(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 475 574 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.11.2004 Bulletin 2004/46

(51) Int Cl.[7]: **F24F 7/10**

(21) Application number: **04076100.9**

(22) Date of filing: **13.04.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **09.05.2003 SE 0301380**

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(54) A ventilated floor, a floorboard included therein, and a method of manufacturing the same

(57) The disclosure relates to a ventilated floor with a sub-floor, a duct- or gap forming device for creating a ventilation space along the sub-floor, a structural layer (4) which rests on the duct- or gap forming device, the structural layer (4) having a flooring on its upper side or itself constituting such a flooring. The ventilated floor also has a filter for the supply of air (21) to the ventilation space and a fan for exhausting air (22) from the ventilation space. The structural layer (4) has a floorboard (9) with a number of ducts which extend in its interior. The ducts are closed towards the top side of the floorboard (9) and are in communication with the ventilation space by the intermediary of a number of apertures. The ducts are in communication with the fan (22).

The disclosure also relates to a floorboard which is included in the ventilated floor.

The disclosure further relates to a method of producing a floorboard, comprising the steps of: making a number of grooves in the floorboard, making a number of through-going apertures in the bottoms of the grooves, forming a recess and securing the top board in the recess.

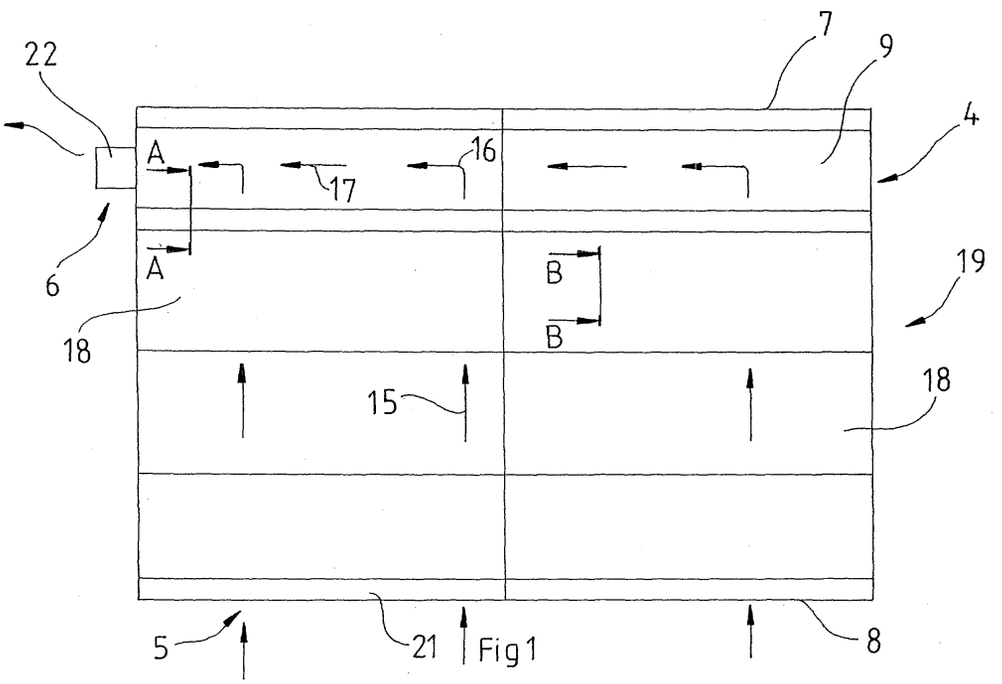

Fig 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a ventilated floor comprising a sub-floor, a duct- or gap forming device for realising a ventilation space along the sub-floor, a structural layer which rests on the duct- or gap forming device, the structural layer displaying, on its upper side, a flooring or itself constituting such a flooring, means for the supply of air to the ventilation space and means for exhausting air from the ventilation space.

[0002] The present invention also relates to a floorboard designed, in a ventilated floor, to rest with its underside on spacers which, between a sub-floor and the underside of the floorboard, form a ventilation space and, with their upper side, support a flooring or themselves constitute such a flooring.

[0003] The present invention further relates to a method of manufacturing a floorboard designed so as to form part of a ventilated floor.

BACKGROUND ART

[0004] Ventilated floors have been employed in many different contexts, principally in attempts to ventilate off residual smell in floors and ground plates and to prevent damp in the sub-floor from rising to superjacent constructions and causing damage.

[0005] Particularly serious situations may arise in such constructions where certain types of plastic floor coverings have been glued on a sub-floor and where migration of plasticizer has taken place down into the adhesive at the same time as rising damp has attacked from beneath. In such instance, it is not uncommon that the combination of adhesive, damp and plasticizer may give rise to damp problems with consequential mould, rot or fungus and bacterial growth which penetrate deep down into the sub-floor and can never be removed.

[0006] Particularly vulnerable are buildings where the foundation of the construction is cast direct on the ground, so-called "slab on the ground" in which event the concrete slab is either in direct contact with the ground or rests on an insulation. The concrete slab will often be uneven in its surface and before an inner floor can be provided thereon the surface is screeded with filler grout which often contains organic material. In other cases, screeding may be effected with a layer of fine particulate material, for example sand, whereon a plastic layer is possibly provided as a damp course. Above the plastic layer, a nailed substrate such as a chipboard panelling is provided in order to give support for the inner flooring, for example a parquet floor. The plastic layer is usually insufficiently moisture tight to prevent damp from rising up into the chipboard panelling and also into the inner flooring. In an area with a high water table, water under high pressure may penetrate up through the concrete slab and be absorbed by the sand and further upwards into the nailed layer which is destroyed and begins to rot.

