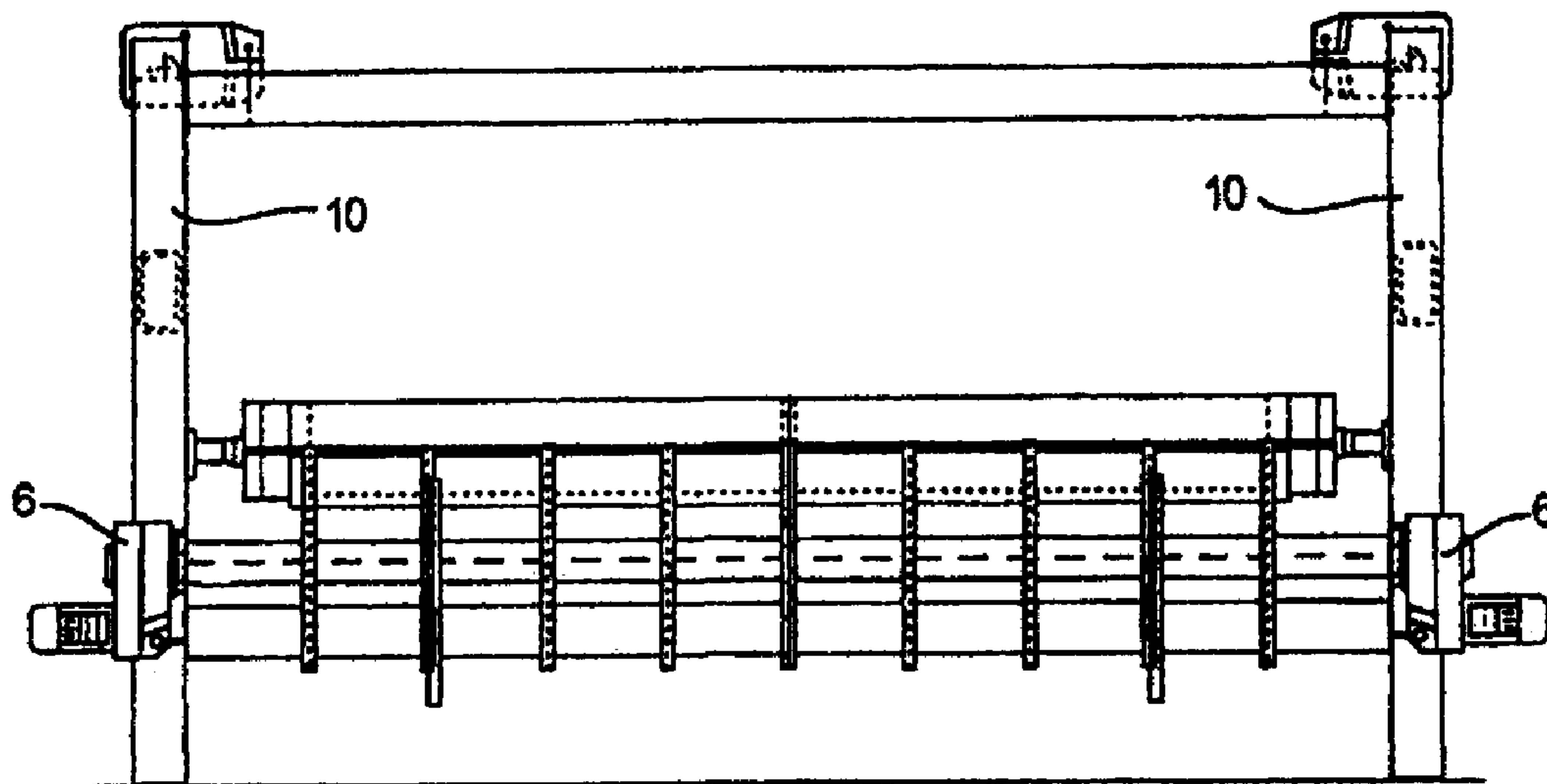




(72) LEHTIMAKI, TEUVO, FI  
(71) SUNDS DEFIBRATOR PANELHANDLING OY, FI  
(51) Int.Cl.<sup>6</sup> B65H 29/00, B65G 57/10  
(30) 1997/10/08 (973906) FI  
(54) **APPAREIL D'EMPILAGE DE FEUILLES**  
(54) **APPARATUS FOR STACKING SHEETS**



