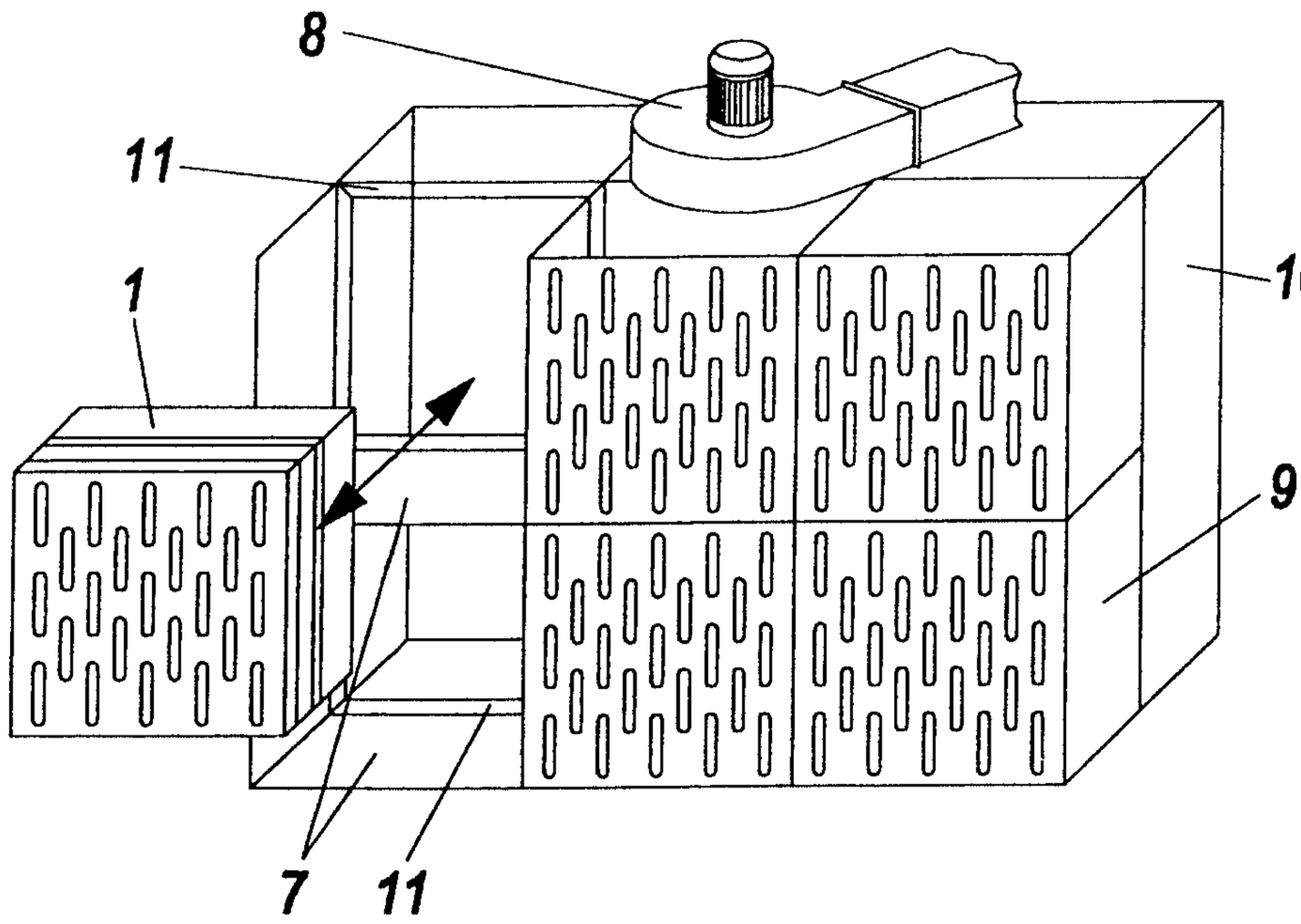


Fig. 4b

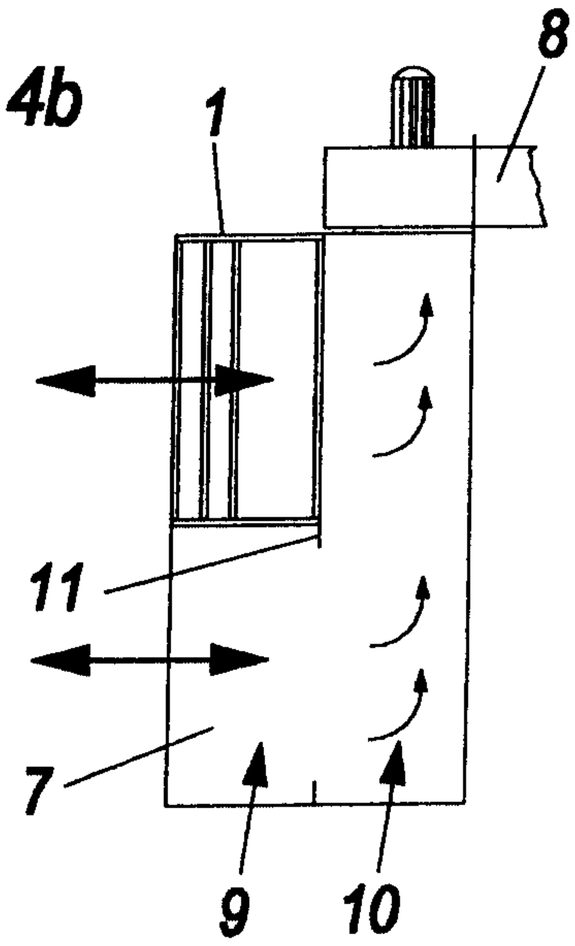
