Nov. 24, 1970 A. A. VERNIER 3,542,625

DEVICE FOR FORMING SUCCESSIVE FOLDS FROM A WEB OF TEXTILE ELEMENTS

Filed Feb. 20, 1967 3 Sheets-Sheet 1

FIG. 1

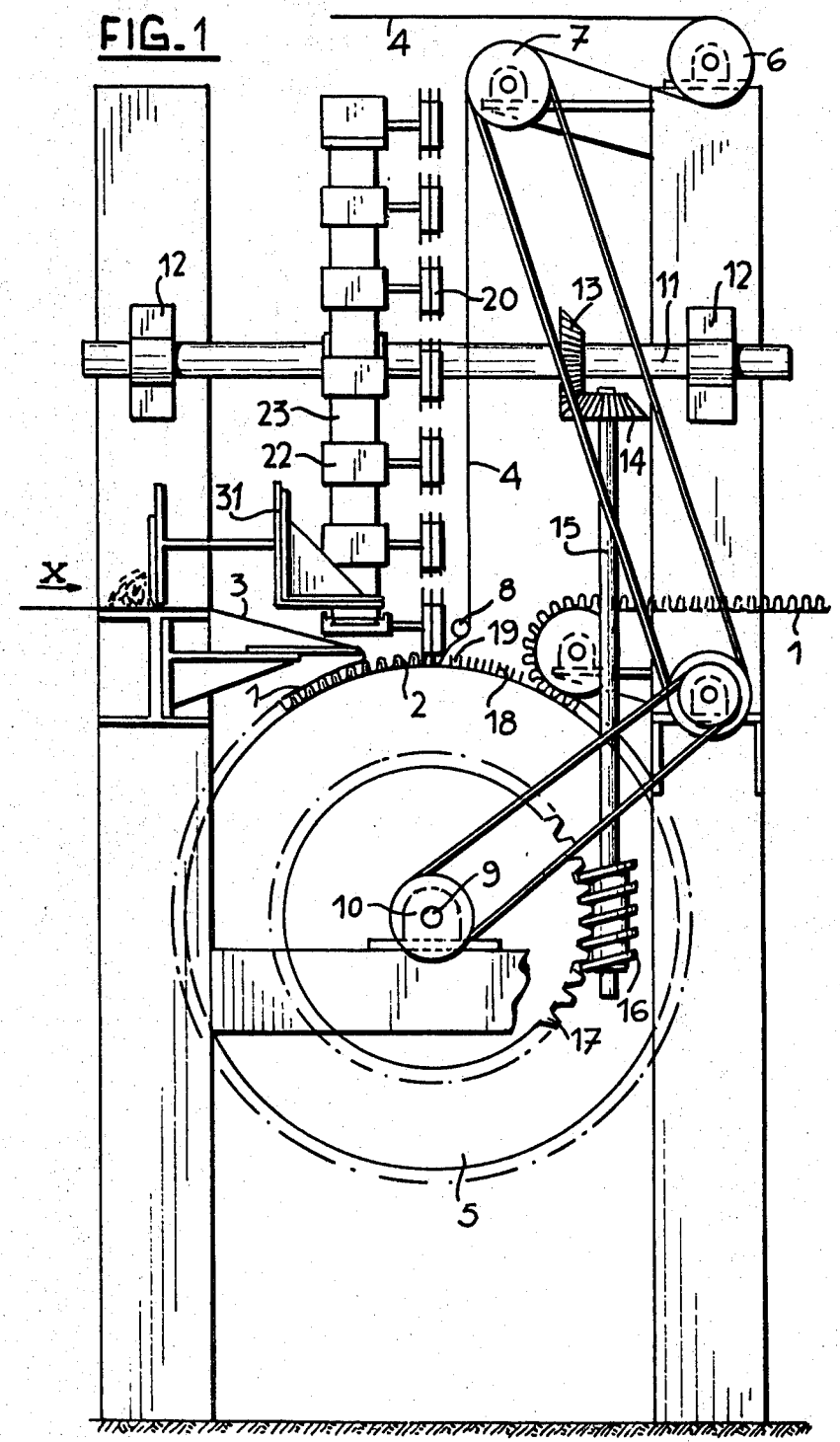

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FIG. 2

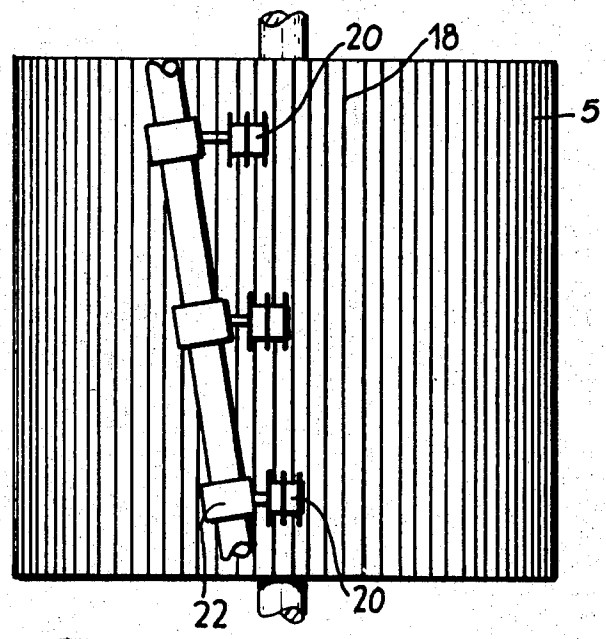

FIG. 3

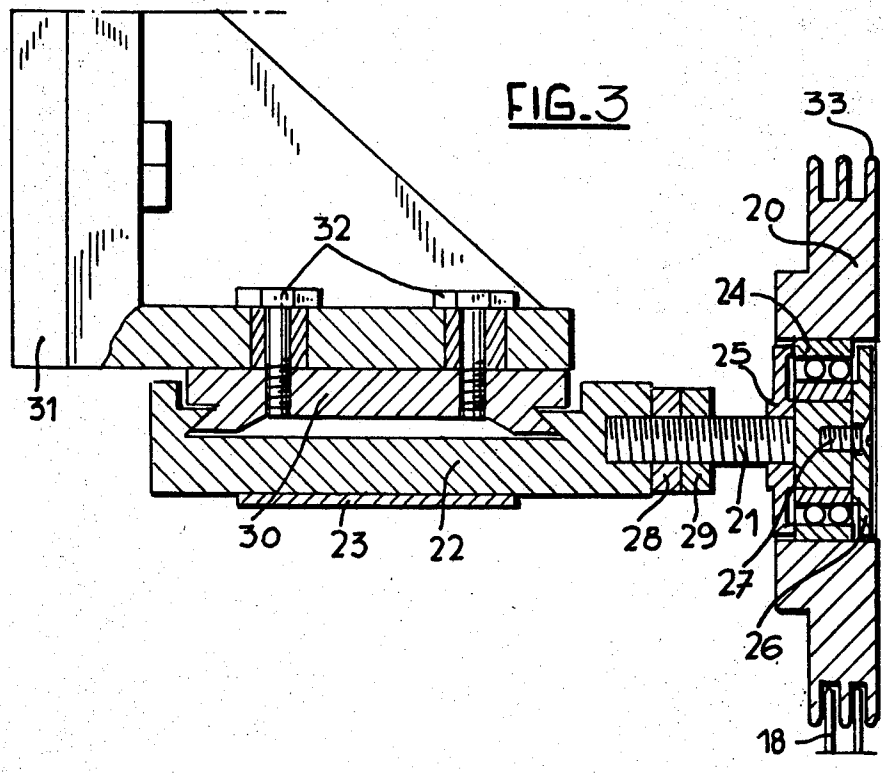

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FIG. 4

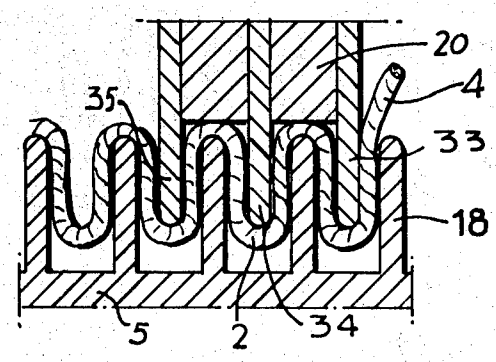


FIG. 5

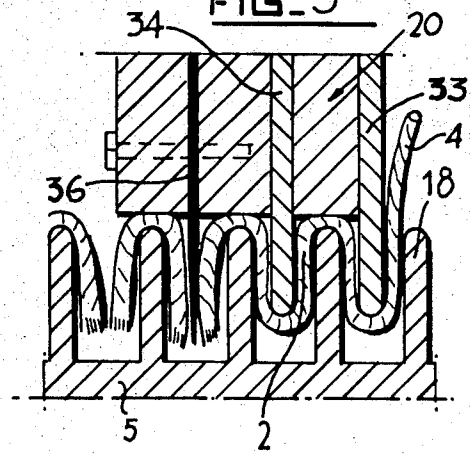


FIG. 6

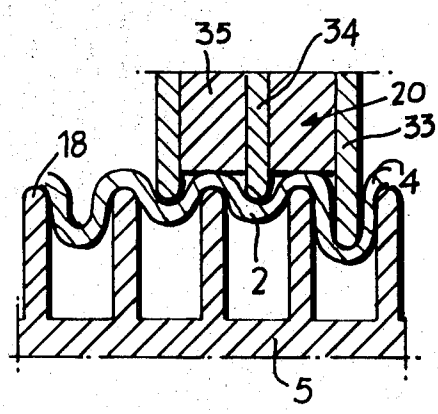
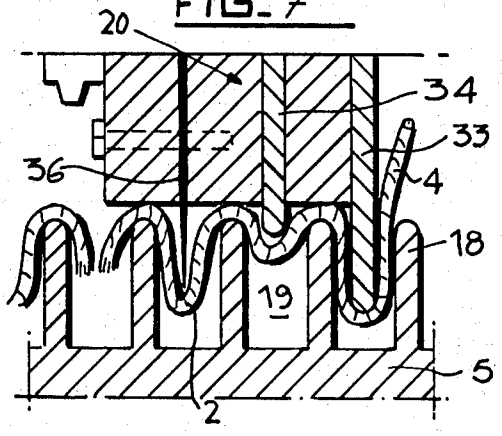


FIG. 7



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3,542,625

DEVICE FOR FORMING SUCCESSIVE FOLDS FROM A WEB OF TEXTILE ELEMENTS

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Claims priority, application Belgium, Feb. 21, 1966, 24,316
Int. Cl. D04h 11/08
U.S. Cl. 156—435 17 Claims

ABSTRACT OF THE DISCLOSURE

