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Apparatus for spreading a sheet-like article

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(56) Related Art
EP 56946
EP 703167
EP 598981

ABSTRACT

An apparatus 10 for spreading a sheet-like article, such as a fleece of wool 12 comprises a conveyor belt 14 which is arranged to travel in a closed vertical loop for transporting the fleece 12 in a first direction T1 at a first speed. A support surface in the form of a table 16 is disposed at a level below that of the conveyor belt 14 so that the fleece 12 can pass from the conveyor belt 14 to the table 16. A mobile frame 18 is provided for effecting relative movement of the conveyor belt 14 and table 16 at a second speed which is greater than the first speed. The frame 18 which supports the conveyor belt 14 is provided with a trolley block 22 which travels along floor rails 24. A drive 26 is provided for driving the frame 18 toward and away from table 16 at the second speed. As the frame 18 is moving toward table 16 at a higher speed than the conveyor belt 14 is travelling, the fleece is laid out on the table 16 at a faster rate than it is payed out and thus is stretched or spread in a lengthways direction.

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COMPLETE SPECIFICATION FOR A

STANDARD PATENT

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Standard Complete Specification for the invention entitled:

APPARATUS FOR SPREADING A SHEET-LIKE ARTICLE

Details of Associated Provisional Applications:

PN 9796 filed 10 May 1996

The following is a full description of this invention, including the best method of performing it known to me:-

APPARATUS FOR SPREADING A SHEET-LIKE ARTICLE

The present invention relates to an apparatus for spreading a sheet-like article and, in particular, but not exclusively, to an apparatus for spreading a fleece.

The motivation for the present invention is derived from the Applicant's prior innovations relating to wool harvesting systems and techniques as described in Australian patent application nos. 28426/95 and 18914/97, the contents of which are incorporated herein by way of reference.

In the aforementioned innovations, the wool from a sheep is harvested in a production line manner by a plurality of wool harvesters with the fleece, once detached, being transported by a conveyor belt for classing and skirting. At present however, the fleece must be physically picked up from the conveyor belt and then spread by throwing onto a table for further processing.

It is an object of the present invention to provide an apparatus which can automatically spread a fleece thus eliminating the need for a person to pick up the fleece and physically transport it and spread it on to a table. However, it will be appreciated that the apparatus can be used for spreading other types of sheet-like articles.

According to the present invention there is provided an apparatus for spreading a sheet-like article comprising:

a conveyor belt arranged for transporting said sheet-like article in a first direction at a first speed;

a support surface disposed below said conveyor belt to which said sheet-like article can pass; and,

means for effecting relative movement between said support surface and said conveyor belt at a second speed which is greater than said first speed and in a second

direction opposite to said first direction so that said sheet-like article is inverted when laid out on said support surface;

whereby, in use, when said sheet-like article is disposed on said conveyor belt and said conveyor belt operated to transport said sheet-like article in a first direction so as to commence to pass onto said support surface, said means is simultaneously operated to cause said relative movement between said conveyor belt and said support surface so that said sheet-like article is laid out in an inverted condition on said support surface at a greater speed than it is paid out from said conveyor belt thereby spreading said sheet-like article.

Preferably said first speed is one of a range of first speeds, all of which are less than said second speed.

Preferably said second speed is one of a range of second speeds all of which are greater than said first speed.

Preferably said support surface is a table and said means comprises a mobile frame which supports said conveyor belt.

Preferably said table is extendable in a direction transverse said first direction so that when said sheet-like article is laid out on said table, the table can be extended in said transverse direction to transversely spread said sheet-like article.

Preferably said apparatus further comprises a pair of rotating spreader disposed and arranged so as to act on said sheet-like article as it passes from said conveyor belt to said support surface to spread said sheet-like article in a direction transverse to said first direction.

In an alternate embodiment, said support surface comprises an upper run of a second conveyor belt and said means

comprises a drive system for effecting movement of said second conveyor belt.