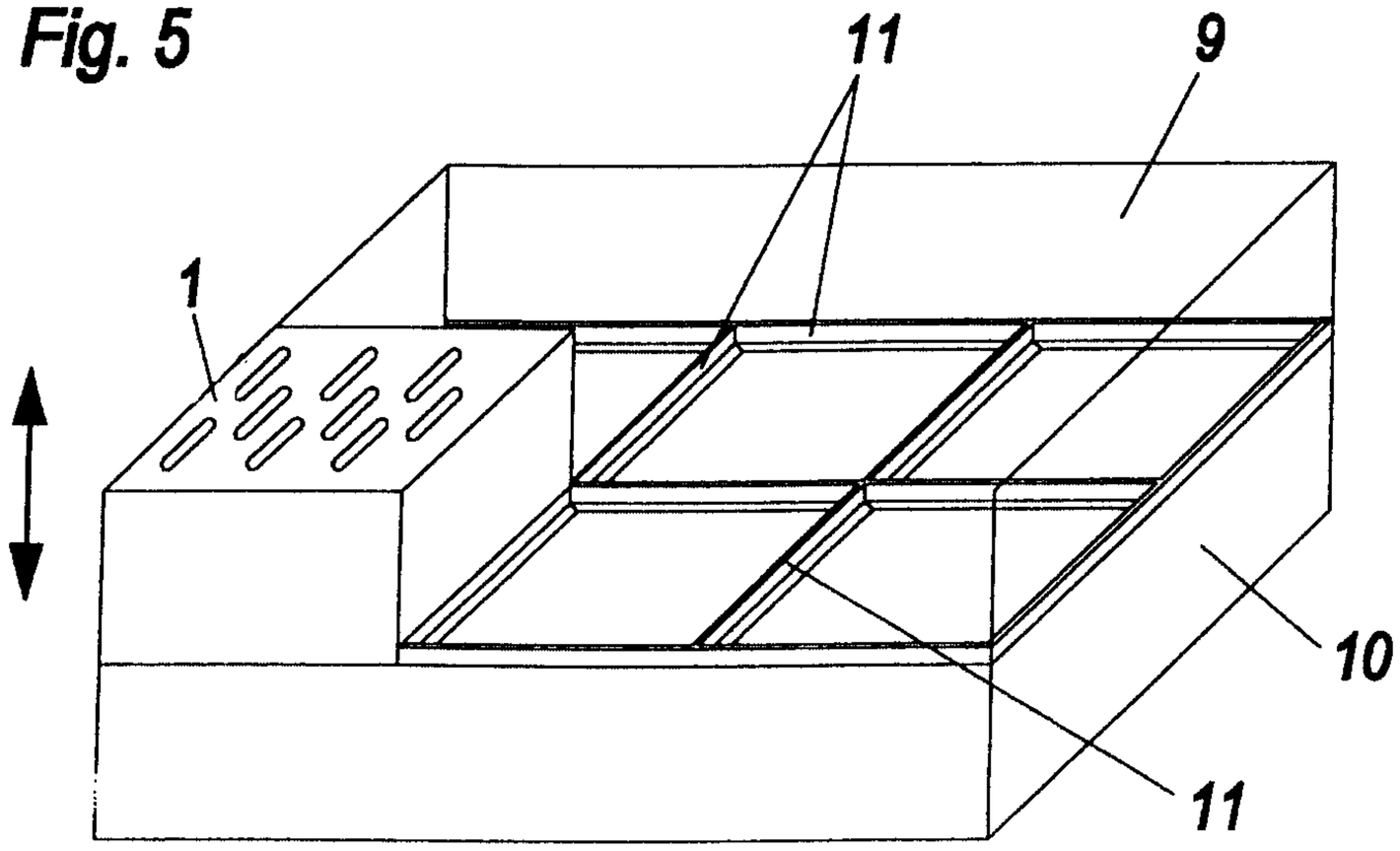
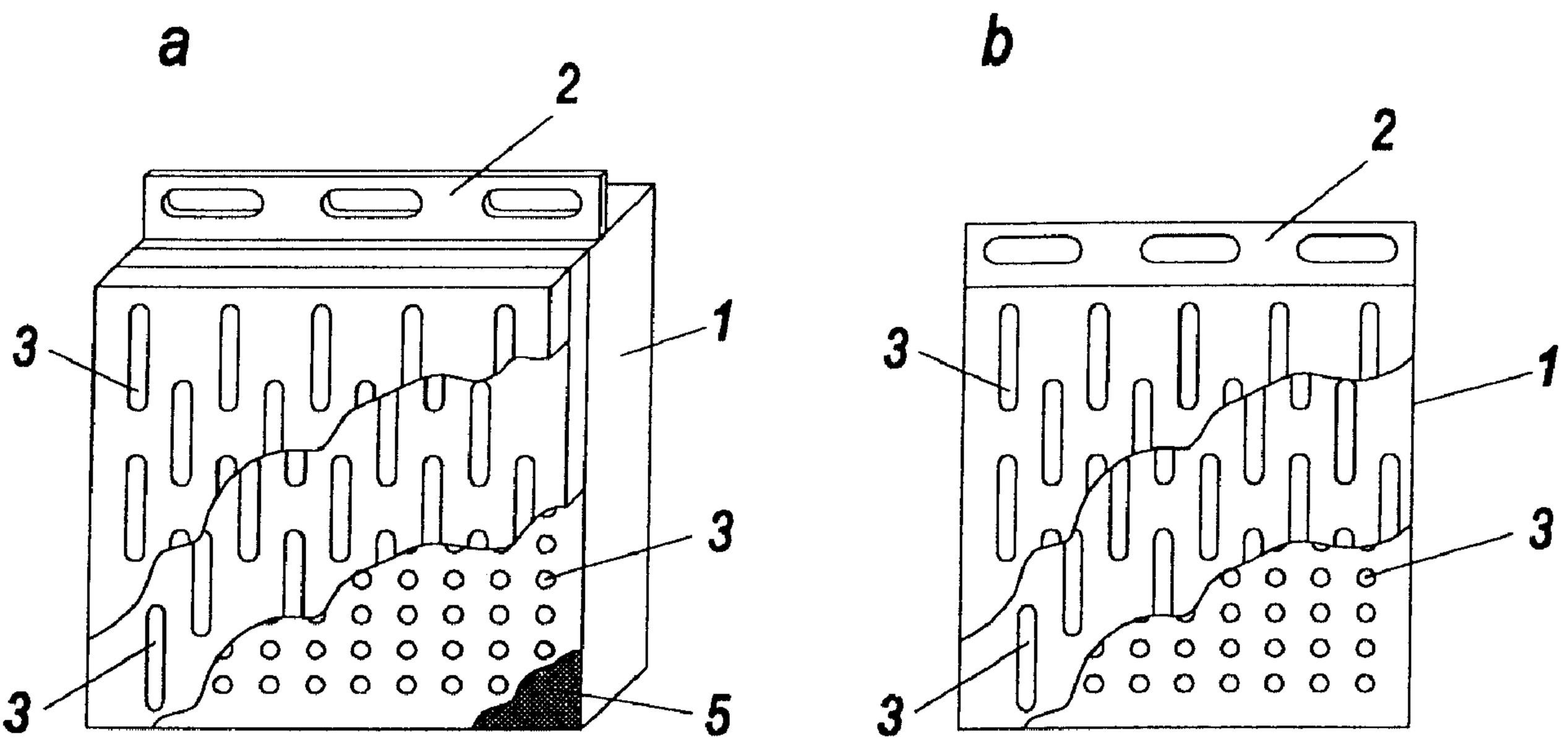


Fig. 5

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