[0007] Buildings laid on basements where the drainage beneath and around the foundation slab of the basement is substandard are also vulnerable to corresponding problems.

[0008] A further field of practical application for ventilation floors is in buildings which are erected in areas where there is a high radon content in the bedrock. The only method of reducing the concentration of radon indoors is to increase the indoor ventilation among other things using ventilation devices such as ventilated floors. The problems inherent in radon may be particularly severe in buildings where a basement wall is manufactured from a radon-emitting material, such as certain types of lightweight concrete.

[0009] It is previously known in the art to ventilate floors with an air duct or gap which is disposed between the sub-floor and the top floor with the aid of a spacing matrix of semi-hard plastic material. Several different types occur on the market, but one of the best known is the so-called platon mat.

[0010] The so-called platon mat consists of a thick plastic film on whose one side projections are provided in a diamond pattern. The projections rest on the sub-floor so that a ventilation space is formed between this floor and the underside of the thick plastic film.

[0011] Patent Specification SE-B-446 022 discloses a ventilated floor with floorboards which rest on a so-called platon mat. The ducts between the projections are in communication with the surroundings via a closed profile which is interconnected to an extraction fan and which is disposed as a flooring lining along a wall. The floor also displays a passage for incoming air through a filter which is disposed along an opposing wall.

[0012] Apart from the insufficient load carrying capacity of a floor built on the so-called platon mat, the air current in such a design will not be uniformly distributed, since the air flow is often greater at that end of the floor where the fan is located.

[0013] There are also ventilated floors in which a structural layer, such as a chipboard panelling, is disposed on other types of spacers, for example plastic sleeves, plastic screws, stud systems etc. Such floors build up considerably in the vertical direction, which is a hindrance when the inner flooring is to be laid, since the building height will be higher than the available space at thresholds and radiators.

PROBLEM STRUCTURE

[0014] The present invention has for its object to design the ventilation floor and floorboard intimated by way of introduction so that they obviate the drawbacks inherent in prior art technology. In particular, the present invention has for its object to design the device according to the invention in such a manner that a uniform flow pattern beneath the entire floor surface is realised and

that the load-carrying capacity of the floor is increased. The present invention further has for its object to design the device according to the invention so that the building height of the floor may be kept within reasonable limits.

SOLUTION

[0015] The objects forming the basis of the present invention will be attained if the ventilated floor intimated by way of introduction is characterised in that the structural layer includes, along a first wall connecting to the sub-floor, a floorboard which has a number of ducts disposed in its interior and directed along the first wall, the ducts being closed towards the upper side of the floorboard and being in communication with the ventilation space by the intermediary of a number of apertures, and that the ducts are in communication with means for the exhausting of air.

[0016] The objects forming the basis of the present invention will further be attained if the floorboard described by way of introduction is characterised in that the floorboard displays a number of ducts which are disposed in its interior and which extend between two opposing edges of the floorboard, and that the ducts are in flow communication with the underside of the floorboard by the intermediary of a number of apertures, while the ducts are closed towards the upper side of the floorboard.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0017] The present invention will now be described in greater detail hereinbelow, with reference to the accompanying Drawings. In the accompanying Drawings:

Fig. 1 is a top plan view of a ventilated floor according to the present invention;

Fig. 2 is a plan sectional view, with the section taken transversely of the plane of the Drawing, along the sectional marking A-A in Fig. 1;

Fig. 3 is a plan sectional view, with the section taken transversely of the plane of the Drawing, along the sectional marking B-B in Fig. 1;

Fig. 4 is a top plan view of the floor slab included in the ventilated floor prior to the laying of the top floorboard;

Fig. 5 is a plan sectional view, with the section taken transversely of the plane of the Drawing, along the sectional marking C-C in Fig 4, the whole section not being shown for reasons of space; and

Fig. 6 is a top plan view of an alternative embodiment of the ventilated floor.

DESCRIPTION OF PREFERRED EMBODIMENT

[0018] The invention relates to a ventilated floor which is intended to ventilate off residual smell in floors and ground plates and to prevent damp in the sub-floor from rising up to superjacent constructions. The ventilated floor may also have for its purpose to remove radon from subjacent ground or from building materials.

[0019] The ventilated floor 19, which is shown in Fig. 1, has a structural layer which includes both floorboards 9 with a duct system 20 and homogeneous floorboards 18 with no duct system. These two types of floorboards 9 and 18 are then assembled together to form a structural or supporting floor 19, the floorboards 9 with the duct system 20 being disposed in sequence after one another along a first wall 7 in the room and homogeneous floorboards 18 being laid on the remaining floor surface.

[0020] The basic principle, which is shown in Fig. 2, behind the ventilated floor 19 is a ventilation space 3 between a sub-floor 1 and the floorboards 9 and 18. The ventilation space 13 occurs when the floorboards 9 and 18 rest on a duct- or gap forming device 2, the ventilation space 3 being connected to the ambient air of the room by the intermediary of means 5 for the supply of air. These means are disposed along a second wall 8 in the room. Further, the ventilation space 3 is, by the intermediary of a number of apertures 12, in communication with a duct system 20 in the floorboards 9 and with a ventilation device. Between the ventilation space 3 and the duct system 20 in the floorboards 9, there occurs a partial vacuum, which entails circulation of the air in the ventilation space 3.