(57) Cette invention concerne un appareil permettant d'empiler au moins deux feuilles, lequel appareil comprend une plate-forme d'empilage (1) pouvant se déplacer verticalement, ainsi qu'un élément de support intermédiaire (2) qui possède de préférence une largeur égale à celle de la plate-forme d'empilage. Cet élément de support intermédiaire peut se déplacer en une position située au dessus de la plate-forme d'empilage ou au dessus d'une pile d'une ou de plusieurs feuilles placées sur ladite plate-forme. La feuille suivante ou la sous-pile de feuilles suivantes sont placées au dessus de l'élément de support intermédiaire qui est ensuite rétracté d'entre les feuilles se trouvant au dessus de lui. Les feuilles sont alignées simultanément contre un repère arrière (3, 4). L'élément de support intermédiaire (2) est fait d'un matériau multicouches dont une couche (2m) au moins est faite d'un matériau possédant une résistance au déchirement relativement élevée.

(57) The invention relates to an apparatus for stacking at least two sheets, said apparatus comprising a vertically movable stacking platform (1) and an intermediate support member (2) with a width advantageously essentially equal to that of said stacking platform, which intermediate support member is adapted movable into a position above the stacking platform or above a stack of at least one sheet placed on said platform and over which intermediate support member the next sheet or sheet substack is brought and which intermediate support member is then retracted from between the overlying sheets, whereby the sheets are simultaneously aligned against a back gage (3, 4). The intermediate support member (2) is made from a multilayer material having at least one layer (2m) made from a material having a substantially high tear resistance.



PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : B65H 29/00, B65G 57/10</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 99/18023</b> (43) International Publication Date: 15 April 1999 (15.04.99)</p>
<p>(21) International Application Number: PCT/FI98/00780 (22) International Filing Date: 6 October 1998 (06.10.98) (30) Priority Data: 973906 8 October 1997 (08.10.97) FI (71) Applicant (for all designated States except US): SUNDS DEFIBRATOR PANELHANDLING OY [FI/FI]; Wipaktie 1, FIN-15560 Nastola (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): LEHTIMÄKI, Teuvo [FI/FI]; Soramäenkatu 4 B 12, FIN-15200 Lahti (FI). (74) Agent: HEINÄNEN OY; Annankatu 31-33 C, FIN-00100 Helsinki (FI).</p>		<p>(81) Designated States: CA, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report. In English translation (filed in Finnish).</i></p>
<p>(54) Title: APPARATUS FOR STACKING SHEETS</p>		
<p>(57) Abstract</p> <p>The invention relates to an apparatus for stacking at least two sheets, said apparatus comprising a vertically movable stacking platform (1) and an intermediate support member (2) with a width advantageously essentially equal to that of said stacking platform, which intermediate support member is adapted movable into a position above the stacking platform or above a stack of at least one sheet placed on said platform and over which intermediate support member the next sheet or sheet substack is brought and which intermediate support member is then retracted from between the overlying sheets, whereby the sheets are simultaneously aligned against a back gage (3, 4). The intermediate support member (2) is made from a multilayer material having at least one layer (2m) made from a material having a substantially high tear resistance.</p>		

## APPARATUS FOR STACKING SHEETS

The present invention relates to an apparatus according to claim 1.

5

Apparatuses of the type concerned in the invention are used for stacking sheet substacks at least one sheet thick into higher stacks. From the prior art are known embodiments utilizing a carrier means similar to a conveyor band as an intermediate support member at a stacking station. These conventional arrangements are hampered by a number of drawbacks including, among others, an inferior resistance of the material used in their intermediate support member to pointed/edged mechanical stress, which tends to cause tearing and cutting of the support means surface. Moreover, the conveyor material has in certain situation been able to mar the sheet material being stacked.

10

15

It is an object of the present invention to provide an apparatus capable of overcoming the disadvantages of the above-described prior-art embodiments.

20

The embodiment of the invention is characterized by what is stated in the appended claims.

25

An apparatus according to the invention offers a number of significant benefits. The structure of the intermediate support member used in the apparatus provides an extremely durable construction. The multilayer structure of the intermediate support member has a very good wear resistance. It is also resistant against cutting. Its soft outer layers are incapable of marring the sheets being stacked. Furthermore, its the felt-like surface texture complies to the small surface irregularities of the stacked sheets. Moreover, the apparatus is capable of making extremely neat stacks. The stack edges become straight as the intermediate support member can push the

30

35

transferred stacks of sheets very reliably against a back gage.

