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(54) **Manufacture of insulating panels**

(57) A cleaning carriage 50 is mounted for vertical movement and is also movable transversely of separated panels 10, 12 along tracks 51 for movement of the carriage 50 across the gap between the separated panels 10, 12. The carriage 50 is moved from a raised inactive position to an extended or lowered active position and is then driven across the gap created between the panels 10, 12 to clean and de-burr the end faces 11, 13. Material removed on cleaning is collected in hoppers 52

to prevent contamination in the region of the panels. To clean the upper and lower faces 70, 71 of a panel 10, the panel is led over a lower face cleaning brush 80 and under an upper face cleaning brush 81 at a panel face cleaning station 85. The brushes 80, 81 are provided in the form of belts that brush across the faces 70, 71 of the panel 10 as the panel travels along a conveyer 86. Debris is brushed into inlets 87 of a vacuum removal system 88.

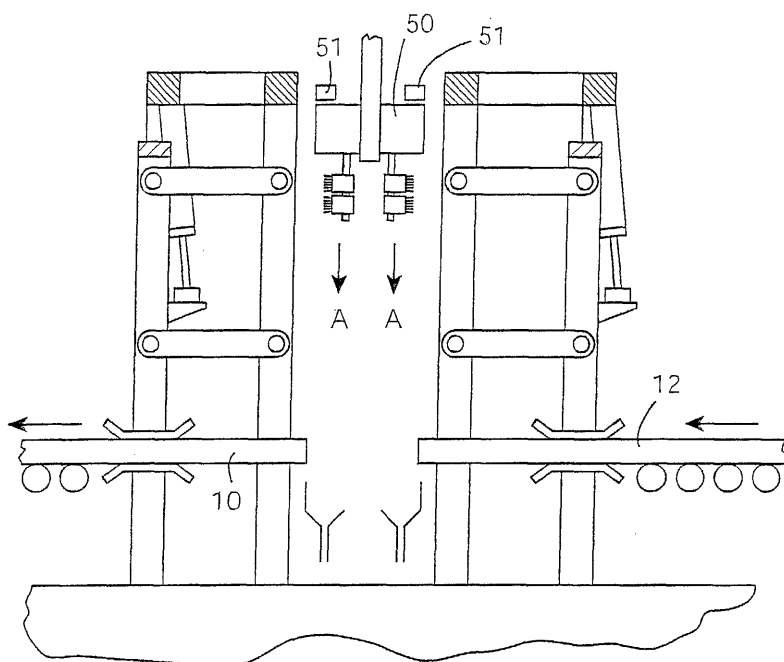


Fig. 5

EP 1 371 426 A2

Description

Introduction

[0001] The invention relates to a method and apparatus for manufacturing and handling panels. In particular, the invention relates to insulating panels of the type comprising an external skin and an internal backing with an insulating core therebetween.

[0002] UK-A-2227712, UK-A-2257086 and UK-A-2338448 describe methods and apparatus for manufacturing insulating panels. However, there is an increasing need to improve manufacturing and handling efficiency and to optimise product quality in a cost efficient manner to cut costs and maximise the production rates for such panels.

[0003] This invention is therefore directed towards providing an improved method and apparatus for producing panels of high quality and for efficient manufacturing and handling of such panels.

Statements of Invention

[0004] According to the invention there is provided a method for manufacturing a composite insulating panel of the type comprising an external skin, an internal backing tray and an insulating core therebetween, the method comprising the steps of:-

cutting a substantially continuous panel to a desired length, the cut defining a leading panel on one side and a trailing panel on the other side;

clamping the leading panel adjacent to the cut using a leading clamping means;

clamping the trailing panel adjacent to the cut using a trailing clamping means;

after clamping, separating the leading and trailing panels by a pre-set distance;

and after separation, cleaning the trailing end of the leading panel and the leading end of the trailing panel.

[0005] In one embodiment the trailing end of the leading panel and the leading end of the trailing panel are cleaned substantially simultaneously.

[0006] Preferably the method comprises de-burring the external skin and/or internal backing tray. The de-burring may be carried out by drawing a blade across the face of the external skin and/or backing tray.

[0007] In one arrangement the external skin and/or backing tray is de-burred while cleaning of the trailing end of the leading panel and the leading end of the trailing panel.

[0008] In a preferred embodiment the trailing end of

the leading panel and the leading end of the trailing panel are cleaned by drawing brush means across the ends of the panels. The brush means may be provided on a cleaning carriage and the method comprises the step, after separation of the panels, of extending the carriage from a retracted position into an extended position in the gap between the trailing end of the leading panel and the leading end of the trailing panel. Preferably the method comprises driving the cleaning carriage across the gap between the trailing end of the leading panel and the leading end of the trailing panel. Ideally the method comprises raising the carriage from the gap on traversing of the ends of the adjacent panels.

[0009] In a preferred embodiment the method comprises cleaning the upper and/or lower faces of the panel. The panel may be led over a lower face cleaning brush and leading the panel over an upper face cleaning brush. In one embodiment the panel is led over the face cleaning brush means after end cleaning.

[0010] In one arrangement the method comprises moving the upper face cleaning brush from a retracted disengaged position to an engaged position in which the brush is engaged with the upper face of the panel.

[0011] The invention also provides an insulated panel whenever manufactured by a method of the invention.

[0012] According to another aspect of the invention there is provided an apparatus for manufacturing a composite insulating panel of the type comprising an external skin, an internal backing tray and an insulating core therebetween, the apparatus comprising:-

cutting means for cutting a substantially continuous panel to a desired length, the cut defining a leading panel on one side and a trailing panel on the other side;

leading clamping means for clamping the leading panel adjacent to the cut;

trailing clamping means for clamping the trailing panel adjacent to the cut;

separating means for separating the leading and trailing panels after clamping by a pre-set distance; and

cleaning means for cleaning the trailing end of the leading panel and the leading end of the trailing panel.

[0013] In one embodiment the cleaning means is adapted for cleaning the trailing end of the leading panel and the leading end of the trailing panel substantially simultaneously.

[0014] Preferably the apparatus comprises de-burring means for de-burring the external skin and/or internal backing tray.