[0021] The ventilation device is a mechanical device which gives rise to a flow pattern uniformly distributed over the entire floor surface and air flows transversely across the room from the longitudinal second wall 8 of the room to the opposing longitudinal first wall 7 in accordance with the flow arrows 15, 16 and 17 in Fig. 1.

[0022] The assembled floor 19, which is assembled from the different floorboards 9 and 18, is shown in Fig. 1. The ventilated floorboards 9 with the duct system 20 are preferably disposed with their longitudinal edges along the longitudinal first wall 7 in a room. The next ventilated floorboard 9 is disposed adjacent the transverse edge of the first floorboard 9, along the first wall 7, whereafter several ventilated floorboards 9 may be disposed in sequence after one another and form a long row. Adjacent the row of the ventilated floorboards 9, homogeneous floorboards 18 are disposed with their longitudinal sides along the longitudinal sides of the ventilated floorboards 9. The homogeneous floorboards 18 may be disposed in a plurality of rows adjacent one another's longitudinal sides until the whole floor surface is covered.

[0023] The assembled ventilated floorboards 9 with

the duct system 20 and the homogeneous floorboards 18 without the system are manufacture from a mechanically durable material such as, for example, a chipboard an MDF or HDF panelling. The floorboards 9 and 18 are treated with an agent to prevent the floorboards 9 and 18 from attracting damp and moisture.

[0024] As was mentioned above, the ventilation device includes means 5 for the supply of air, for example through a filter 21 or a floor lining with recesses for incoming air, which is connected to the ventilation space 3 along the entire longitudinal second wall 8 with homogeneous floorboards 18 and means for exhausting air 6, for example an extractor fan 22 which is connected to the duct system 20 at a transverse edge of the row of the ventilated floorboards 9. The ducts in the opposing edge of the row of floorboards 9 are blocked, for example by plugs, so as to create a tight system.

[0025] The extractor fan 22 for outgoing air is in communication with all ducts 10 in the duct system 20. The devices for incoming and outgoing air 21 and 22 are preferably disposed on two of the opposing longitudinal sides of the room, this in order to create a uniform air current beneath the floor in the ventilation space 3. The air flows in a pattern from the second wall 8 to the first wall 7, where the flow lines 15 of the air are substantially parallel with each other, according to Fig. 1.

[0026] The ventilated floorboard 9, which is shown in Figs. 4 and 5, has a duct system 20 which displays a plurality of ducts 10 which each have at least one through-going aperture 12, permitting circulation of air from the ventilation space 3 beneath the floor up to the duct system 20. The duct system 20 is closed on the top side 11 of the floorboard by a homogeneous top board 23 which stabilises the floorboard 9 and is disposed in a recess 24 over the duct system 20 and by such means forms a part of the structural layer 4 of the floorboard 9.

[0027] The recess 24 is of a depth that corresponds to the thickness of the top board 23, whereby the floorboard 9 displays a smooth and uniform top side also over the duct system 20. The floorboard 9 and the top board 23 are manufactured from the same material so as to avoid deformations in the floorboard depending on variations in the moisture content in the two boards. Finally, the top board 23 is glued in the recess.

[0028] The duct system 20 of the floorboard 9 which is shown partly in Fig. 5 accommodates a plurality of ducts 10, for example by machining, in the central region of the floorboard 9. The ducts 10 extend substantially parallel with the edges of the floorboard 9 from the one transverse edge of the floorboard 9 to the opposing, second transverse of the floorboard 9. On machining of the upwardly open ducts 10, a portion is left intact in the lower region of the floorboard 9 which imparts rigidity to the floorboard 9. On the machining, an intact portion is also left of both edges of the floorboard 9 in order that the floorboard 9 will retain its stability. Upwardly, the ducts discharge in the bottom of the recess 24 before this is closed by means of the top board 23.

[0029] The recess 24 is also machined from the upper side of the floorboard 9. The sequence between the machining of the recess 24 and the ducts 10 is determined for reasons of production engineering.

[0030] In the lower region of the floorboard 9, the apertures 12 are disposed vertically through the lower intact portion of the duct system 20, for example by drilling, in a diagonally transverse pattern between two opposing comers of the floorboard 9. It is vital that the surface area of the apertures 12 is considerably less than the surface area of the ventilation ducts 10 in order to ensure a reliable flow through all apertures 12 and thereby realise the sought-for uniform and all-covering flow pattern according to Figs. 1 and 6.

[0031] Fig. 5 shows a row of diagonally disposed apertures 12 in the bottoms of the ducts 10. This implies that the apertures 12 in adjacent ducts are offset in relation to one another in the longitudinal direction of the ducts, and possibly more than one row of diagonally placed apertures 12 may be provided in the duct system 20.

[0032] The underside 14 of the floorboard 9 rests on duct- or gap forming devices 2, for example spacers 13 which support the floorboards 9 and 18 and are disposed in a pattern so as to support and stabilise the floorboards 9 and 18. The number of spacers required depends on how great the loading the floor 19 is assumed to withstand, the greater the number of spacers 13, the higher can be the loading that the assembled floor 19 can be subjected to. The spacers 13 are also disposed in the transitions between the floorboards 9 and 18 at the joints. The spacers 13 are, for example, loose, solid plastic spacers which may be fixedly glued beforehand or otherwise secured on the undersides of the floorboards 9 and 18. Possibly, the spacers 13 may be disposed with closer spacing beneath the duct systems 20.