5 In the following the invention will be examined in greater detail with reference to the appended drawings, in which

10 Figure 1 shows an apparatus according to the invention in a side view;

Figure 2 shows an apparatus according to the invention in an end view;

15 Figure 3 shows an apparatus according to the invention in a top view; and

20 Figure 4 shows the structure of the intermediate support member used in the apparatus according to the invention schematically in sectional view.

25 Referring to the diagrams, the apparatus according to the invention shown therein comprises a framework 10 having a vertically movable platform 1 adapted thereto. The apparatus includes an intermediate support member 2 adapted to be movable into a position above the stacking platform 1 or above a stack of at least one sheet placed on said platform. The width of the intermediate support member 2 is advantageously made essentially equal to the width of the stacking platform 1. The next sheet or substack of sheets is brought on the intermediate support member 2 by means of, e.g., a pusher 4. The function of the intermediate support member is to make the transfer of sheets onto the underlying stack of sheets easier and to protect the substacks of sheets from marring each other. When the intermediate support member 2 is removed from between the stacked sheets, the sheets are allowed to rest on each other simultaneously as they are pushed at least by their

30

35

one edges against a back gage 3, 4. The pusher 4 can act as a back gage during the retraction of the intermediate support member. The apparatus also includes means 5, 6, 7, 8 for moving the intermediate support member to above the stacking platform 2 and retracting the same from between the sheets. The intermediate support member 2 is connected by its one end to a support roller element 5, whose driven rotation by a drive means 6 forces the intermediate support member 2 to retract in a winding manner from the stacking area of the sheets. The apparatus further includes guides 7 along which the movable intermediate support member is adapted to run. The guides serve to support carriages 8 to which the intermediate support member 2 is connected, e.g., by its edges.

The sheets or sheet substacks to be stacked are fed from the direction of arrow 9 marked in Fig. 2 by means of the pusher 4 onto the stacking platform 1 or an intermediate support member 2 driven over the stack of sheets already stacked on the platform. When the new substack of sheets is fully pushed home in the stacking station, the intermediate support member 2 is removed from the gap remaining between the stacked sheets by actuating the roller element 5 to wind the intermediate support member away via the slot between the pusher 4 and the back gage 3. Then, the upper part of the lower substack is supported by the back gage 3, while at least the lower part of the upper substack is supported by the pusher 4 which is located in essentially the same plane with the back gage. Next, the platform 1 is lowered and the intermediate support member 2 is driven above the sheet stack resting in the stacking area, whereby a new sheet substack can be transferred onto the intermediate support member.

The intermediate support member 2 is made from a multi-layer material having at least one layer 2m of a material having a substantially high tear resistance. Furthermore,

at least one surface layer 2s of the member is made from a soft material.

5 The surface layer 2s of the intermediate support member 2 may be made from, e.g., a felt-like material. At least one inner layer 2m of the intermediate support member 2 is made from a fabric of substantially high tear resistance such as a metallic fabric. One advantageous choice for the middle layer is a metal wire fabric.

10

The intermediate support member 2 typically comprises two surface layers 2s and one inner layer 2m. The surface layer 2s is of a felted-surface polymer fabric such as a polyester-resin-bonded fabric.

15

Advantageously, the intermediate support member 2 is made from a flexible material, whereby it can be rolled about the support roller element.

20

The layers 2s, 2m are bonded to each other by glueing. Also other similar bonding methods may be used.

25

In a typical application, the dimensions of the intermediate support member over the stacking area are about 2-4 m wide by 5-9 m long. The thickness of the layers in the intermediate support member are determined by the material used. The surface layers may have a thickness in the order of 2 - 3 mm, while the middle layer is typically not thicker than 1 mm. Obviously, the dimensions of the intermediate support member may depending on the application vary even in a wide range from the above-cited typical figures.

30

35

The invention also concerns an intermediate support member alone particularly suited for use in a stacking apparatus of the type described above. Then, the intermediate support member 2 is made from a multilayer mate-

rial in which at least one surface layer 2s is made from a soft material and at least one second layer 2m of a material having a high tear resistance.

- 5 The apparatus and intermediate support member according to the invention may be used in applications related to the sheet-manufacturing industry in conjunction with, e.g., a trim-sawing line of sheets.
- 10 To those versed in the art it is obvious that the invention is not limited by the exemplifying embodiments described above.

