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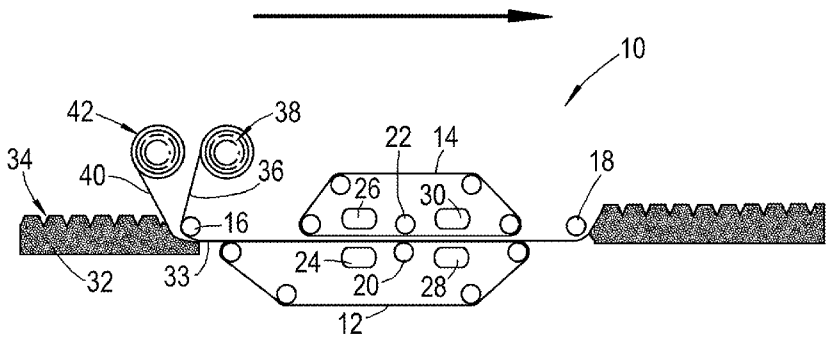
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(54) Title: FOAM COVERING

Fig.1



(57) Abstract: Disclosed herein is a covering method and apparatus comprising stressing an elastic body (32) having a contoured surface (34) to reduce the contours thereof; laminating a covering material (36) to the reduced body surface; and de-stressing the elastic body/covering material laminate to permit the contoured surface to return to substantially the original contours thereof with the covering material conforming to the shape thereof; stressing may comprise compressing and/or stretching to flatten the contours thereof and laminating the covering material to the flattened surface using a bonding film (40); the elastic body may be a foam plastic mattress core.

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Foam Covering

This invention relates to methods for covering materials and it particularly relates to a method of covering shaped or contoured bodies whereby the cover conforms to the shape of the body. The present invention also relates to an apparatus for laminating a covering material to the contoured surface of a body.

Background

Covering shaped or contoured bodies, such as foam plastic mattress cores, so that the cover conforms to the shape of the mattress core, is a complex and expensive process which may require one of:

(i) covering a mattress with a quilted bed cover. This is expensive in labour and materials and requires seaming and/or buttoning;

(ii) laminating a plain sheet covering material to an unshaped mattress blank and then post-shaping the sheet/mattress laminate. This limits the materials from which the covered mattress can be made and the shapes or contours that can be formed.

Prior Art

United States Patent Specification No. 4,806,088 (BUSCH et al) discloses an apparatus for the production of foam cushions having a textile cover in which the cover is inserted into a mould cavity and adapted to the contour of the mould cavity by the application of a vacuum wherein movable gates assist in improving the adaptation of the cover to the contour of the mould cavity.

Object of the Present Invention

It is an object of the present invention to obtain a surface shape or design on a mattress, seat, seat back or, in general, any stretchable piece foam.

It is a further object of the present invention to provide a method of covering shaped bodies of stretchable piece foam, such as a mattress, that overcomes the aforementioned problems and does not require the use of a special mould.

Statement of the Invention

According to the present invention, a covering method comprises the steps of:

i) stressing an elastic body having a contoured surface to reduce the contours thereof;

ii) laminating a covering material to the reduced body surface;

and,

iii) de-stressing the elastic body/covering material laminate to permit the contoured surface return to substantially the original contours with the covering material conforming to the shape thereof.

Stressing may comprise compressing and/or stretching the elastic body.

In accordance with an embodiment of the present invention, the elastic body is stressed to flatten the contours thereof and the covering material is laminated to the flattened surface.

In accordance with another embodiment, the method of the present invention further comprises the steps of:-

i) stretching a length of elastomeric foam material to reduce the contours of the shaped surface;

ii) co-stretching a length of elastomeric cover material with the elastomeric foam material;

iii) supplying an adhesive bonding material between the co-stretched elastomeric foam material and the elastomeric cover material;

iv) compressing the elastomeric foam material, activating adhesive and elastomeric cover material to bond the elastomeric cover material to the reduce contoured surface of the foam material;

and,

v) de-compressing the bonded elastomeric foam material/elastomeric cover material laminate to permit the elastomeric foam material to return to approximate original shape with the covering material conforming to the shape of the contoured surface.

In accordance with another embodiment, the method of the present invention comprises simultaneously stressing the elastic body and laminating the covering material to the reduced body surface.

Also according to the present invention, an apparatus for laminating a covering material to the contoured surface of an elastic body comprises:

i) means to stress the elastic body to reduce the contours thereof;

ii) means to laminate the covering material to the reduced body surface;
and,

iii) means to de-stress the elastic body/covering material laminate to permit the contoured surface return to substantially the original contours with the covering material conforming to the shape thereof.