[0033] Along the transverse and longitudinal edges of the floorboards 9 and 18, there are provided jointing elements, for example tongue and groove edges, which interconnect the floorboards 9 and 18 with each other. In order that the floor 19 will obtain the intended circulation of air according to Fig. 1, it is necessary that these joints between the floorboards 9 and 18 are tight and in order to achieve this tightness, these joints may also be sealed by a sealant, sealing strip or other sealing agent, or, quite simply, be glued together.

[0034] The homogeneous floorboard 18 without duct system is a board which ahs the same outer dimensions and appearance as the above-described ventilated floorboard 9 in order that they be able to be readily joined together.

DESCRIPTION OF ALTERNATIVE EMBODIMENT

[0035] One alternative embodiment of the device according to the present invention, in the assembled state, is shown in Fig. 6. In this embodiment, the floorboards

9 and 18 are constructed in the same manner as above, but are laid out in a different pattern. The floorboards 9 with the duct system 20 are disposed along the first and second longitudinal walls 7 and 8 of the room, according to Fig. 6, the means for the supply of air 5 being disposed adjacent the short side of the one row of floorboards 9 and the means for exhausting air 6 being disposed on the opposing side of the room adjacent the second short side of the row of floorboards 9.

[0036] In situations where the longitudinal walls 7 and 8 of the room are extremely long, it is appropriate to have two mutually discrete and separate duct systems 20 along the first wall 7. These two duct systems are each served by their fan 22 at the opposing edge walls of the room.

[0037] It is also possible to offset the duct system to an asymmetric position as close to the first wall 7 of the room as will be permitted by the mechanical strength of the floorboard 9.

Claims

1. A ventilated floor comprising a sub-floor (1), a duct- or gap forming device (2) for realising a ventilation space (3) along the sub-floor (1), a structural layer (4) which rests on the duct- or gap forming device (2), the structural layer (4) displaying, on its upper side, a flooring or itself constituting such a flooring, means for the supply of air (5) to the ventilation space (3) and means for exhausting air (6) from the ventilation space, **characterised in that** the structural layer (4) includes, along a first wall (7) connecting to the sub-floor, a floorboard (9) which has a number of ducts (10) disposed in its interior and directed along the first wall, the ducts being closed towards the upper side (11) of the floorboard (9) and being in communication with the ventilation space (3) by the intermediary of a number of apertures (12), and that the ducts (10) are in communication with said means for the exhausting of air (6).

2. The ventilated floor as claimed in Claim 1, **characterised in that** the structural layer (4) has homogeneous floorboards (18) on that side of the floorboard (9) with the ducts facing away from the first wall (7).

3. The ventilated floor as claimed in Claim 1 or 2, **characterised in that** the means for the supply of air (5) are located along a second wall (8) which is opposed to the first wall (7).

4. The ventilated floor as claimed in any of Claims 1 to 3, **characterised in that** the ventilation space (3) is closed to its ambient surroundings, with the exception of said means for the supply and exhausting of air (5, 6).

5. The ventilated floor as claimed in any of Claims 1 to 4, **characterised in that** the duct- or gap forming device (2) comprises a number of spacers (13) disposed a distance from one another and between the sub-floor (1) and the structural layer (4).

6. A floorboard designed so as, in a ventilated floor (19), to rest with its underside (14) on spacers (13) which, between a sub-floor (1) and the top side (14) of the floorboard, form a ventilation space (3) and, in order to support, with their upper side (11) a flooring or themselves constitute such a flooring, **characterised in that** the floorboard (9) has a number of ducts (10) disposed in its interior and which extend between two opposing edges of the floorboard (9); and that the ducts (10) are in flow communication with the underside (14) of the floorboard (9) by the intermediary of a number of apertures (12), while the ducts (10) are closed to the top side (11) of the floorboard (9).

7. The floorboard as claimed in Claim 6, **characterised in that** the ducts (10) are substantially parallel with one another and with two of the opposing edges of the floorboard (9).

8. The floorboard as claimed in Claim 6 or 7, **characterised in that** the apertures (12) in two adjacent ducts (10) are offset in relation to one another in the longitudinal direction of the ducts.

9. The floorboard as claimed in any of Claims 6 to 8, **characterised in that** each duct (10) has more than one aperture (12).

10. The floorboard as claimed in any of Claims 6 to 9, **characterised in that** the ducts (10) are closed towards the top side (11) of the floorboard (9) by means of a top board (23) which is located and secured in a recess (24) made over the ducts (10), whereby the floorboard is planar also over the ducts.

11. A method of producing a floorboard designed so as to be included in a ventilated floor, **characterised by** the steps of:

    making a number of grooves or ducts from a first side of the floorboard, the ducts being formed along a first edge of the floorboard;

    making a number of through-going apertures from the bottoms of the grooves to the other side of the floorboard;

    forming a recess from the first side of the floorboard so that the grooves discharge in its bottom; and

securing a top board in the recess so that the grooves are thereby closed towards the first side of the floorboard.

12. The method as claimed in Claim 11, **characterised in that** the grooves are formed parallel with one another and with the one longitudinal edge of the floorboard, the grooves being open towards the opposing short edges of the floor panel.

13. The method as claimed in Claim 11 or 12, **characterised in that** the recess is given a depth that corresponds to the thickness of the top board, whereby the floorboard is given a planar first side.