**Claims:**

1. An apparatus for stacking at least two sheets, said apparatus comprising a vertically movable stacking platform (1) and an intermediate support member (2) with a width advantageously essentially equal to that of said stacking platform, which intermediate support member is adapted movable into a position above the stacking platform or above a stack of at least one sheet placed on said platform and over which intermediate support member the next sheet or sheet substack is brought and which intermediate support member is then retracted from between the overlying sheets, whereby the sheets are simultaneously aligned against a back gage (3, 4), characterized in that said intermediate support member (2) is made from a multilayer material having at least one layer (2m) made from a material having a substantially high tear resistance.
2. An apparatus as defined in claim 1, characterized in that at least one surface layer (2s) is made from a soft material.
3. An apparatus as defined in claim 1 or 2, characterized in that said surface layer (2s) of said intermediate support member (2) is made from a felt-like material.
4. An apparatus as defined in any of foregoing claims 1 - 3, characterized in that at least one inner layer (2m) of said intermediate support member (2) is made from a fabric of substantially high tear resistance such as a metallic fabric.
5. An apparatus as defined in any of foregoing claims 1 - 4, characterized in that said inter-

mediate support member (2) comprises two surface layers (2s) and one middle layer (2m).

- 5 6. An apparatus as defined in any of foregoing claims 1 - 5, characterized in that said surface layer (2s) is made from a felted-surface polymer fabric.
- 10 7. An apparatus as defined in any of foregoing claims 1 - 5, characterized in that said layers (2s, 2m) are bonded to each other by glueing.
- 15 8. An intermediate support member for use in an apparatus defined in claim 1, characterized in that said intermediate support member (2) is made from a multilayer material having at least one layer (2m) of a material having a substantially high tear resistance.
- 20 9. An intermediate support member as defined in claim 8, characterized in that at least one surface layer (2s) is made from a soft material.