[0015] In one embodiment the de-burring means

comprises a blade which is drawn across the face of the external skin and/or backing tray.

[0016] In another embodiment the de-burring means and the cleaning means are mounted on a common carriage.

[0017] In a further embodiment the cleaning means comprises brush means which are drawn across the ends of the panels.

[0018] Preferably the apparatus comprises a cleaning carriage which is extendable from a retracted position into an extended position in the gap between the trailing end of the leading panel and the leading end of the trailing panel.

[0019] In another embodiment the driving means for driving the cleaning carriage across the gap between the trailing end of the leading panel and the leading end of the trailing panel.

[0020] Preferably the apparatus comprises means for raising the carriage from the gap on traversing of the ends of the adjacent panels.

[0021] In one embodiment the apparatus comprises panel face cleaning means for cleaning the upper and/or lower faces of the panel. Preferably the panel face cleaning means comprises a lower face cleaning brush and an upper face cleaning brush.

[0022] In one embodiment the upper face cleaning brush is movable from a retracted disengaged position to an engaged position in which the brush is engaged with the upper face of the panel.

Brief Description of Drawings

[0023] The invention will be more clearly understood from the following description thereof given by way of example only in which:-

Fig. 1 is a side view of a cutting step in the method of the invention;

Fig. 2 is an enlarged cross-sectional view illustrating the cutting of a panel;

Fig. 3 is a side view of a separating step in the method of the invention;

Fig. 4 is a cross-sectional view of adjacent panels separated;

Fig. 5 is a side view of a first stage step in panel edge cleaning;

Fig. 6 is a cross-sectional view of adjacent panel ends, prior to cleaning;

Fig. 7 is a side view of a panel end cleaning step in the method of the invention;

Fig. 8 is an enlarged cross-sectional view of the

panel ends being cleaned;

Fig. 9 is a plan view of a panel cleaning and de-burring step;

Fig. 10 is a perspective view of an end cleaning apparatus used in the method of the invention;

Fig. 11 is a perspective view of panel face cleaning apparatus used in the method of the invention;

Fig. 12 is a side view of a panel face cleaning step used in the method of the invention; and

Fig. 13 is a cross-sectional view of the panel face cleaning step.

Detailed Description

[0024] Referring to the drawings there is illustrated part of a method and apparatus used for manufacturing an insulated panel length 1 of the type having an external skin, an internal backing tray and an insulating core between the external skin and backing tray.

[0025] Referring initially to Figs 1 and 2 a continuous length of panel 1 is formed and delivered to a cutting station 2 at which the panel 1 is cut to a desired length by a cross-cut saw 4. The panel is cut to provide a leading panel 10 with a trailing end 11 and a trailing panel 12 having a leading end 13. A first clamp comprising a first upper clamping head 20 and a first lower clamping head 21 grips the leading panel 10. A second clamp comprising a second upper clamping head 22 and a second lower clamping head 23 grips the trailing panel 12. The first and second clamps are mounted on separate carriages 24, 25 which are moved apart as illustrated in Fig. 3 to separate the panels 10, 12 at the joint. The carriages 24, 25 on which the clamps are mounted to travel with the panels as they progress along the production line. This ensures that processing time is optimised as the panels are not stopped during the separation of the panels. At this stage the trailing end 11 of the leading panel 10 is separated from the leading end 13 of the trailing panel 12. The end faces have a rough finish after the cutting process and may be contaminated by metal shards, and dust of foam material.

[0026] Cleaning apparatus for simultaneously cleaning and de-burring the end faces 11, 13 of the adjacent panels is illustrated in Figs. 5 to 10. The cleaning apparatus comprises a cleaning carriage 50 which is mounted for vertical movement in the direction of the arrows A, for example by a ram. The carriage 50 is also movable in the direction of the arrows B transversely of the panels 10, 12 along tracks 51 for movement of the carriage 50 across the gap between the separated panels 10, 12. In use, the carriage 50 is moved from the raised inactive position of Figs. 5 and 10 to the extended or lowered active position of Figs. 7 and 8 and is then driven across

the gap created between the panels 10, 12 to clean the end faces 11, 13. Material removed on cleaning is collected in lower collection hoppers 52 to prevent contamination in the region of the panels.

[0027] The carriage 50 carries a leading panel cleaning head 55 and a trailing panel cleaning head 56. The leading panel head 55 has pairs of upper and lower brushes 60, 61 and de-burring knives 63 between the pair of upper brushes 60. Similarly, the trailing panel cleaning head 56 has pairs of upper and lower brushes 63, 64 and de-burring knives 65 between the upper brushes 63. As the carriage 50 is moved across between the panels 10, 12 in the direction of the arrow B in Fig. 9 the brushes 60, 61, 63, 64 brush off debris from the ends 11, 13 of the panels 10, 12 and the knives 63, 65 drag on the uppermost metal edge of the panels, removing metal shards. The lowermost metal edge of the panels may be similarly de-burred.

[0028] After end cleaning the carriage 50 is lifted back up to the inactive position, the panels 10, 12 travel to the next station at which the faces of the panel are cleaned and the cutting, cleaning and de-burring station is ready for the next panel.

[0029] Referring to Figs. 10 to 13 to clean the upper and lower faces 70, 71 of a panel 10, the panel is led over a lower face cleaning brush 80 and under an upper face cleaning brush 81 at a panel face cleaning station 85. In this case the brushes 80, 81 are provided in the form of belts that brush across the faces 70, 71 of the panel 10 as the panel travels along a conveyer 86. Debris is brushed into inlets 87 of a vacuum removal system 88. Both the upper and lower face cleaning brushes 80, 81 are movable from a raised to a lowered position by any suitable means such as a ram.

[0030] The invention provides a highly optimised process for producing insulating panels in which the panel is cut to a desired length in-line, the end faces are cleaned and de-burred and the panel faces are cleaned in-line without interrupting the production panel flow. Substantially clean faces are provided which assists in optimising use of the panels and preventing damage caused by loose metal shards or debris which may damage the panel faces or ends.

[0031] The invention is not limited to the embodiments hereinbefore described which may be varied in construction and detail.