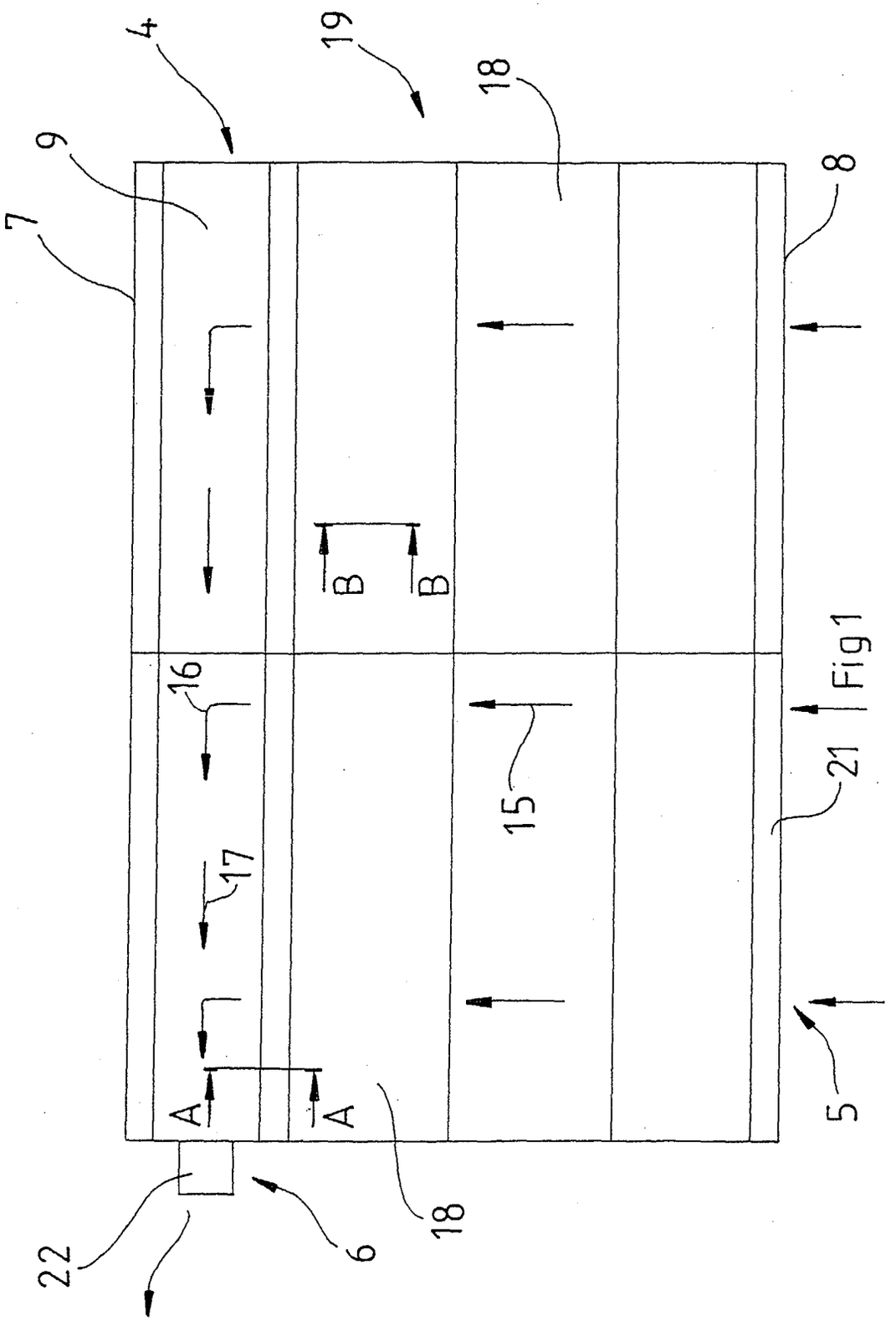

Fig 1

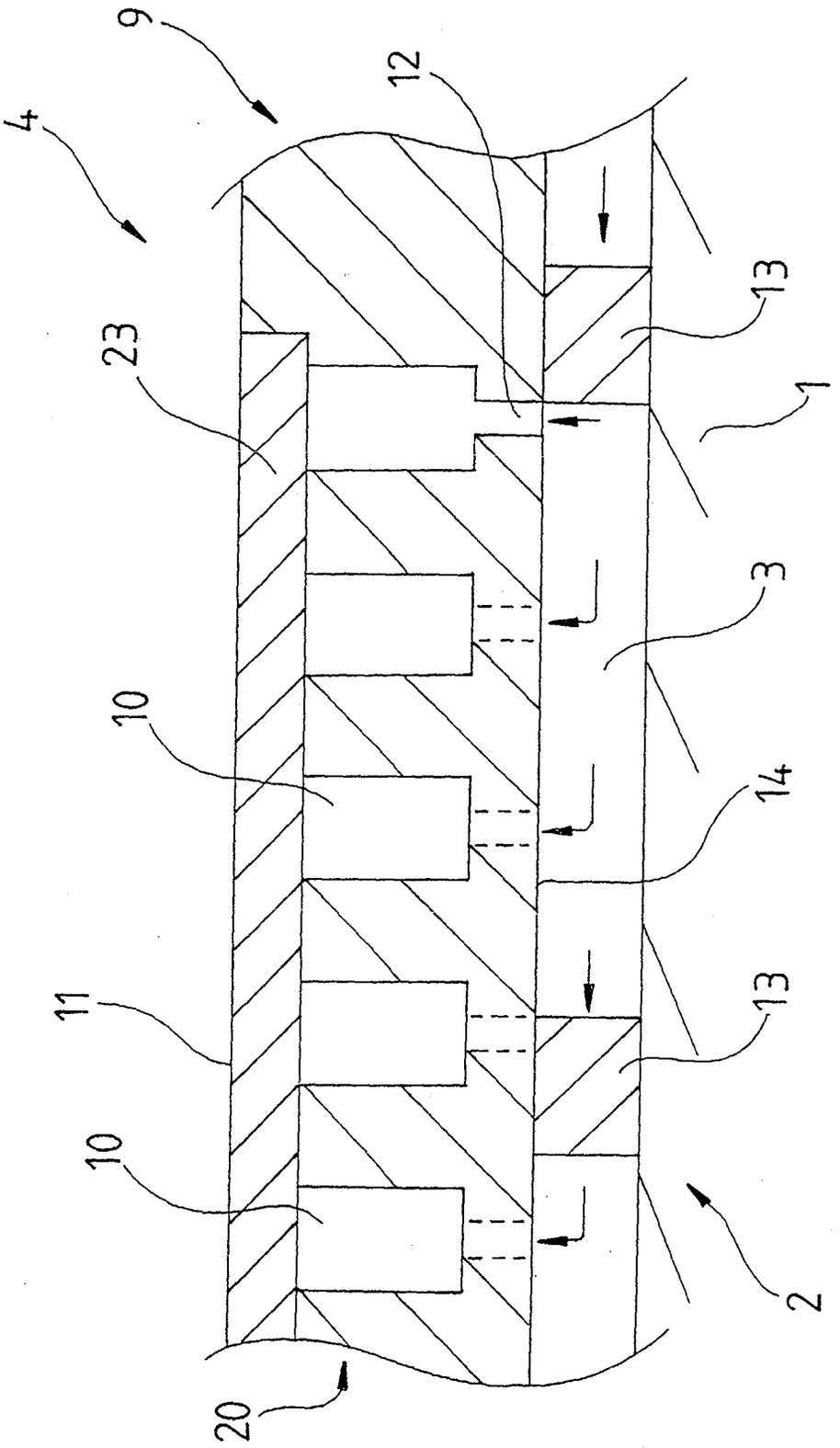