According to an embodiment of the present invention, a laminating apparatus comprises a tunnel press with:-

i) a pair of contra-rotating drive belts;

ii) an in-feed roller positioned upstream of the drive belts;

iii) one or more heaters positioned within one or both of the drive belts;

iv) one or more coolers positioned within one or both of the drive belts and downstream of the nip rollers;
and,

v) means for co-supply of stretchable cover material and stretchable heat bonding film to the in-feed roller together with a length of contoured surface elastomeric foam material.

According to another embodiment of the present invention, laminating apparatus comprises:

i) a pair of heated, contra-rotating calender rolls;
and,

ii) rollers for co-supply of stretchable cover material and stretchable heat bonding film to the calender rolls together with a length of contoured surface elastomeric foam material to simultaneously stress the elastic body and laminate the covering material to the reduced body surface.

Detailed Description

The above and further features of the present invention are illustrated, by way of example, in the Drawings wherein:

Fig. 1 is a schematic diagram of apparatus for laminating a cover to a shaped body according to a first embodiment of the present invention,

Fig. 2 is a schematic diagram of apparatus for laminating a cover to a shaped body according to a second embodiment of the present invention.

Fig. 3 is a schematic diagram of apparatus for laminating a cover to a shaped body according to a third embodiment of the present invention,

and

Fig. 4 is a photograph of a sectioned mattress produced by the method of the present invention.

As shown by Fig. 1, apparatus for laminating a cover to a shaped body consists of a tunnel press 10 having a pair of contra-rotating drive belts 12 and 14, the lower drive belt 12 extending essentially the whole length of the press and the upper drive belt 14 extending partway of the length of the press, terminating in the same region as the lower drive belt. An upper in-feed roller 16 positioned upstream of the lower drive belt 12 and an upper out-feed roller 18 positioned downstream of the lower drive belt 12. The tunnel press 10 operates from left to right as shown in the figure. In the particular embodiment, a pair of opposed nip rollers 20 and 22 are respectively positioned within the lower and upper drive belts. A pair of opposed heaters 24 and 26 are respectively positioned within the lower and upper drive belts upstream of the nip rollers 20 and 22 and a pair of opposed coolers 28 and 30 are respectively positioned within the lower and upper drive belts downstream of the nip rollers 20 and 22.

A continuous length of stretchable piece foam 32, having an appropriately pre-shaped or contoured upper surface 34, is fed into the tunnel press 10 to extend under the in-feed roller 16, through the drive belts 12 and 14 and emerge from under the out-feed roller 18. A stretchable fabric sheet material 36 is fed from a supply roller 38 to the in-feed roller 16 so as to run through the tunnel press 10 above and with the piece foam 32. A heat bonding film 40 is fed from a supply roller 42 to the in-feed roller 16 so as to run through the tunnel press 10 between the fabric material 36 and the piece foam 32.

The rotational speeds of the in- and out-feed rollers 16, 18 and the drive belts 12, 14 and the supply of piece foam length to the tunnel press 10 are all arranged so that the piece foam length 32 is placed under such tension between the drive belts 12, 14 for the foam material to be stretched sufficiently to flatten or at least substantially or reduce the shape of the contoured upper surface 34. The fabric sheet material 36 and the heat bonding film 40 are also co-stretched as they are fed into the tunnel press 10.

The layers of piece foam, bonding film and cover fabric are heated by heaters 24, 26, forming a laminate 33 that is compressed as they pass between pinch rollers 20, 22 and cooled by coolers 28, 30, to bond the fabric 36 to the piece foam upper surface 34. Other adhesive types can be used to bond the fabric 36 to the piece foam upper surface 34 such as powder polymer glue. Equally, it is not essential to supply the heat bonding film from a roll and other means are permissible to supply the adhesive to bond the fabric 36 to the piece foam upper surface 34. For example, the adhesive can be sprayed from a suitable spray gun or alternatively, the piece foam upper surface 34 or one side of the cover film 36 has a coating of an adhesive such that the piece foam upper surface 34 bonds to the cover fabric 36 as they are fed under the in-feed roller 16. This removes the need for the roller 42 for supplying the heat bonding film as shown in Figs. 1 and 2. In addition, other means are permissible to activate the adhesive besides the use of the heaters 24, 26 and coolers 28, 30. For example, the adhesive can be self-curing or a separate curing agent can be applied to the adhesive to cure the adhesive. The pair of pinch rollers 20, 22 is not essential to the invention and the stretching/compression of the mattress foam 32 by the in- and out-feed rollers 16, 18 can create the necessary tension to cause compression of the layers of piece foam 32 together with the bonding film 40 and the cover fabric 36. Alternatively, compression of the piece foam 32, bonding film 40 and the cover fabric 36 can also by achieved by means of a pair of opposed plates positioned above and below the laminate 33. The fabric covered piece foam laminate 33 is de-compressed as it emerges from the out-feed roller 18. The piece foam upper surface 34 returns to approximately original shape as the piece foam decompresses and the fabric cover 36 assumes, and closely conforms to, the shape of the decompressed mattress upper surface.