According to a further aspect of the present invention there is provided a method for spreading a sheet-like article comprising the steps of:

providing a conveyor belt for transporting said sheet-like article in a first direction at a first speed;

providing a support surface below said conveyor belt to which said sheet-like article can pass; placing said fleece on said conveyor belt;

transporting said sheet-like article at said first speed on said conveyor belt in the first direction to pass onto the support surface; and,

when said fleece commences to pass to said support surface, moving said support surface relative to said conveyor belt at a second speed greater than said first speed and in a second direction opposite to said first direction so that the fleece on the support surface and is laid out in an inverted condition on said support surface at a greater speed that it is laid out from said conveyor belt thereby spreading said sheet-like article.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a side view of a first embodiment of the apparatus according to the present invention;

Figure 2 is a top view of the apparatus shown in Figure 1;

Figure 3 is a schematic representation of a second embodiment of the present invention;

Figure 4 is a schematic representation of a third embodiment of the apparatus;

Figure 5 is a schematic representation of a fourth embodiment of the apparatus; and

Figure 6 is a schematic representation of a fifth embodiment of the apparatus.

As shown in the accompanying drawings with particular reference to Figures 1 and 2, an apparatus 10 for spreading a sheet-like article such as a fleece of wool 12 comprises a conveyor belt 14 which is arranged to travel in a closed vertical loop for transporting the fleece 12 in a first direction T1 at a first speed. A support surface in the form of a wool table 16 is disposed at a level below the conveyor belt 14 so that the fleece 12 can pass from the conveyor belt 14 to the table 16. Means in the form of a mobile frame 18 is provided for effecting relative movement of the conveyor belt 14 and table 16 at a second speed which is greater than the first speed. The frame 18 supports the conveyor belt 14 and is provided with one or more uprights 20 each having at their respective lower ends a trolley block 22. Each trolley block is arranged to travel along a floor mounted rail 24. A drive system 26 is also provided for driving the frame 18 toward and away from the table 16 at a second speed which is higher than the speed of travel of the conveyor belt 14. On the right hand side of the conveyor 14 is a further conveyor 28 which forms part of a wool harvesting system with which the present apparatus 10 may be used.

In an initial position, the conveyor belt 14 is to the right of the table 16 with one end 30 near the end of conveyor 28 and an opposite end 32 near but spaced from the table 16. The harvested fleece 12 is moved by conveyor 28 so as to fall onto conveyor 14 at end 30. The conveyor 14 then operates to transport the fleece to the end 32. Just prior to the fleece 12 reaching end 32, an electronic eye 34

detects the fleece 12. Upon detecting of the fleece, the conveyor belt 14 is stopped. When it is desired to spread the fleece 12, the drive means 26 operates so as to cause the mobile frame 18 to move in direction T1 over the table 16, which in terms of relative movement is equivalent to table 16 moving in an opposite direction T2 under the belt 14. Simultaneously, the conveyor belt 14 is also operated to transport the fleece 14 in a direction so that it commences to fall off end 32 and passes onto the underlying table 16. As the frame 18 is moving toward the table 16 at a higher speed than the conveyor belt 14 is travelling, the fleece is laid out on the table 16 at a faster rate than it is paid out from the conveyor belt 14. This difference in speed has the effect of stretching or spreading the fleece lengthways. Also, it will be seen that in relative terms, the table 16 and conveyor belt 14 are moving in opposite directions. Because of this, as the fleece passes from the conveyor belt 14 to the table 16, it will be inverted.

The degree of spreading or stretching of the fleece in a lengthwise direction can be varied by changing the difference in speed between the speed of travel of the conveyor belt 14 and the speed of movement of the frame 18.

In a variation of the apparatus 10 shown in Figure 3, the frame supporting conveyor belt 14 is stationary and the table 16 is arranged to move in a direction T2 to pass under the conveyor belt 14. Again, the speed of travel of the table 16 in a direction T2 is higher than the speed of travel of conveyor belt 14 so as to provide the spreading effect.

In a further variation of the embodiment shown in Figure 3, the starting position of the table 16 may be beneath the conveyor belt 14 so that when it is time to spread the fleece, table 16 is moved in direction T1 at the second speed. In this variation, it will be appreciated that the

fleece will be laid out on table 16 in the same way up as it is disposed on the conveyor belt 14.

In yet a further embodiment as shown in Figure 4, the conveyor belt 36 is disposed beneath the conveyor belt 14 and is arranged so that its upper run 38 travels in a direction T2 opposite the direction of travel T1 of the upper run of conveyor belt 14.