Fig 2

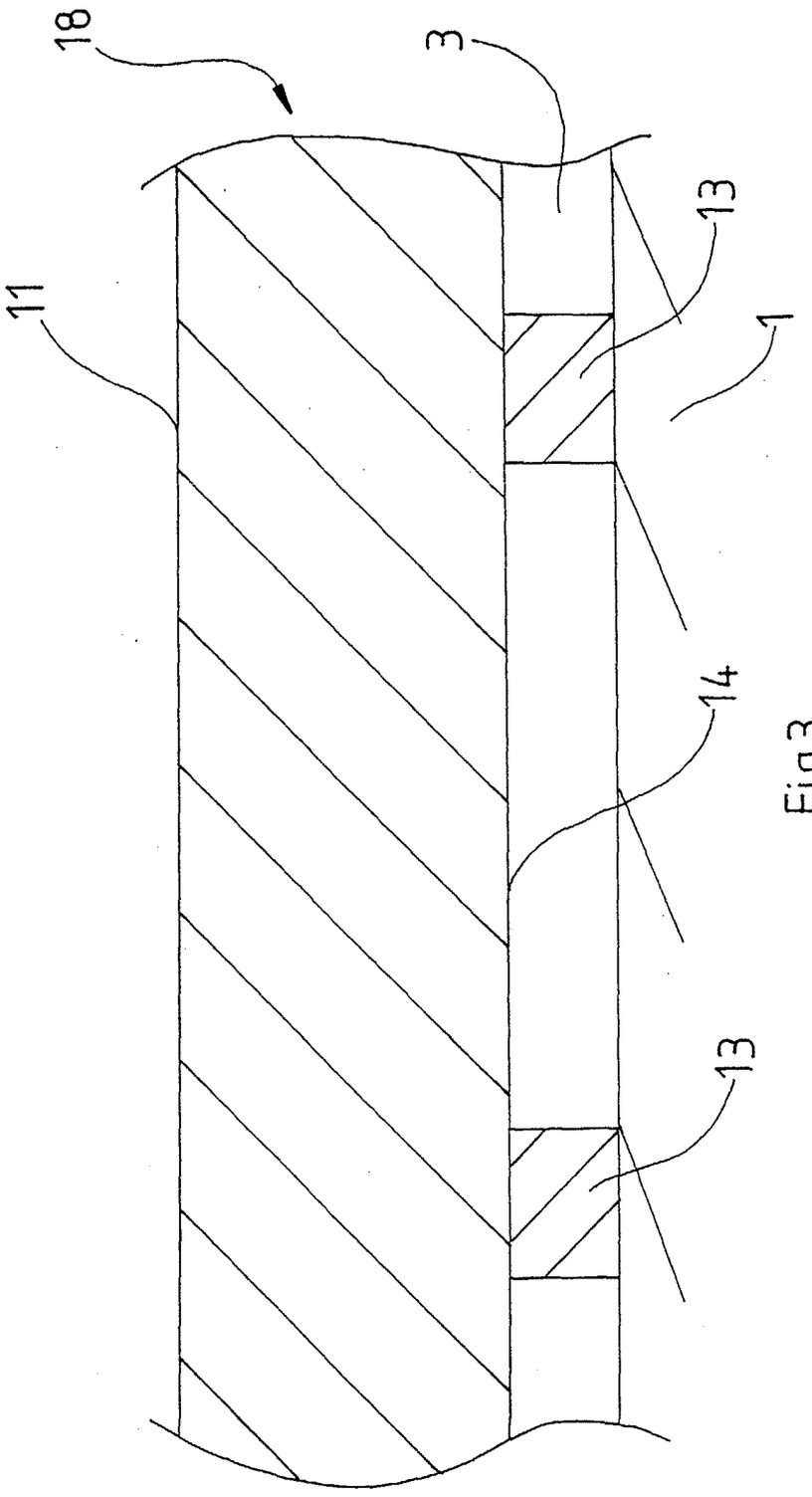

Fig3