Claims

1. A method for manufacturing a composite insulating panel of the type comprising an external skin, an internal backing tray and an insulating core therebetween, the method comprising the steps of:-

cutting a substantially continuous panel to a desired length, the cut defining a leading panel on one side and a trailing panel on the other side;

clamping the leading panel adjacent to the cut using a leading clamping means;

clamping the trailing panel adjacent to the cut using a trailing clamping means;

after clamping, separating the leading and trailing panels by a pre-set distance;

and after separation, cleaning the trailing end of the leading panel and the leading end of the trailing panel.

2. A method as claimed in claim 1 wherein the trailing end of the leading panel and the leading end of the trailing panel are cleaned substantially simultaneously.
3. A method as claimed in claim 1 or 2 comprising de-burring the external skin and/or internal backing tray.
4. A method as claimed in claim 3 wherein the de-burring is carried out by drawing a blade across the face of the external skin and/or backing tray.
5. A method as claimed in claim 3 or 4 wherein the external skin and/or backing tray is de-burred while cleaning of the trailing end of the leading panel and the leading end of the trailing panel.
6. A method as claimed in any of claims 2 to 5 wherein the trailing end of the leading panel and the leading end of the trailing panel are cleaned by drawing brush means across the ends of the panels.
7. A method as claimed in claim 6 wherein the brush means are provided on a cleaning carriage and the method comprises the step, after separation of the panels, of extending the carriage from a retracted position into an extended position in the gap between the trailing end of the leading panel and the leading end of the trailing panel.
8. A method as claimed in claim 7 comprising driving the cleaning carriage across the gap between the trailing end of the leading panel and the leading end of the trailing panel.
9. A method as claimed in claim 8 comprising raising the carriage from the gap on traversing of the ends of the adjacent panels.
10. A method as claimed in any preceding claim comprising cleaning the upper and/or lower faces of the panel.
11. A method as claimed in claim 10 comprising leading

the panel over a lower face cleaning brush and leading the panel over an upper face cleaning brush.

12. A method as claimed in claim 11 wherein the panel is led over the face cleaning brush means after end cleaning. 5
13. A method as claimed in claim 11 or 12 comprising moving the upper face cleaning brush from a retracted disengaged position to an engaged position in which the brush is engaged with the upper face of the panel. 10
14. An insulated panel whenever manufactured by a method as claimed in any proceeding claim. 15
15. Apparatus for manufacturing a composite insulating panel of the type comprising an external skin, an internal backing tray and an insulating core therebetween, the apparatus comprising:- 20
 - cutting means for cutting a substantially continuous panel to a desired length, the cut defining a leading panel on one side and a trailing panel on the other side; 25
 - leading clamping means for clamping the leading panel adjacent to the cut;
 - trailing clamping means for clamping the trailing panel adjacent to the cut; 30
 - separating means for separating the leading and trailing panels after clamping by a pre-set distance; and 35
 - cleaning means for cleaning the trailing end of the leading panel and the leading end of the trailing panel. 40
16. Apparatus as claimed in claim 15 wherein the cleaning means is adapted for cleaning the trailing end of the leading panel and the leading end of the trailing panel substantially simultaneously. 45
17. Apparatus as claimed in claim 15 or 16 comprising de-burring means for de-burring the external skin and/or internal backing tray.
18. Apparatus as claimed in claim 17 wherein the de-burring means comprises a blade which is drawn across the face of the external skin and/or backing tray. 50
19. Apparatus as claimed in claim 17 or 18 wherein the de-burring means and the cleaning means are mounted on a common carriage. 55

20. Apparatus as claimed in any of claims 16 to 19 wherein the cleaning means comprises brush means which are drawn across the ends of the panels.

21. Apparatus as claimed in claim 20 wherein the brush means are provided on a cleaning carriage which is extendable from a retracted position into an extended position in the gap between the trailing end of the leading panel and the leading end of the trailing panel.

22. Apparatus as claimed in claim 21 comprising driving means for driving the cleaning carriage across the gap between the trailing end of the leading panel and the leading end of the trailing panel.

23. Apparatus as claimed in claim 22 comprising means for raising the carriage from the gap on traversing of the ends of the adjacent panels.

24. Apparatus as claimed in of claims 15 to 23 comprising panel face cleaning means for cleaning the upper and/or lower faces of the panel.

25. Apparatus as claimed in claim 24 wherein the panel face cleaning means comprises a lower face cleaning brush and an upper face cleaning brush.

26. Apparatus as claimed in claim 25 wherein the upper face cleaning brush is movable from a retracted disengaged position to an engaged position in which the brush is engaged with the upper face of the panel.