Device for forming successive folds from a web of natural or synthetic textile elements, notably for the manufacture of carpets or velvets.

The elements of the web are pushed successively between the blades of a grooved cylinder by means of a folding roller acting as a folding member and moving parallel to the blades from one edge to the opposite edge of the web of textile elements, between adjacent blades at a given distance from the bottom of the grooves formed by said blades in the cylinder.

This invention relates to a device for forming successive folds from a web of natural or synthetic textile elements, notably for the manufacture of carpets or velvets.

In known devices, the successive folds are generally formed between blades or ribs of a grooved cylinder, by means of at least a folding blade, which is moved with a reciprocating motion in the direction which is perpendicular to the rotation axis of the cylinder or to the blades of this cylinder.

These known devices using a reciprocating blade have several drawbacks.

They only allow the production of a restricted number of articles comprising formed folds. These folds can only be of a low density. The necessity of operating with a straight reciprocating blade limits practically the width of the obtained folds to about 1.5 meter, since such a blade having a width of more than 1.5 meter hardly remains straight and has a bending or warping tendency, so that said blade may become jammed between the blades or ribs of the grooved cylinder and may cut the textile elements.

Moreover, the reciprocating movement of the conventional folding blade requires a precise parallelism between said blade and the rotation axis of the grooved cylinder, so as to avoid an uneven pressure for forming the folds on the web of textile elements.