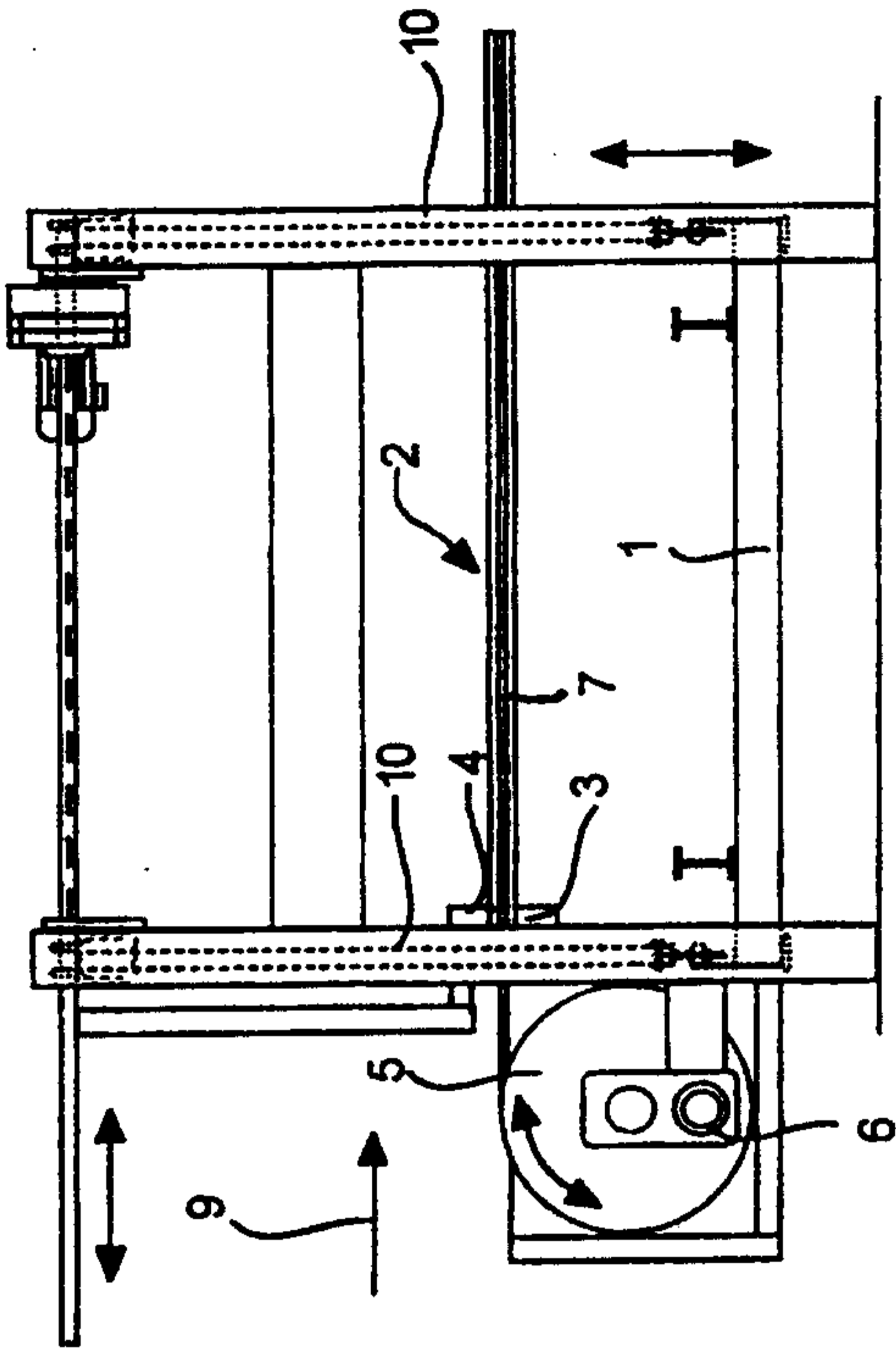


FIG 2