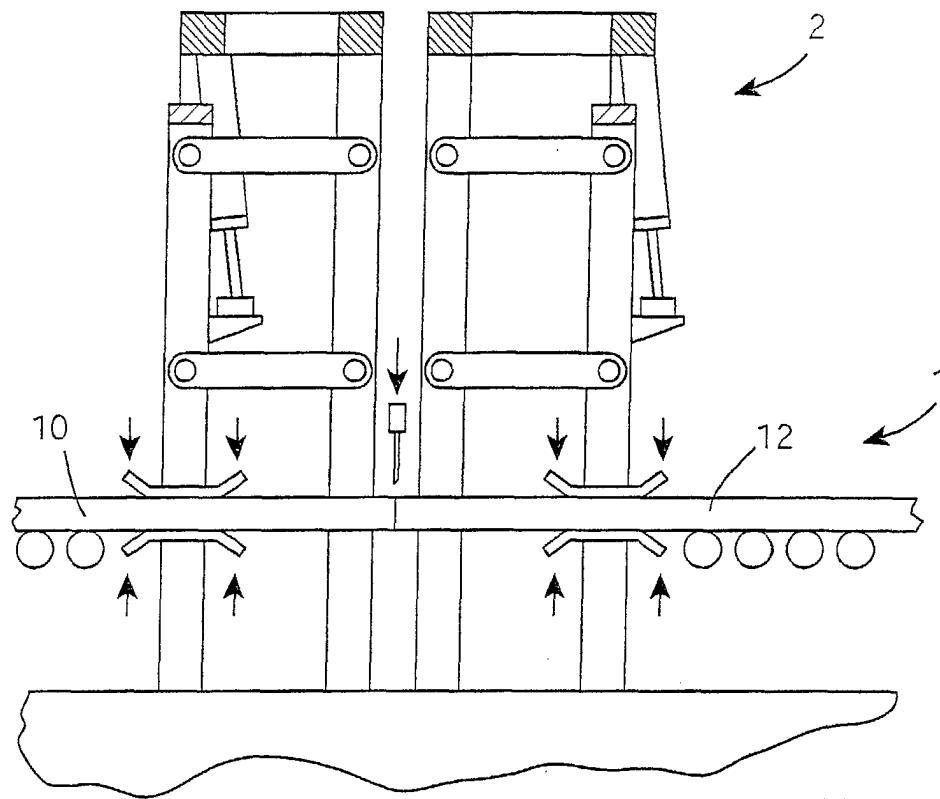


Fig. 1

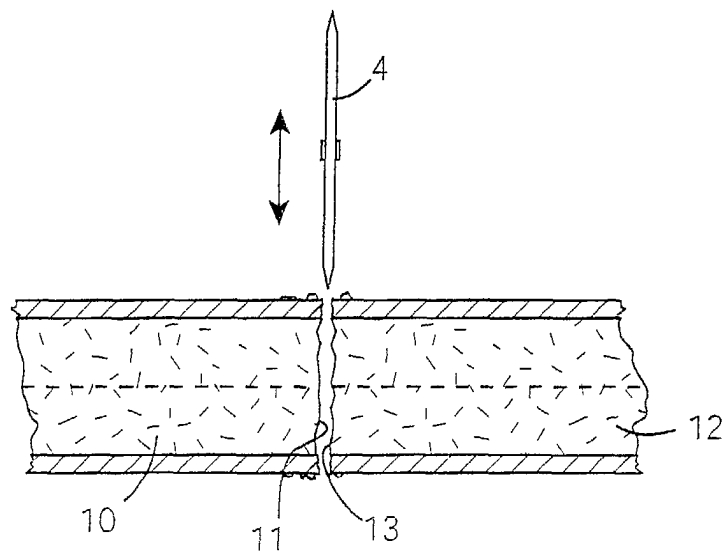


Fig. 2

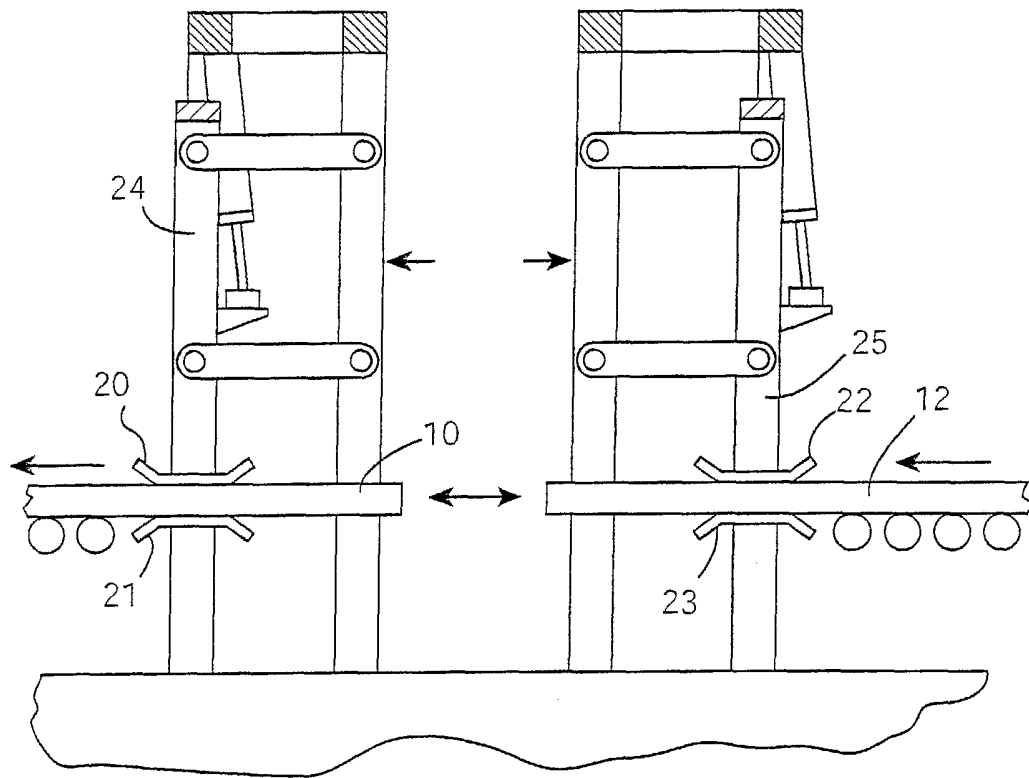