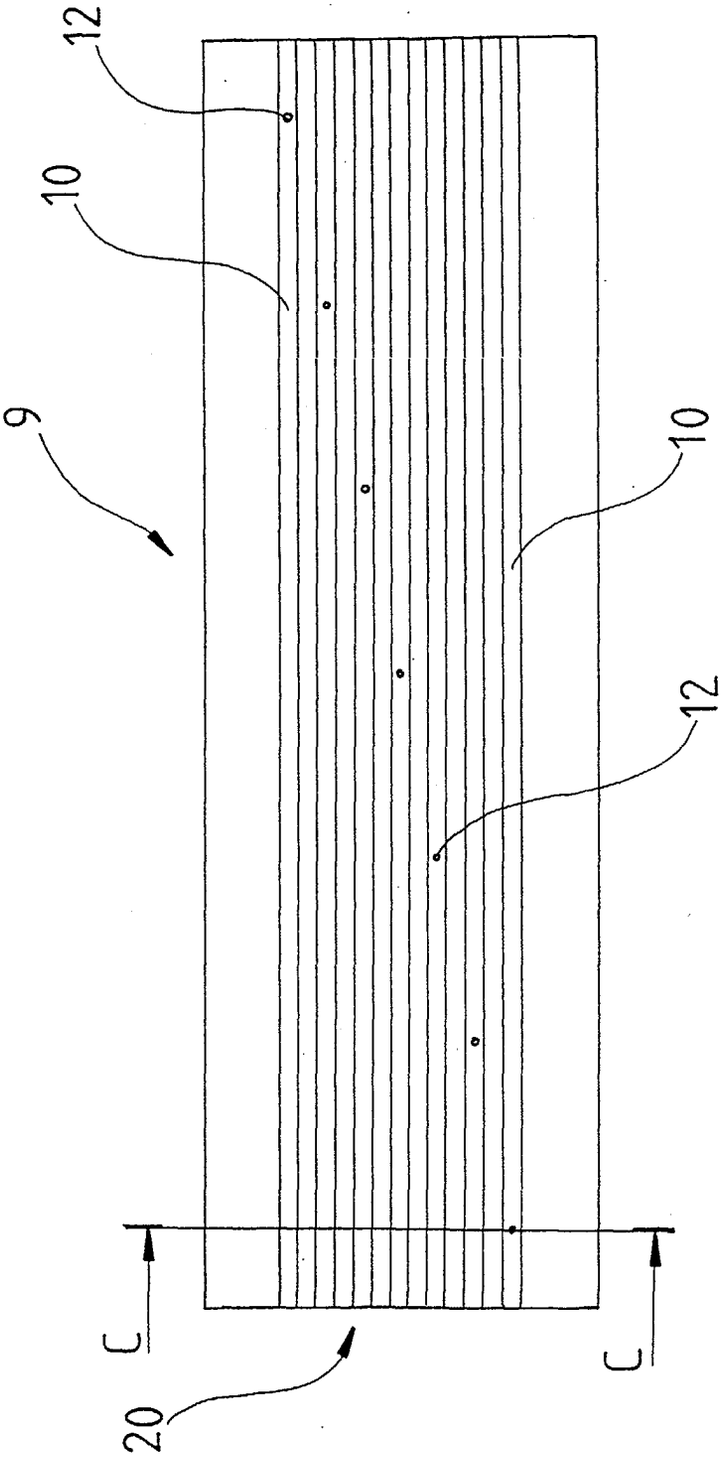

Fig 4

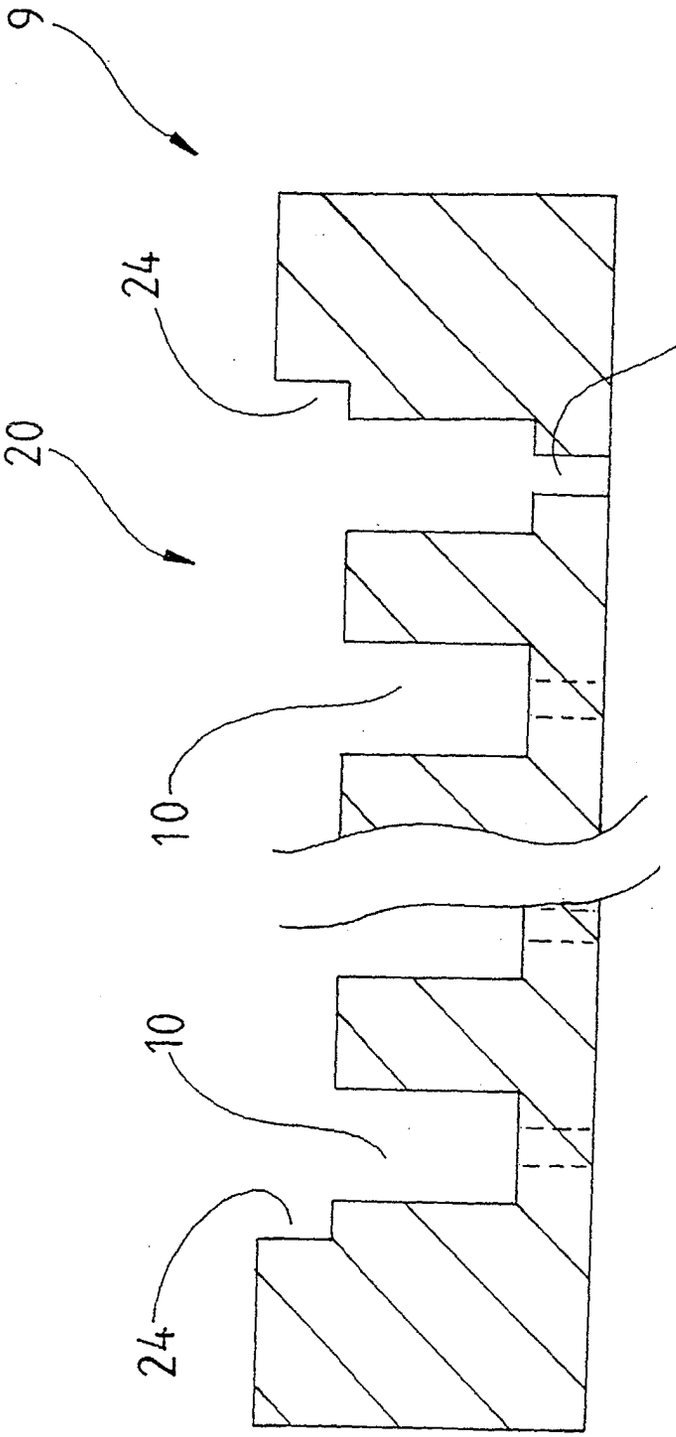