In yet a further embodiment depicted in Figure 5, which is applicable where the support surface 16 is in the form of a table as depicted in Figures 1-3, the table 16 can be formed with a plurality of telescopically extendable transversely laid slats 40 so that when fleece 12 has been laid on the table 16, the table can be effectively widened so as to spread the fleece in the transverse direction. This may be achieved by hydraulic or electrical means for moving opposite sides of the table 16 apart so as to telescopically extend the slats 40. To assist in the transverse spreading of the fleece 12, the slats 40 can be provided with means for gripping, catching or otherwise engaging the fleece.

In a further embodiment of the apparatus 10 shown in Figure 6, transverse spreading of the fleece 12 can be achieved by providing a pair of rotating spreaders 42 near end 32 of conveyor 14. The spreaders 42 are in the form of rotating wheels 44 provided with radially extending fingers 46. The axes of rotation of wheels 44 are disposed so as to converge in a direction away from conveyor 14 and the wheels 44 rotated in a direction so that when they engage the fleece 14 they tend to spread the fleece outwardly away from the centre. The spreaders 42 may be in the form of rotating mops or buffers provided with fingers 46 made from textile or plastics materials. Of course, the spreaders 42 may be supported on or with support surface 16 rather than on the conveyor 14.

Now that embodiments of the present invention have been described in detail, it will be apparent to those skilled in the relevant arts that numerous modifications and variations may be made without departing from the basic inventive concepts. For example, in Figure 1, the conveyor 14 is shown as having a horizontal portion and a contiguous inclined portion. However, conveyor belt 14 may be of any suitable configuration including wholly horizontal, or wholly inclined upwardly or downwardly. Further, the conveyor 14 may form part of a larger wool harvesting system of the type described in the above-referenced patent applications in the name of the applicant. That is, with reference to Figure 1, the conveyor 14 and conveyor 28 may be one and the same.

All such modifications and variations are deemed to be within the scope of the present invention, the nature of which is to be determined from the foregoing description and the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An apparatus for spreading a sheet-like article comprising:

a conveyor belt arranged for transporting said sheet-like article in a first direction at a first speed;

a support surface disposed below said conveyor belt to which said sheet-like article can pass; and,

means for effecting relative movement between said support surface and said conveyor belt at a second speed which is greater than said first speed and in a second direction opposite to said first direction so that said sheet-like article is inverted when laid out on said support surface;

whereby, in use, when said sheet-like article is disposed on said conveyor belt and said conveyor belt operated to transport said sheet-like article in a first direction so as to commence to pass onto said support surface, said means is simultaneously operated to cause said relative movement between said conveyor belt and said support surface so that said sheet-like article is laid out in an inverted condition on said support surface at a greater speed than it is paid out from said conveyor belt thereby spreading said sheet-like article.

2. An apparatus according to claim 1, wherein said first speed is one of a range of first speeds, all of which are less than said second speed.

3. An apparatus according to claim 1, wherein said support surface is a table and said means comprises a mobile frame which supports said conveyor belt.

4. An apparatus according to any one of claims 1 to 3, wherein said support surface comprises an upper run of a second conveyor belt and said means comprises a drive system for effecting movement of said second conveyor belt.

5. An apparatus according to claim 4, said table is extendable in a direction transverse said first direction so that when said sheet-like article is laid out on said table, the table can be extended in said transverse direction to transversely spread said sheet-like article.

6. An apparatus according to any one of claims 1 to 5, further comprising a pair of rotating spreader disposed and arranged so as to act on said sheet-like article as it passes from said conveyor belt to said support surface to spread said sheet-like article in a direction transverse to said first direction.

7. A method for spreading a sheet-like article comprising the steps of:

providing a conveyor belt for transporting said sheet-like article in a first direction at a first speed;

providing a support surface below said conveyor belt to which said sheet-like article can pass;

placing said sheet-like article on said conveyor belt;

transporting said sheet-like article at said first speed on said conveyor belt in the first direction to pass onto the support surface; and,

when said fleece commences to pass to said support surface, moving said support surface relative to said conveyor belt at a second speed greater than said first speed and in a second direction opposite to said first direction so that the fleece out on the support surface and is laid out in an inverted condition on said support surface at a greater speed that it is paid out from said conveyor belt thereby spreading said sheet-like article.

8. A method according to claim 7 wherein said transporting step includes transporting said sheet-like article at one of a range of said first speeds each of which is less than said second speed.

9. An apparatus substantially as herein described with reference to and as illustrated by the accompanying drawings.

10. A method of spreading a sheet-like article as herein described with reference to and as illustrated by the accompanying drawings.