Fig. 3

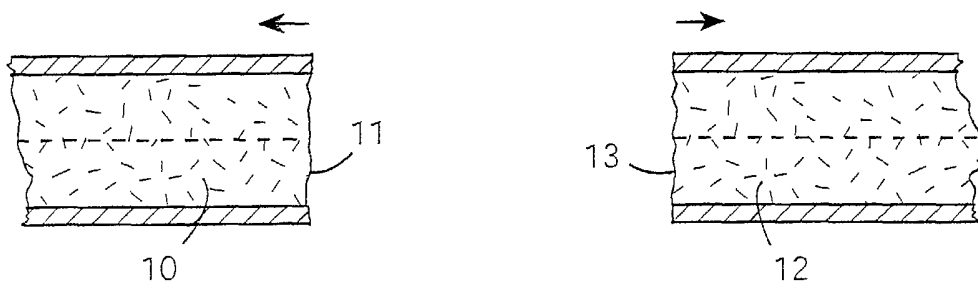


Fig. 4

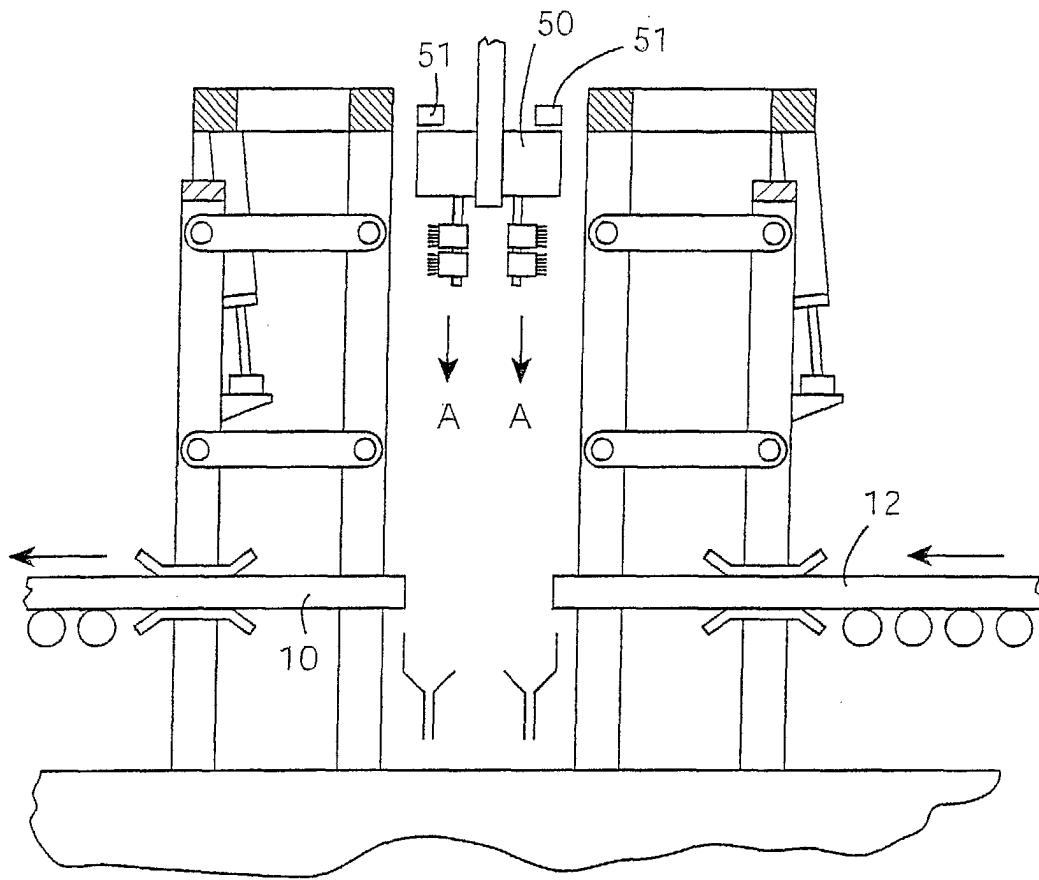


Fig. 5