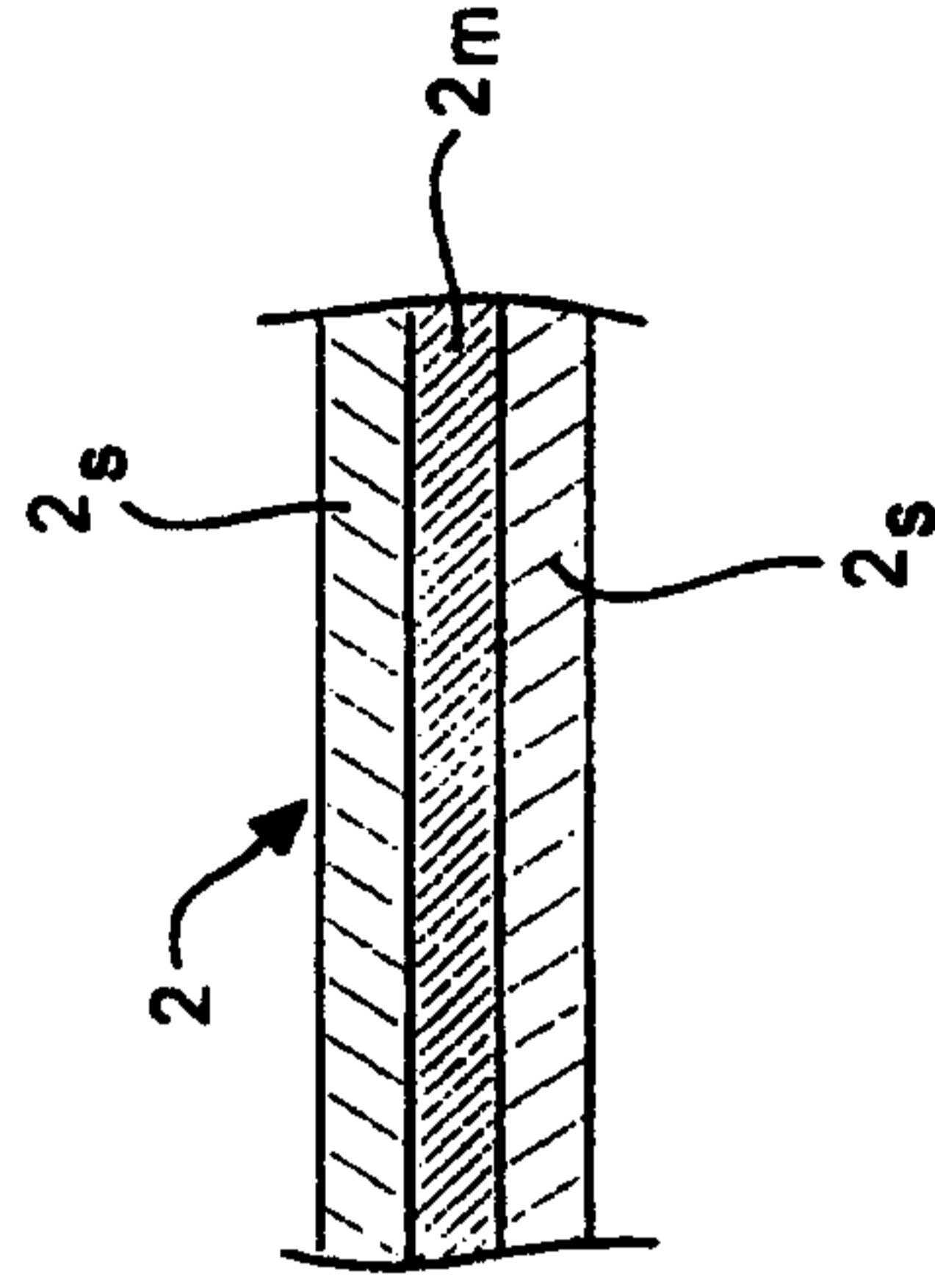


FIG 4

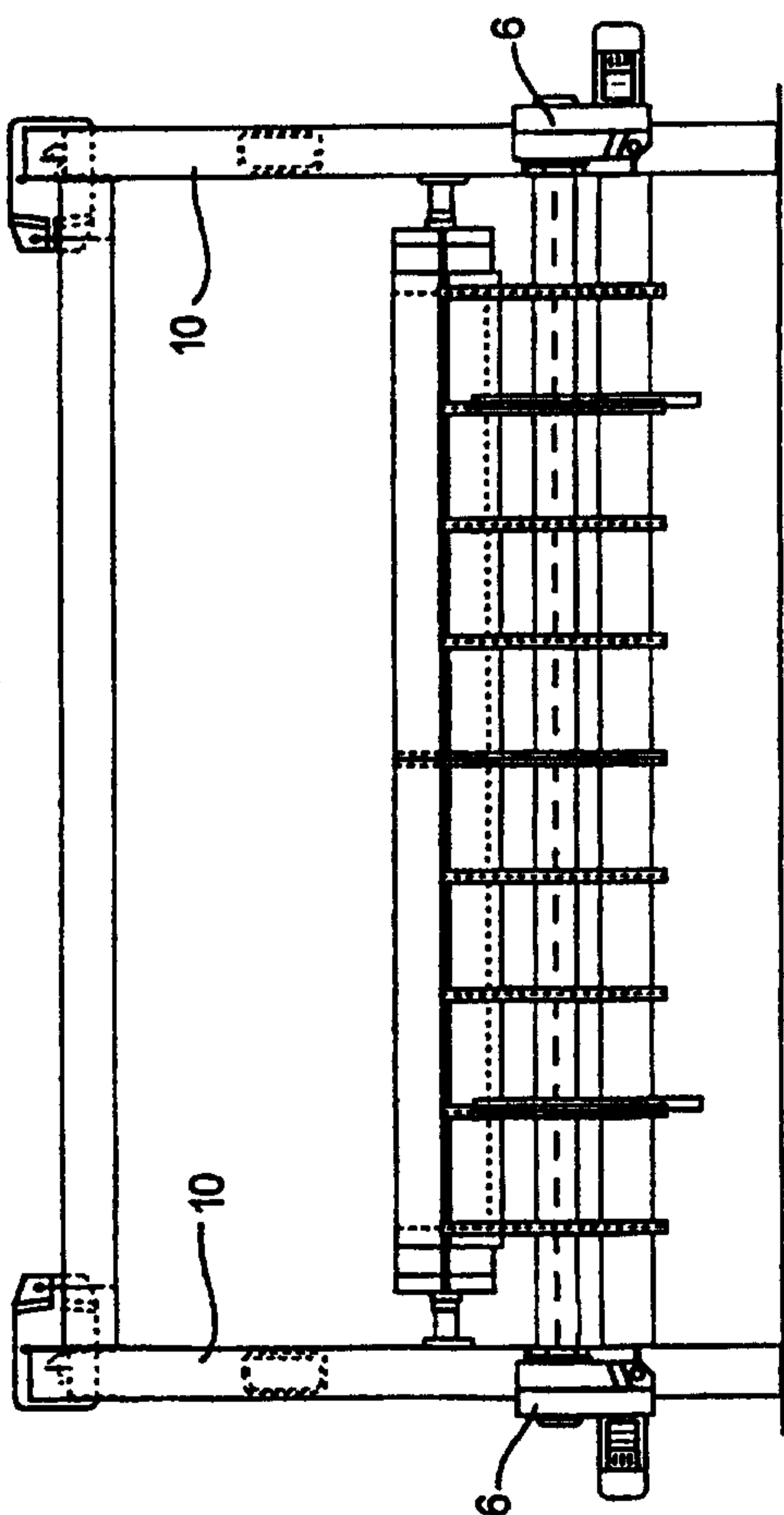


