

### [54] PATTERN SHEARING DEVICE FOR PILE FABRICS

[75] Inventor: **Ralph L. Davidson**, Worcester, Mass.

[73] Assignee: **Curtis & Marble Machine Company**, Worcester, Mass.

[22] Filed: **Jan. 31, 1972**

[21] Appl. No.: **222,075**

[52] U.S. Cl. .... **26/16, 198/124, 198/202**

[51] Int. Cl. .... **D06c 23/02**

[58] Field of Search ..... 26/16, 70; 198/124, 125, 198/202

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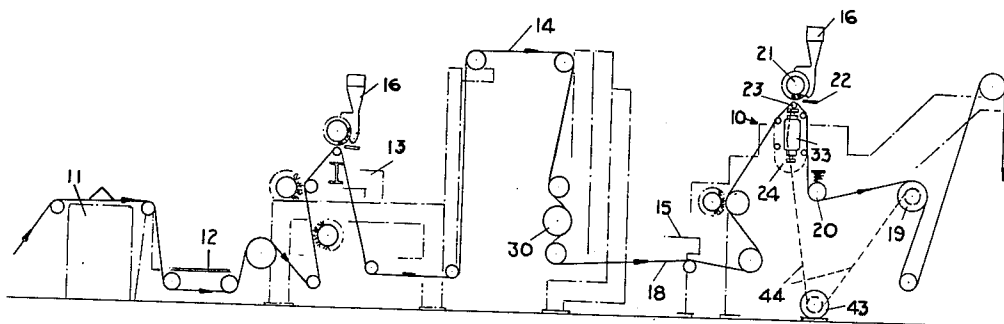
*Primary Examiner*—Robert R. Mackey

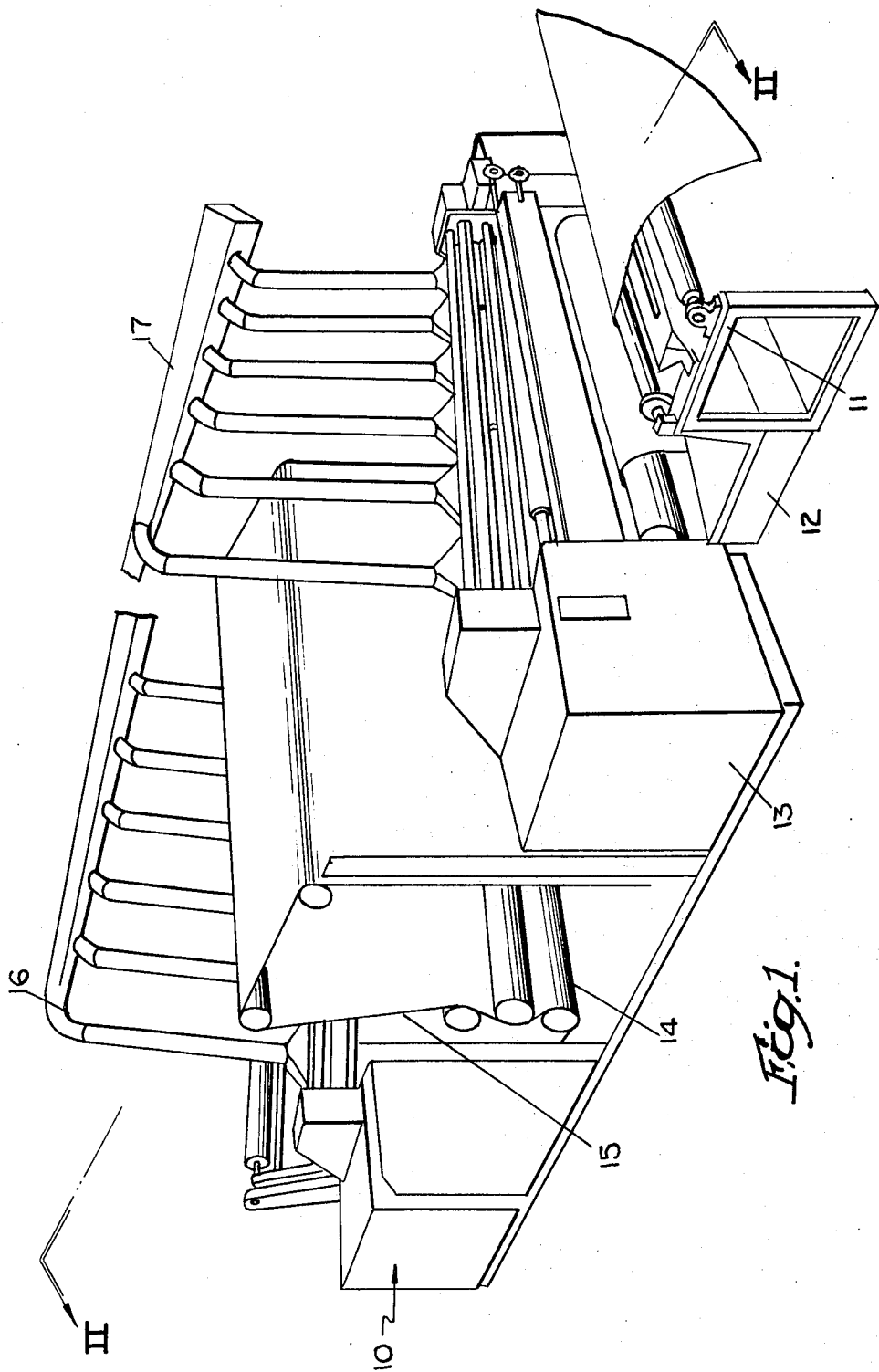
*Attorney, Agent, or Firm*—Norman S. Blodgett; Gerry A. Blodgett