Dated this 14th day of July 2000

CHAIN SHEARING LTD
By its Patent Attorneys:

GRIFFITH HACK
Fellows Institute of Patent
Attorneys of Australia.

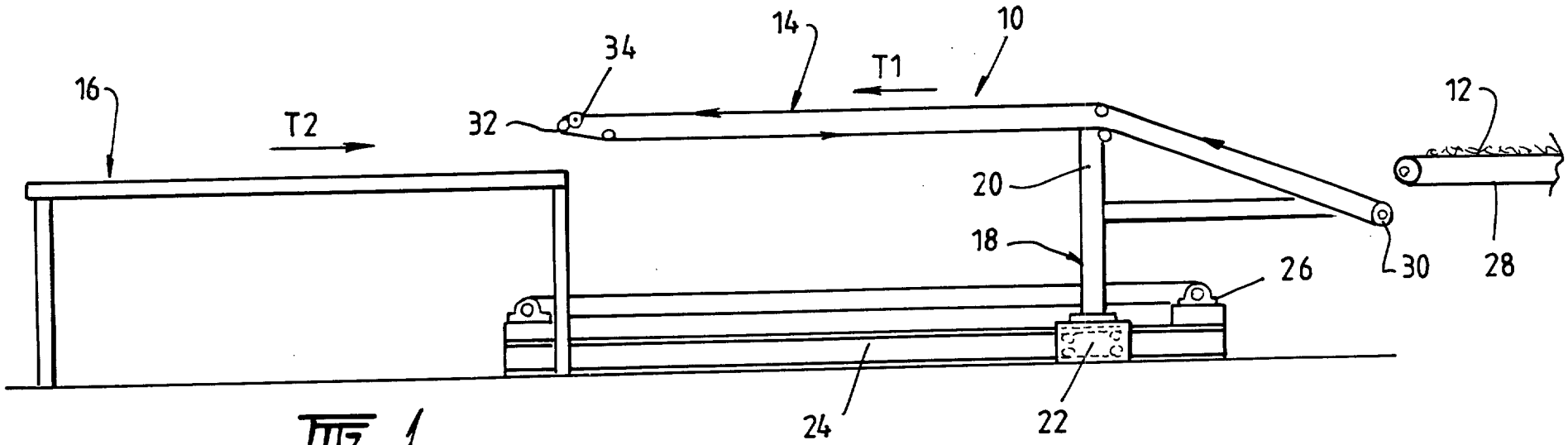

FIG. 1.

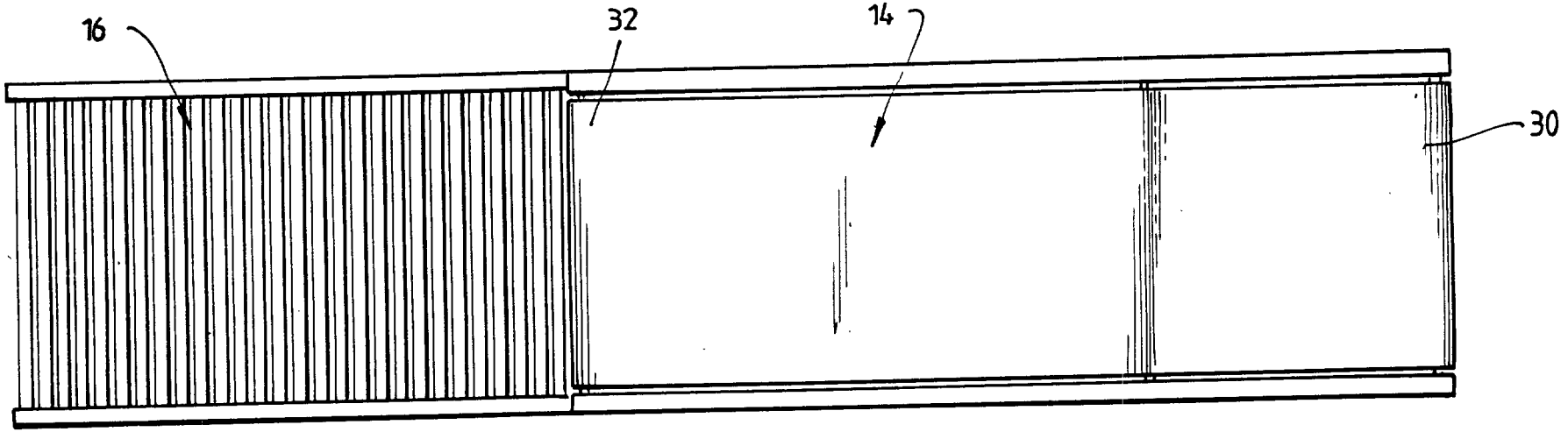

FIG. 2.