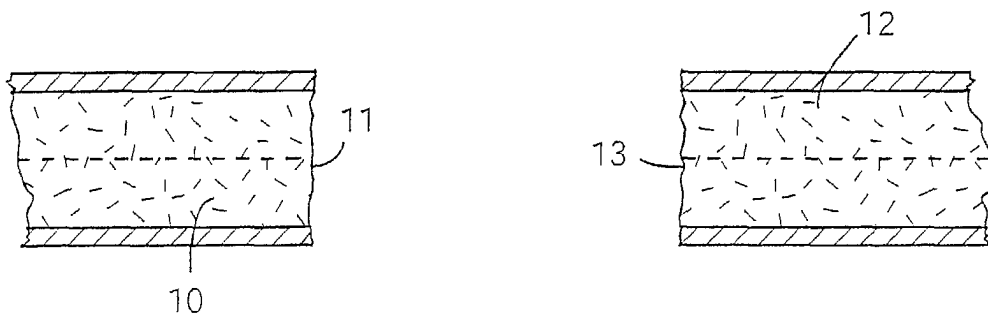


Fig. 6

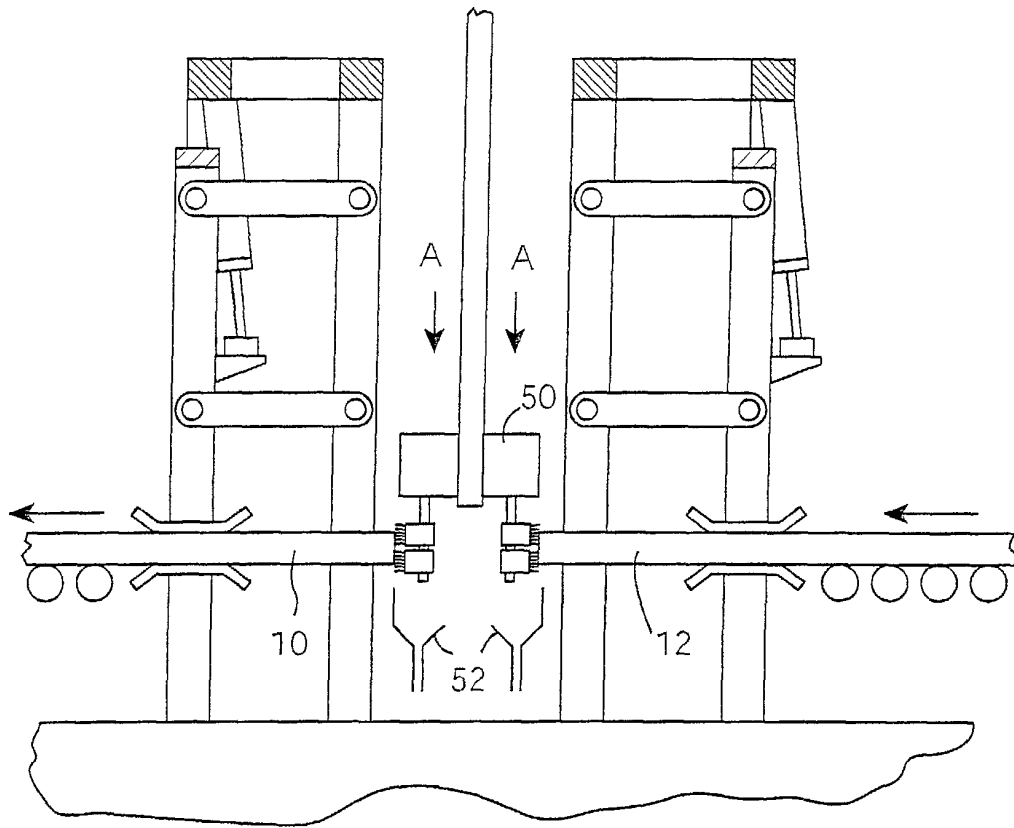


Fig. 7

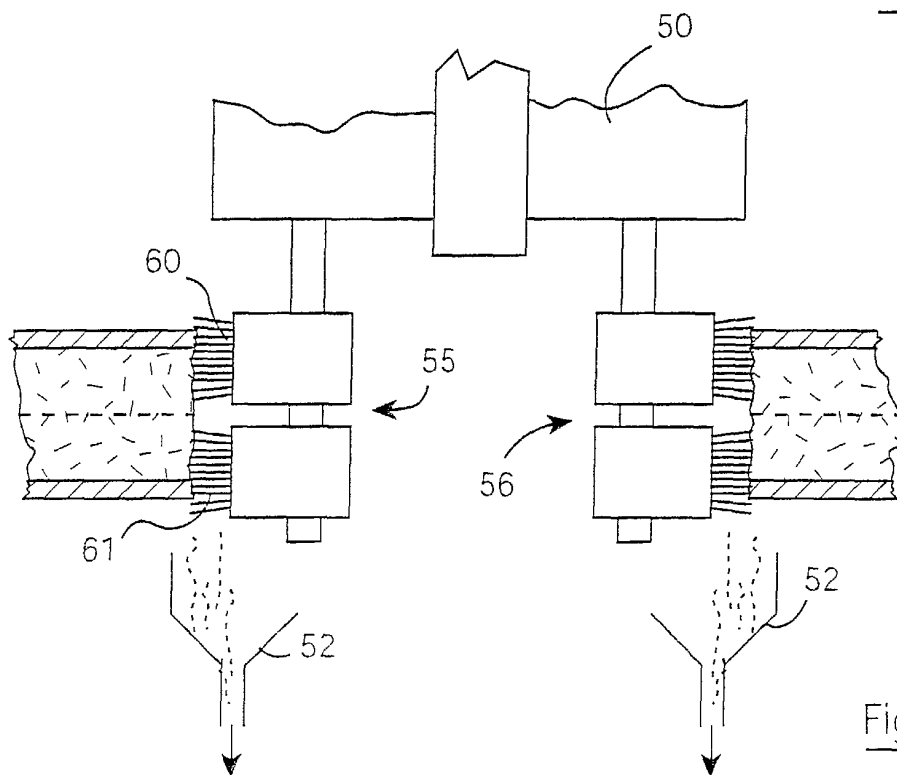