This stretching/compressing laminating process will result in some modification to the original shape of the upper surface 34, depending upon physical characteristics of the piece

foam, bonding film and cover fabric materials. If desired, the "original" shape of the upper surface 34 can be chosen so that a desired "final" covered upper surface shape is obtained.

A second embodiment of the apparatus shown in Fig. 2 for laminating a cover to a shaped body is a slight modification of the apparatus shown in Fig. 1. Instead of placing the piece foam length 32 under tension between the in-feed roller 16 positioned upstream of the lower drive belt 12 and the out-feed roller 18 positioned downstream of the lower drive belt 12 as shown in Fig. 1, the piece foam length 32 is placed under tension between the rollers 17 and 19 driving the upper drive belt 14 so as to enable the foam material to be stretched sufficiently to flatten or at least substantially or reduce the shape of the contoured upper surface 34. As with the first embodiment shown in Fig. 1, the stretchable fabric sheet material 36 is fed from the supply roller 38 to the in-feed roller 16 with the piece foam 32. The heat bonding film 40 is also fed from the supply roller 42 to the in-feed roller 16. However, unlike the apparatus shown in Fig, 1, the out-feed roller 18 has been removed and the in-feed roller 16 is positioned further back away from the tunnel press 10 upstream of the lower drive belt 12.

In operation, the continuous length of stretchable piece foam 32 is fed under the in-feed roller 16. At the same time the piece foam 32 is fed under the in-feed roller 16, the stretchable fabric sheet material 36 from the supply roller 38 and the heat bonding film 40 from the supply roller 42 are fed under the in-feed roller 16 so as to lay on the upper surface of the piece foam 32 and to create a laminate 33 consisting of the layers of stretchable piece foam 32, the stretchable fabric sheet material 36 and the heat bonding film 40 between the fabric material 36 and the piece foam 32. The laminate 33 driven by the contra-rotating drive belts 12 and 14 is then fed into the tunnel press 10 to extend under the upper drive belt entrance roller 17 and emerge from under the upper drive belt exit roller 19. The rotational speeds of the in-feed roller 16 and the drive belts 12, 14 and the supply of piece foam length 32 to the tunnel press 10 are all arranged so that the piece foam length 32 of the laminate 33 emerging from the in-feed roller 16 is placed under tension between the upper drive entrance roller 17 and the upper drive exit roller 19 for the foam material to be stretched sufficiently to flatten or at least substantially reduce the shape of the contoured upper surface 34. The laminate 33 is not restricted to being driven into the tunnel press 10 by the contra-rotating drive belts 12 and 14 and can be driven by other external means into the tunnel press 10 so as to enable the foam material to be stretched sufficiently to flatten or at least substantially reduce the shape

of the contoured upper surface 34. The function of the remaining features such as the heaters 24, 26 and the coolers 28, 30 for bonding the fabric 36 to the piece foam upper surface are the same as described in the first embodiment. However in the second embodiment shown in Fig. 2, the pair of opposed pinch rollers 20, 22 have been replaced by a pair of opposed plates 20a and 22a for compressing the laminate 33 after emerging from the heaters 24, 26 so as to bond the fabric 36 to the piece foam upper surface 34.

A third embodiment of the apparatus for laminating a cover to a shaped body is shown in Fig. 3 to consist of a pair of heated, contra-rotating calender rolls 50, 52, between which is fed a length of polyurethane foam material 54, having a shaped and contoured upper surface 56. Polyethylene cover film 58 and a heat bonding film 60 are fed also fed to the calender rolls 50, 52 from supply rollers 62, 64. The layered polyurethane foam length, polyethylene cover film and a heat bonding film are simultaneously heated and compressed as they feed between the rollers to flatten the shaped material and bond the polyethylene cover film to the polyurethane foam length to form a laminate. The polyethylene cover film conforming to the shape of the upper surface 56 of the foam material as the bonded laminate emerges from between the calendar rolls to de-compress and the surface 56 returns to proximate original shape.