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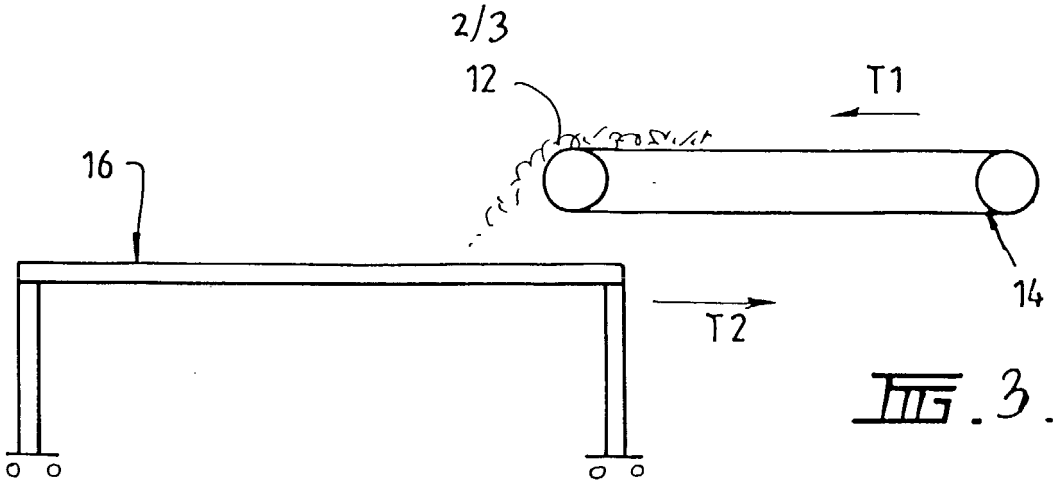

FIG. 3.