Fig. 8

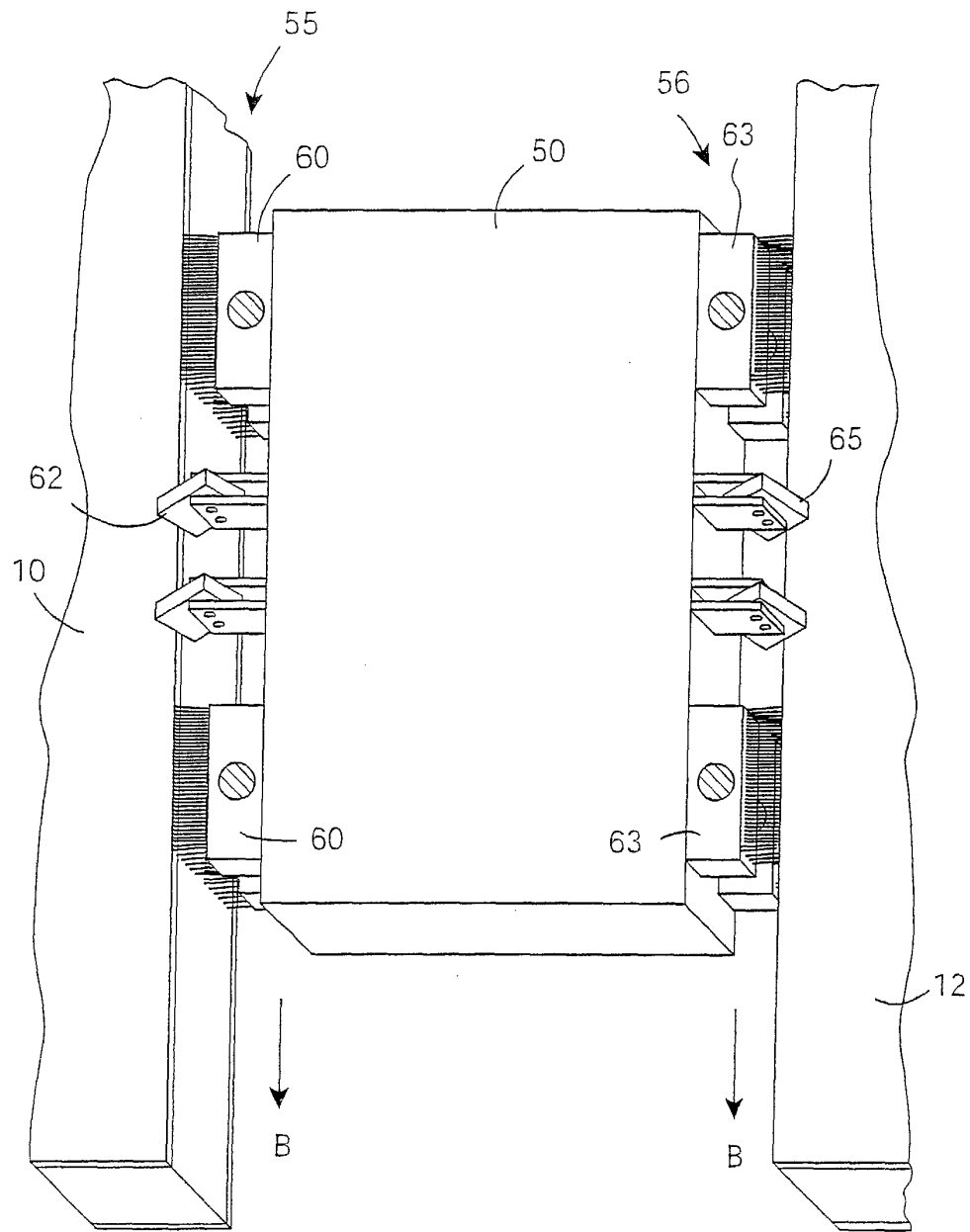


Fig. 9

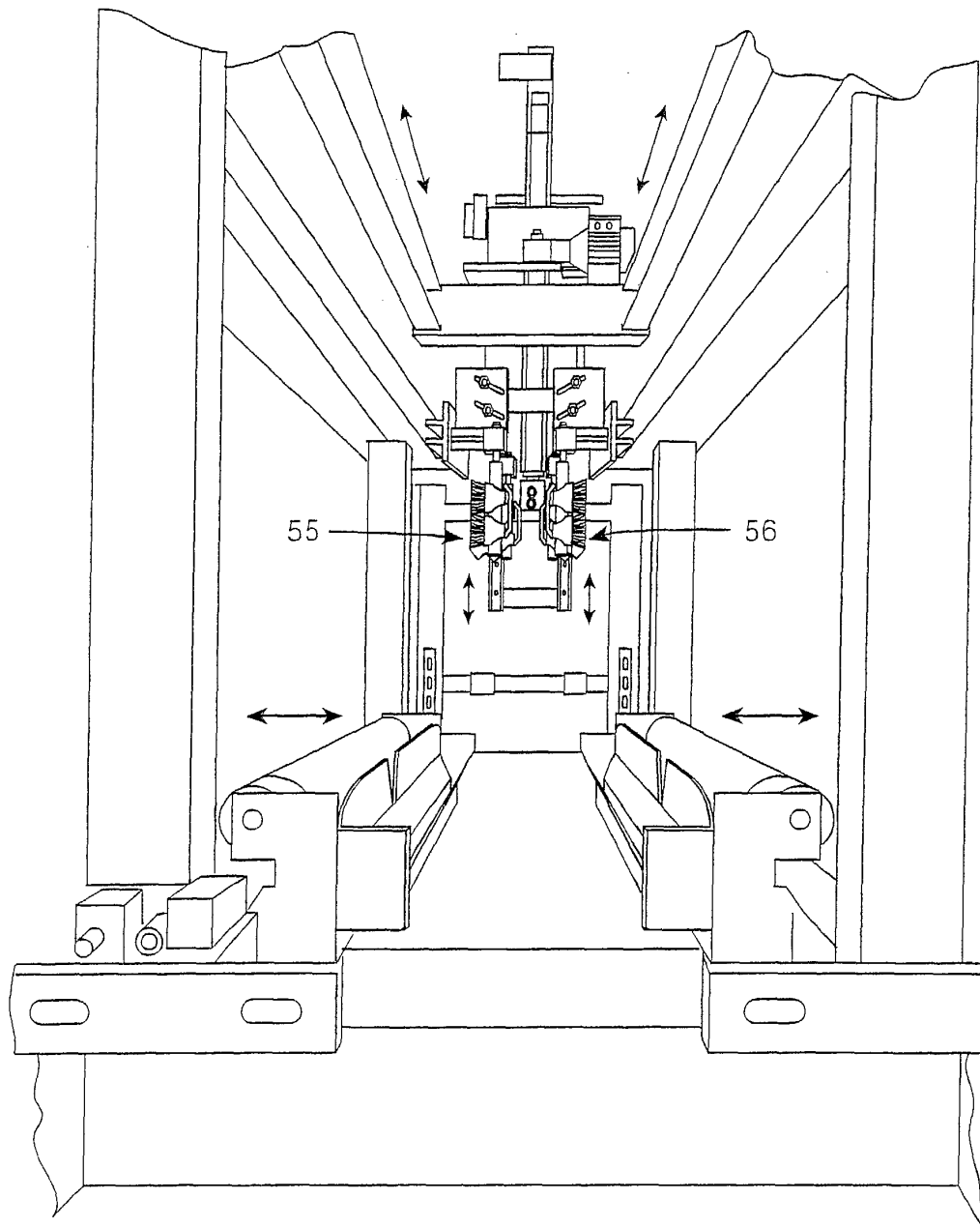


Fig. 10

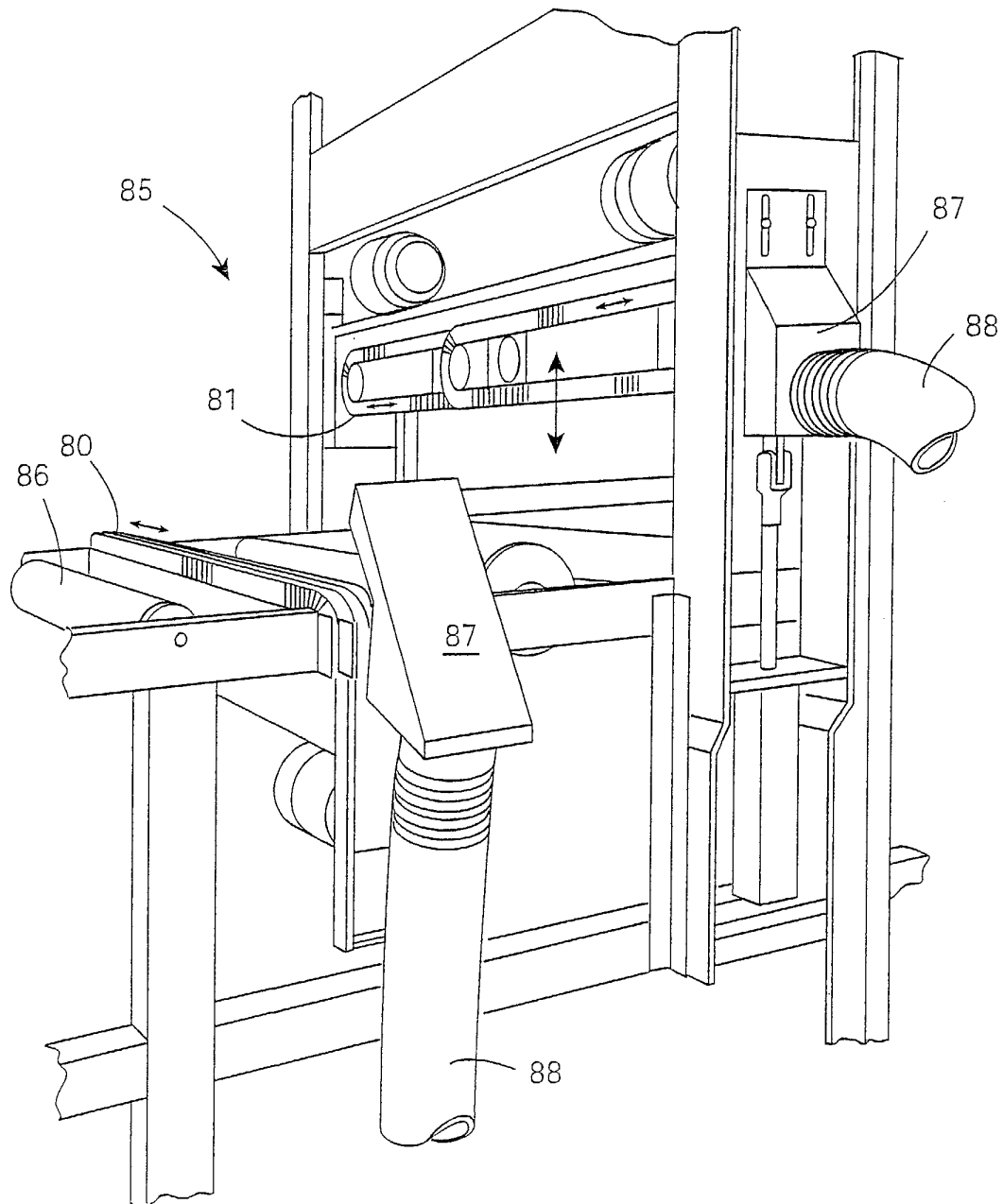