A sample section of covered piece foam produced in accordance with the present invention is shown in Fig. 4 and shows the cover closely conforming to the shape of the mattress.

The preferred arrangement is to have the laminate 33 consisting of the layers of the piece foam 32, stretchable fabric sheet material 36 and heat bonding film 40 move relative to the tunnel press 10 in the first and second embodiment or relative to the contra-rotating calendar rolls 50, 52 in the third embodiment. Thus in one arrangement, the tunnel press or the contra-rotating calendar rolls 50, 52 remains stationary and the laminate 33 is fed into the tunnel press or contra-rotating calendar rolls 50, 52 or equally in another arrangement the laminate 33 remains stationary and the tunnel press 10 or the contra-rotating calendar rolls 50, 52 moves longitudinally along the length of the laminate 33 to effect stretching/compression of the piece foam or in a further arrangement both the laminate 33 and the tunnel press 10 or contra-rotating calendar rolls 50, 52 moves relative towards each other to effect stretching/compression of the piece foam 32.

Whilst the laminating process of the present invention works best with a stretchable, elastic cover sheet material, the process can be used with any type of coversheet provided that the correct tension is applied to the materials as they are being laminated.

Similarly, although the laminating process of the present invention works best with a stretchable, elastic heat bonding material, the process can be used with any type of heat bonding material provided that the correct tension is applied to the materials as they are being laminated.

Although it is preferable for as much as possible of the piece foam and cover fabric/film surfaces to be covered with adhesive; the laminating process of the present invention will worked with a reduced or partial adhesive coverage, the result being that the coving fabric/film will not conform to deeply contoured parts of the upper surface, where adhesive may be lacking.

The above processes have been described in relation to stretchable piece foam although the process can be used for any flexible product, such as mattresses, seats or seat backs. Suitable foam materials include polyurethane foam, polyethylene foam, rubber, polyester fibre or, more generally, any deformable flexible material. The surface shape or design can be obtained by existing industrial means such as contour cutting, compression cutting, heat compression, moulding.

Any type of covering material may be used to cover the flexible material shape. It could be fabric, plastic film (PVC, polyethylene, polyurethane), leather; provided that cover material can be stressed/compressed in such a way that, once laminated, the initial shape of the flexible material will be replicated in the cover. In order to do this the cover must have sufficient adhesion with the shaped flexible material.

Alternative adhesives to heat bonding materials/films could be used. Suitable adhesives include glue, Polyethylene film, resin, reactivatable powder.
One and/or the other surface of the mattress or the cover fabric/film could be pre-supplied, coated, with a suitable adhesive prior to lamination.

Claims:

1. A covering method comprising the steps of:
   i) stressing an elastic body having a contoured surface to reduce the contours thereof;
   ii) laminating a covering material to the reduced body surface;
   and,
   iii) de-stressing the elastic body/covering material laminate to permit the contoured surface to return to substantially the original contours thereof with the covering material conforming to the shape thereof.

2. The method of claim 1, wherein stressing the elastic body comprises compressing and/or stretching.

3. The method of claim 1 or claim 2, comprising:
   i) stressing the elastic body to flatten the contours thereof;
   and,
   ii) laminating the covering material to the flattened surface.

4. The method as claimed in any of claims 1 to 3, further comprising the steps of:-
   i) stretching a length of elastomeric foam material to reduce the contours of the shaped surface;
   ii) co-stretching a length of elastomeric cover material with the elastomeric foam material;
   iii) supplying an adhesive bonding material between the co-stretched elastomeric foam material and the elastomeric cover material;
   iv) compressing the elastomeric foam material, activating the adhesive and elastomeric cover material to bond the elastomeric cover material to the reduce contoured surface of the foam material;
   and,
   v) de-compressing the bonded elastomeric foam material/elastomeric cover material laminate to permit the elastomeric foam material to return to approximate original shape with the covering material conforming to the shape of the contoured surface.

5. The method as claimed in Claim 4, wherein the adhesive is a stretchable bonding film or powder polymer glue.

6. The method as claimed in Claim 4 or 5, wherein the adhesive is heat sensitive.

7. The method as claimed in any of Claims 4 to 6, further comprising the step of heating the adhesive to bond the elastomeric cover material to the reduce contoured surface of the foam material and cooling the bonded elastomeric foam material/elastomeric cover material laminate.