Finally, the reciprocating movement of the folding blade, renders the production of the folds jerky and is harmful for the accuracy of the fold formation.

According to this invention, the above disadvantages are removed.

In the device according to this invention, all the textile elements of the web are driven into the grooves between the blades by means of a folding roller acting as a folding member and moving from one edge to the opposite edge of the web of textile elements, between adjacent blades at a given distance from the bottom of the grooves formed by said blades in the cylinder.

According to an important feature of the invention, when a fold is formed by pushing elements of the web between two adjacent blades of the grooved cylinder, the preceding fold is simultaneously retained between the two blades between which this fold has just been formed.

For obtaining folds having the same height, the elements of the web are pushed between the blades of the grooved cylinder until they reach a position where they

are at a given distance from the bottom of the grooves formed by said blades, said distance being the same for all the grooves.

For obtaining folds of different heights, the elements of the web are pushed between the blades of the grooved cylinder until they reach a position where they are at a given distance from the bottom of the grooves formed by said blades, this distance being different from one groove to the other.

The distance at which the elements of the web are pushed between the blades of the grooved cylinder, from the bottom of the grooves, may be constant for each fold throughout the width of the web or may vary for at least one fold throughout said width.

According to another feature of the invention, when a fold is formed by pushing the elements of the web between two adjacent blades of the grooved cylinder by the corresponding folding roller, the bottom of at least one preceding fold is cut by a rotating knife moving jointly with said folding roller, between the blades of the cylinder, which correspond to said preceding fold.

Other details and features of the invention will appear in the following description, wherein reference is made to the attached drawings which illustrate, by way of example only, an embodiment of the invention. In these drawings:

FIG. 1 is a front view of a machine for manufacturing carpets comprising an embodiment of a device according to this invention,

FIG. 2 is a plan view of the grooved cylinder and of the folding rollers of said device,

FIG. 3 is a vertical section showing the assembly of a working or folding roller,

FIGS. 4 to 7 show the working roller of said embodiment and working rollers of other different embodiments.

In these figures, the same reference numerals are used for identical elements.

FIG. 1 shows a machine **1** for the manufacture of carpets by means of a series of successive folds **2** and of a supporting band or belt **3** which carries a layer of adhesive on one face and is bonded by means of said adhesive layer, on the loops of one side of the series of successive folds **2**.

The machine comprises a device for forming said successive folds **2** from a web **4** of natural or synthetic textile elements.

Said device comprises essentially a rotating grooved cylinder **5** and a special folding head. Moreover, the device comprises means for forwarding the web **4** of textile elements between the grooved cylinder **2** and the folding head. These forwarding means comprise notably reversing rollers **6** and **7** and a guide rod **8**.

The grooved cylinder is mounted on a horizontal rotating shaft **9**, which is supported by bearings **10** and is driven by a motor (not shown). This motor is connected to a main shaft **11** supported by bearings **12** and carrying a bevelled gear **13** driving another gear **14** fixed on the upper end of a vertical transmission shaft **15**, the lower end of which is provided with a worm screw **16** meshing with a correspondingly toothed wheel **17** fixed on shaft **9**.

The cylindrical face of the grooved cylinder **5** is provided with blades **18** which are uniformly distributed and are parallel to the horizontal axis of shaft **9**. The inner side faces of said blades are rough and the height of said blades is small, compared with the diameter of the cylindrical face of the cylinder. The blades **18** define with the cylindrical face of the cylinder the grooves **19** of said cylinder.

The special folding head comprises essentially a series of working rollers **20** which may rotate freely on pivots

21 fixed to movable supports 22 attached to an endless belt 23.

The arrangement of each working roller 20 on the corresponding pivot is clearly shown in FIG. 3. The working roller 20 is mounted on the head of the pivot 21 by means of a suitable ball bearing 24, the ball races of which are axially retained by plates 25 and 26, plate 25 being screwed against the head of the pivot, whereas plate 26 is attached to said head by means of a set screw 27. The pivot 21 consists in a bolt with a threaded rod screwed into a recessed threaded hole of the support 22, wherein said threaded rod is maintained by means of a nut 28 and a lock nut 29.