Fig 5

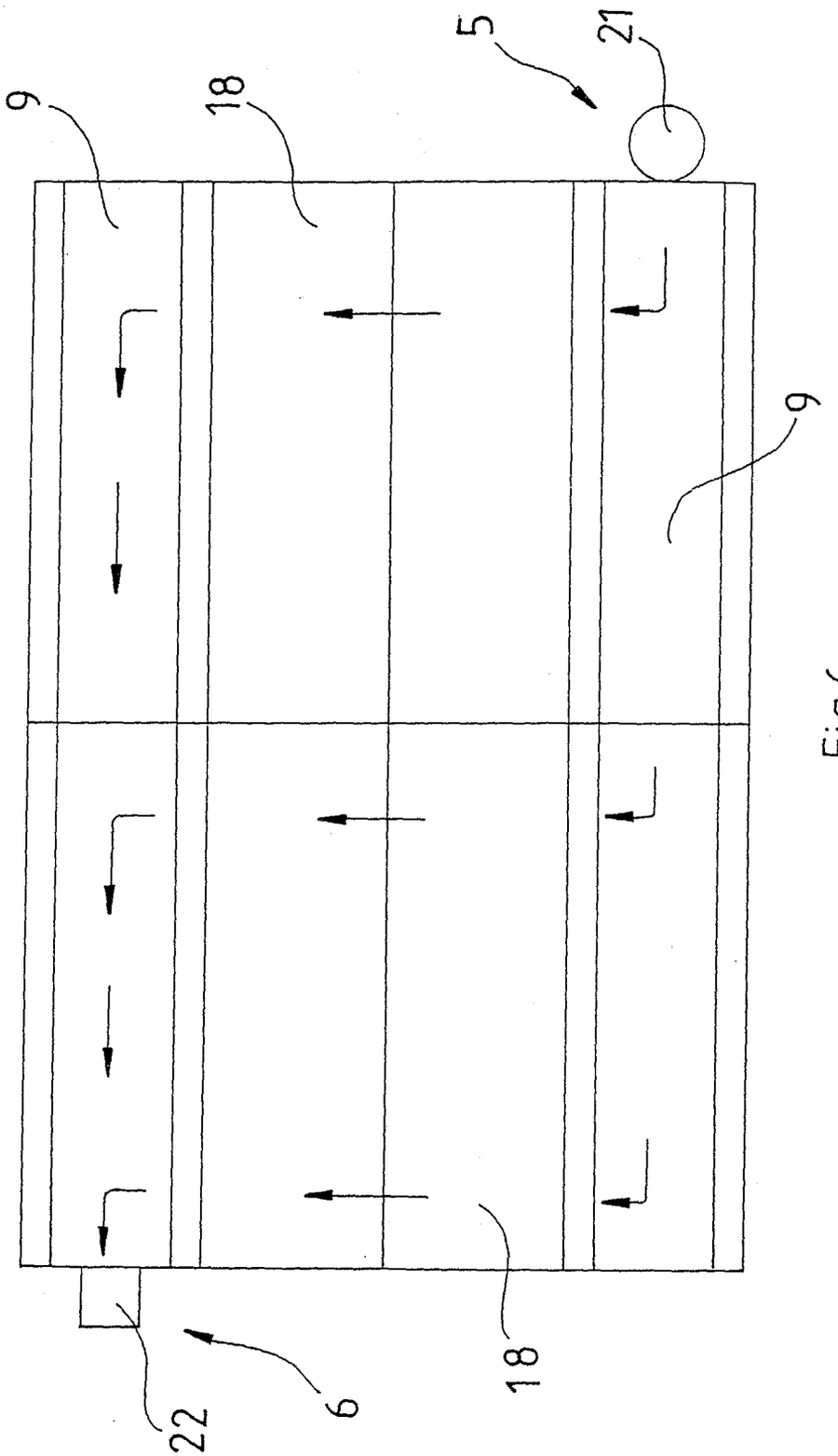

Fig 6