8. The method as claimed in any of claims 1 to 3, further comprising simultaneously stressing the elastic body and laminating the covering material to the reduced body surface.

9. Apparatus for laminating a covering material to the contoured surface of an elastic body comprising:

i) means to stress the elastic body to reduce the contours thereof;

ii) means to laminate the covering material to the reduced body surface;
and,

iii) means to de-stress the elastic body/covering material laminate to permit the contoured surface to return to substantially the original contours with the covering material conforming to the shape thereof.

10. Apparatus as claimed in claim 9 and comprising a tunnel press with:-

i) a pair of contra-rotating drive belts;

ii) an in-feed roller positioned upstream of the drive belts ;

iii) one or more heaters positioned within one or both of the drive belts and upstream of the nip rollers;

iv) one or more coolers positioned within one or both of the drive belts;
and,

v) means for co-supply of stretchable cover material and stretchable heat bonding film to the in-feed roller together with a length of contoured surface elastomeric foam material.

11. Apparatus as claimed in Claim 10, comprising rollers for co-supply of stretchable cover material and stretchable heat bonding film.

12. Apparatus as claimed in Claim 10 or 11, wherein the apparatus further comprises an out-feed roller positioned downstream of the drive belts.

13. Apparatus as claimed in any of the Claims 10 to 12 and further comprising a pair of opposed nip rollers each respectively positioned within one of the drive belts.

14. Apparatus as claimed in any of the Claims 10 to 13 and further comprising a pair of opposed plates each respectively positioned within one of the drive belts.

15. Apparatus as claimed in claim 9 and comprising:

i) a pair of heated, contra-rotating calender rolls;
and,

ii) rollers for co-supply of stretchable cover material and stretchable heat bonding film to the calender rolls together with a length of contoured surface elastomeric foam material to simultaneously stress the elastic body and laminate the covering material to the reduced body surface.