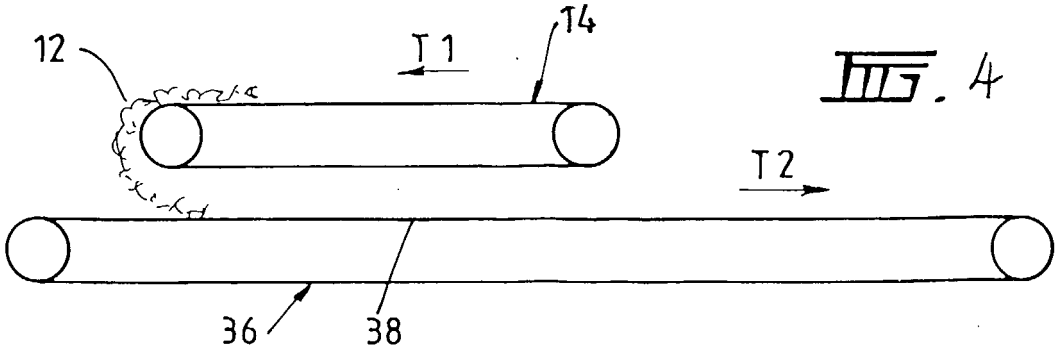

FIG. 4

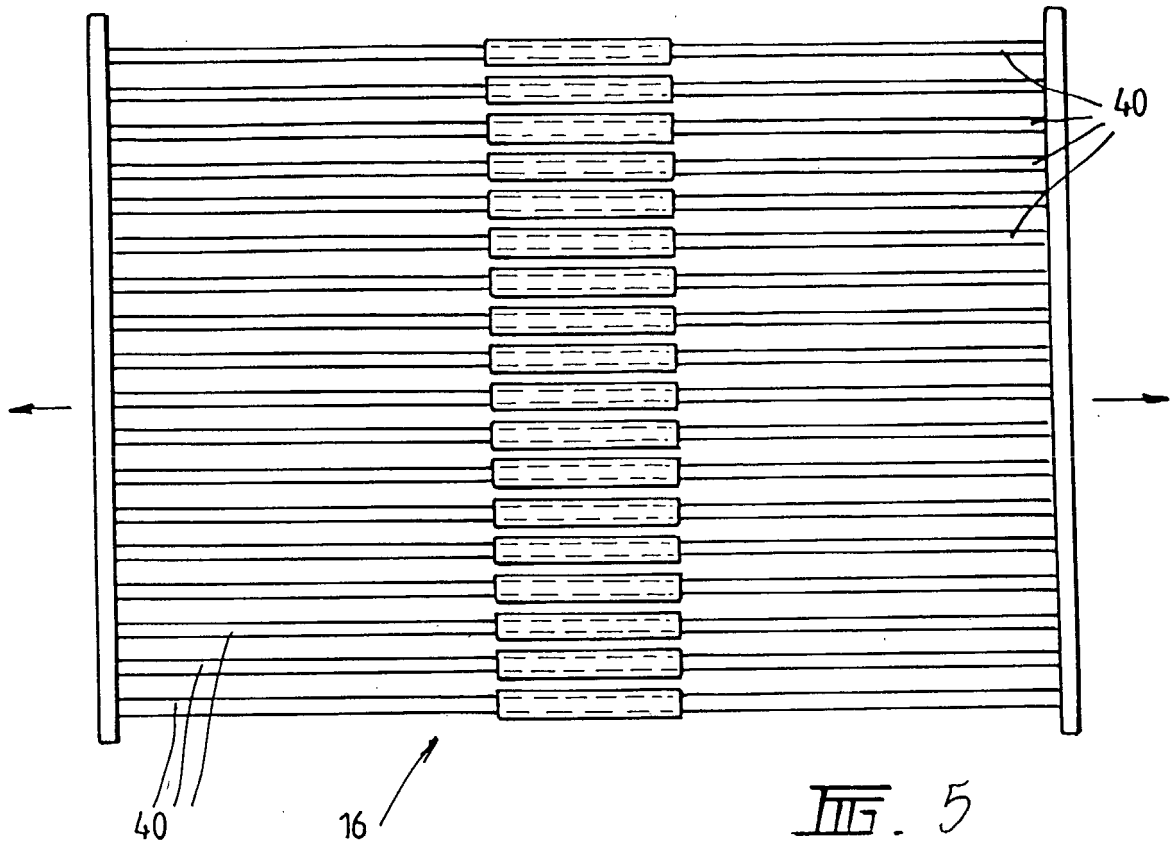

FIG. 5

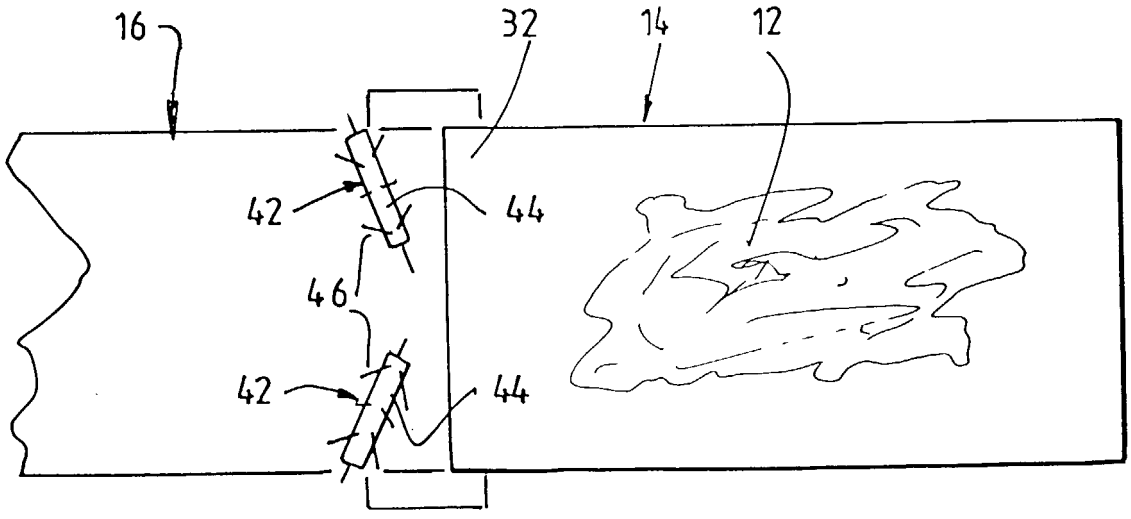

FIG. 6