The path of the working rollers comprises essentially a horizontal part which is slightly oblique or substantially parallel to the geometrical axis of the rotating shaft 9 of the cylinder 5, said part of the path extending throughout the length of the cylinder, said horizontal part being followed by a rising part and by a returning descending part. These rising and descending parts may also be oblique.

The horizontal part only of said path is effective for forming the folds. Along this horizontal part, the working rollers move between the blades in the same grooves from one end to the other end of the cylinder 5, up to a predetermined distance from the bottom of the grooves. These working rollers move in synchronism with the rotating cylinder 5. In order to obtain a correct movement of said working rollers substantially at equal distance from the blades in the grooves, the supports 22 are conveniently guided above the cylinder 5 by a stationary guide 30 attached to the frame 31 of the machine for example by means of screws 32.

For forming a fold by means of the web 4 of textile elements, the working roller 20 is provided with a folding ring 33 which operates as a folding roller and moves at a given distance from the cylindrical face of the cylinder 5. For retaining or holding the already formed fold, the working roller 20 is provided with one or two retaining rings 34 and 35 having the same external diameter as the folding ring 33, the roughness of the blades also contributing to the retention of the already formed folds. The retaining rings 34 and 35 move into the grooves preceding the groove where a fold is being formed, up to a distance from the bottom of said grooves which corresponds to that at which the folding ring 33 moves, so as to contact the bottom of the formed folds. Said retaining rings 34 and 35 are in fact retaining rollers which, in the shown embodiment, are attached to the folding roller and move together with this folding roller. However, according to other embodiments, said retaining rings may be separate from each other or separate from the folding roller and may be movable jointly with this folding roller or separately from this folding roller while being conveniently carried together by the same pivot.

For retaining or holding the already formed folds, the elements of the web are clamped between the body of the working roller 20 and the free edges of the corresponding blades 18, as shown on FIGS. 4 to 7. In fact, the body of the working roller 20 is generally constituted by a lateral flange of the folding roller, said flange being adjacent to the already formed folds and being movable at a given distance from the longitudinal free edge of blade 18, above which said flange extends, said distance being smaller than the thickness of the elements of web 4.

As for the folding roller, the body of the working roller 20 is also constituted by a lateral flange for one of the retaining rollers and/or for the other retaining roller, for clamping the elements of the web 4 against the free edge of the corresponding blades 18.

For obtaining even looped carpets with a looped pile of uniform height, a working roller according to the first embodiment is used. In this case, the folding ring and the retaining rings are entirely circular and have

substantially the same external diameter. The obtained folds have all the same height. Moreover, this height is constant and uniform throughout the width of the web 4.

For obtaining even cut carpets with a cut pile of uniform height, the working roller shown in FIG. 5 is used. This new working roller is similar to that shown in FIG. 4, except that the second retaining ring 35 is replaced by a knife 36 having an outer diameter which is greater than that of the rings 33 and 34, so as to enable the cutting of the bottom of each penultimate formed fold as clearly shown in FIG. 5. It is to be noted that the elements of the web are retained on both sides of the knife 36 by the body of the working roller acting as lateral flanges pressing these elements on the free upper edge of the blades disposed on both sides of said knife 36.

For obtaining textured carpets with upper and lower looped pile, a working roller as shown in FIG. 6 may be used. This working roller comprises three rings, the first of which is used for forming the folds and has a greater diameter than the two other rings. The formed folds are retained or maintained by the body of the roller constituted by two lateral retaining flanges interposed between said rings. As shown in FIG. 6, one fold is higher than the other folds, one of the rollers having a folding ring with a greater diameter than that of the two other rollers.

For obtaining textured carpets with upper looped and lower cut pile, a working roller of the type shown in FIG. 7 is used. This roller comprises a first folding ring 33, a second retaining ring 34 having a smaller diameter than the folding ring 33 and a knife 36 having a diameter comprised between that of ring 33 and that of ring 34. In this case, the successive folds are alternatively deep and shallow, the shallow folds only being cut by the knife 36.