Fig.1

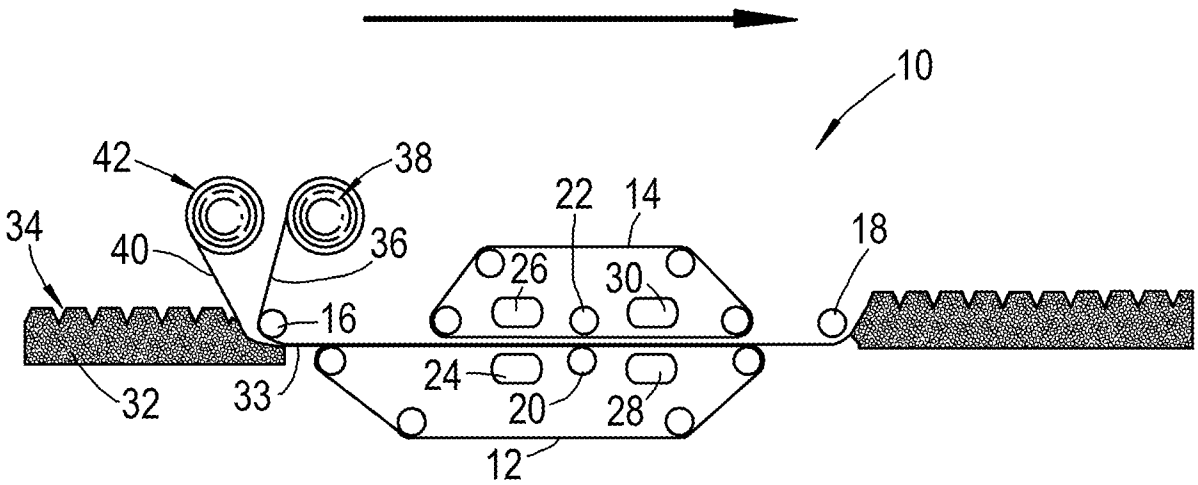

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Fig.3

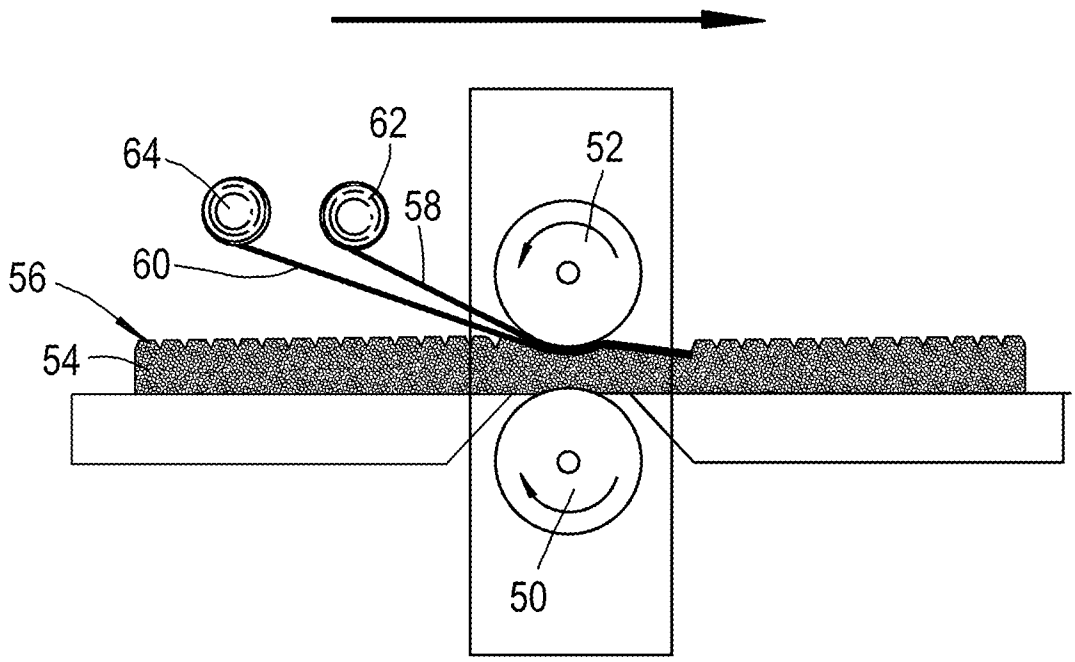

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Fig.2

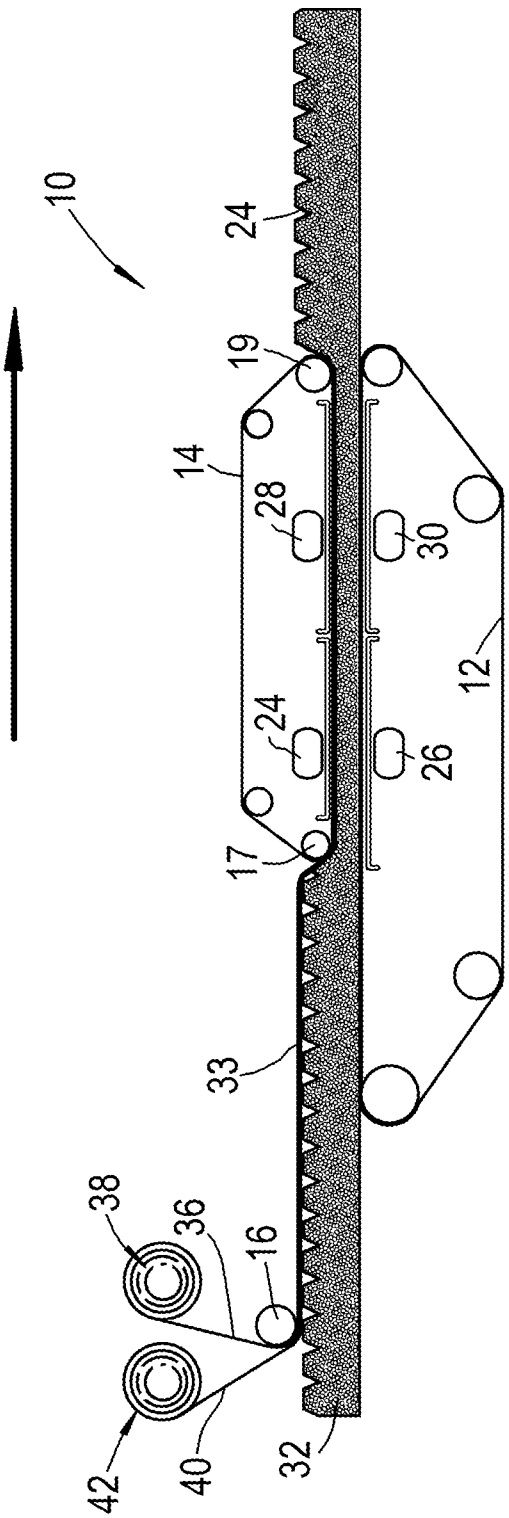


Fig.4