Fig. 11

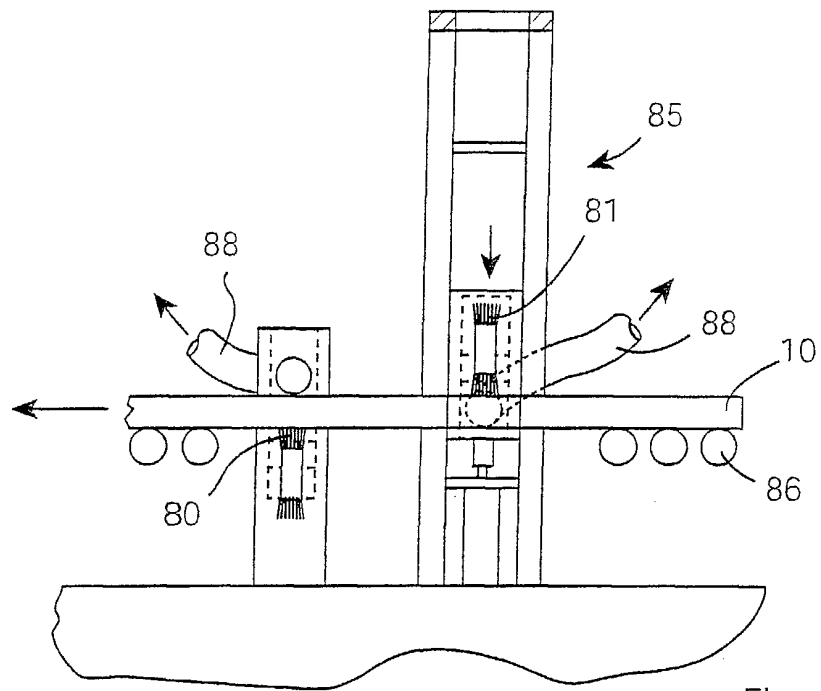


Fig. 12

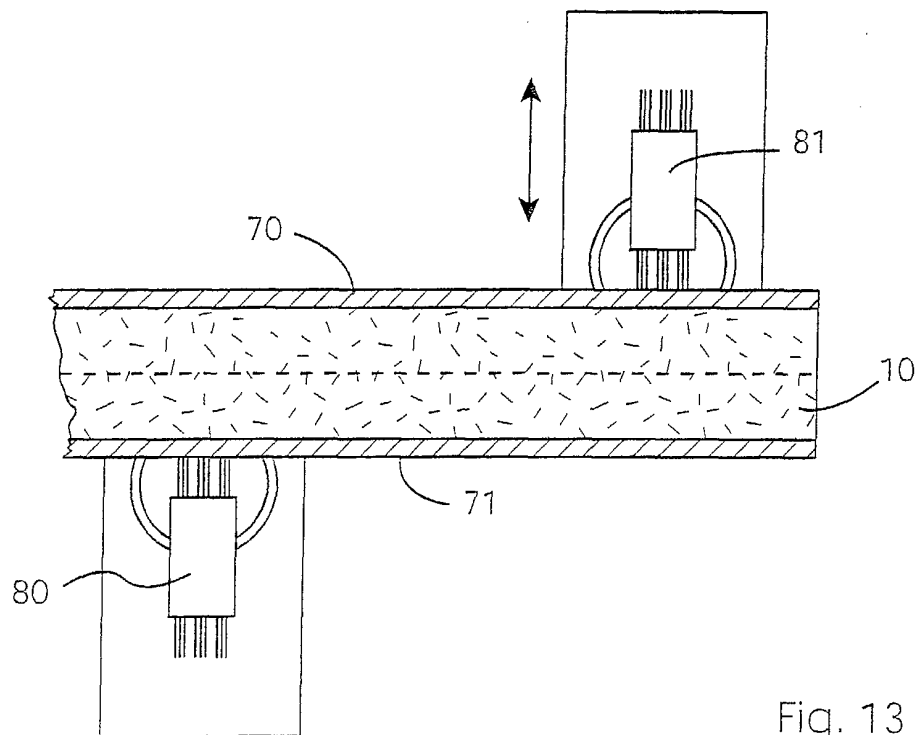


Fig. 13