In the embodiments described by way of example of the new device according to the invention, the folding and retaining rings, as well as the rotating knives are entirely circular, so that the formed folds have a constant height throughout the width of the web 4. However, in other examples, the elements of the working rollers may be circular along part of the periphery thereof and may comprise a flat part or an arcuate segment along the remaining part of the periphery thereof, so as to obtain folds of varying height along the width of the web.

It is understood that the invention is not limited to the embodiments shown in the drawings and that many changes may be made in the shape, the arrangement and the constitution of certain elements, within the scope of the present invention.

What I claim is:

1. A device for forming successive folds from a web of natural or synthetic textile elements, comprising:

a rotating cylinder,

a series of blades mounted in fixed interrelation on the cylinder, said blades extending parallel to the rotation axis of said cylinder, and defining grooves thereon,

means for rotating the grooved cylinder,

means for forwarding the web of textile elements to the grooved cylinder,

a folding rotating roller displaceable along and between a pair of adjacent blades of the grooved cylinder, said folding rotating roller rolling on the web of textile elements, from one edge to the opposite edge thereof, and pushing progressively said web between said adjacent blades thereby to form a fold,

and means for translating the axis of rotation of the folding rotating roller parallel to the blades of said grooved cylinder.

2. A device as claimed in claim 1, said translating means comprising an endless belt on which said roller is mounted, said endless belt having a portion extending adjacent and along the whole length of the blades thereby

to move the roller lengthwise of the blades upon circulation of the endless belt.

3. A device as claimed in claim 1, and a retaining roller coaxial with said folding roller and movable conjointly with said folding roller between a pair of blades other than said adjacent blades to retain a previously formed fold between said other blades.

4. A device as claimed in claim 3, said folding and retaining rollers being in unitary assembly and rotatable with each other.

5. A device as claimed in claim 1, and a flange on said folding roller that presses the web against the outer edge of one of said blades.

6. A device as claimed in claim 1, and a rotating knife coaxial with said folding roller and movable conjointly with said folding roller between a pair of said blades other than said adjacent blades and bearing against the bottom of a previously formed fold to sever said web of textile elements.

7. A device as claimed in claim 6, and a retaining roller between said knife and said folding roller and engageable in a said groove between the groove in which the folding roller moves and the groove in which the knife moves.

8. A device as claimed in claim 7, said knife and retaining roller and folding roller being coaxial and in unitary assembly for rotation with each other.

9. A device as claimed in claim 8, and flanges between said knife and said retaining roller and between said retaining roller and said folding roller to press the web against the outer edges of said blades.

10. A device as claimed in claim 1, there being several of said folding rollers spaced from each other in a direction lengthwise of the blades of the grooved cylinder, said folding rollers being disposed between successive pairs of adjacent blades of the grooved cylinder.

11. A device as claimed in claim 10, and an endless belt on which said several folding rollers are mounted in spaced relation.

12. A device as claimed in claim 11, said endless belt having a portion which extends adjacent and lengthwise of said blades when said rollers are disposed in said grooves, said portion of said endless belt being disposed at an acute angle to the adjacent said blades.

13. A device as claimed in claim 10, said folding rollers being spaced different distances from the bottoms of their respective grooves so as to form folds having different heights.

14. A device as claimed in claim 10, said several folding rollers being all disposed at the same distance from the bottoms of their respective grooves so as to produce folds of constant height.

15. A device as claimed in claim 1, said roller being noncircular over at least a portion of its periphery thereby to produce folds having heights that vary along the width of the web of textile elements.

16. A device as claimed in claim 7, said retaining roller having a diameter less than the diameter of the folding roller and the knife having a diameter intermediate that of the retaining and folding rollers thereby to form loops that differ in height from each other and to sever the web in only the shorter of said loops.

17. A device as claimed in claim 3, said retaining roller being of a diameter less than the diameter of said folding roller, thereby to form in said web, loops that differ in height from each other.

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U.S. Cl. X.R.

156—72, 204, 205