FIG 1

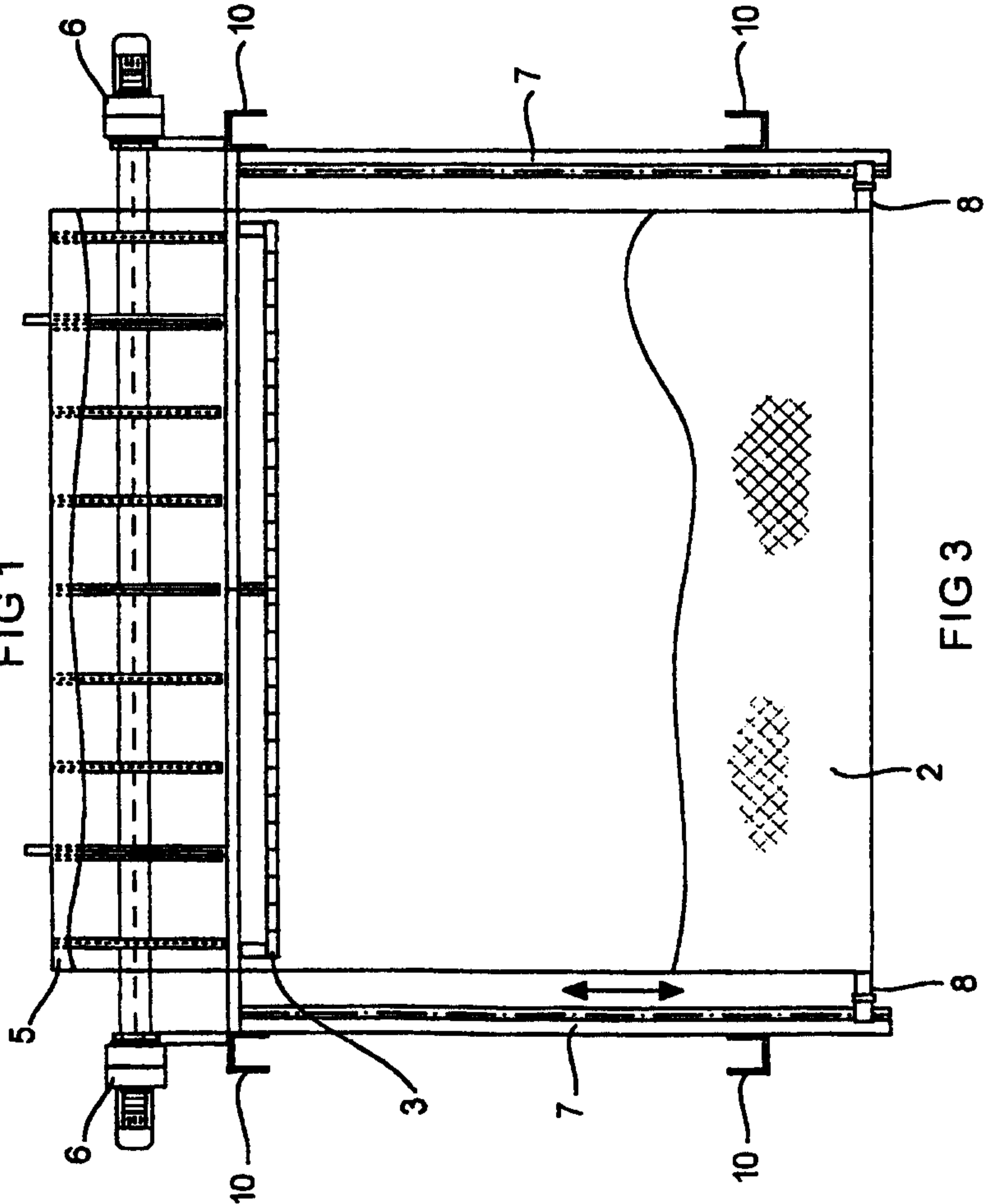


FIG 3