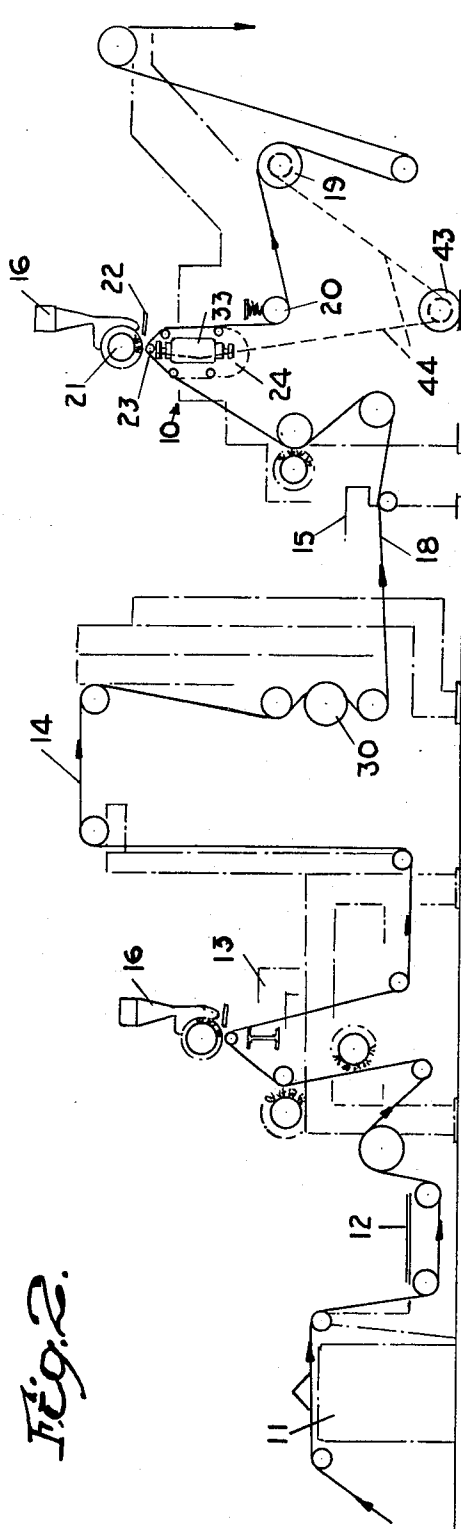
### [57] ABSTRACT

A textile shear having a blade and an endless belt with an embossed surface for supporting a pile fabric adjacent the knife. The endless belt, mounted on supporting means pivotable about a vertical axis for ease in pattern changing, includes longitudinal ridges to prevent longitudinal sliding thereof along a driven supporting roller and a carved pattern portion more elastic than the portion thereof being driven.

**3 Claims, 11 Drawing Figures**







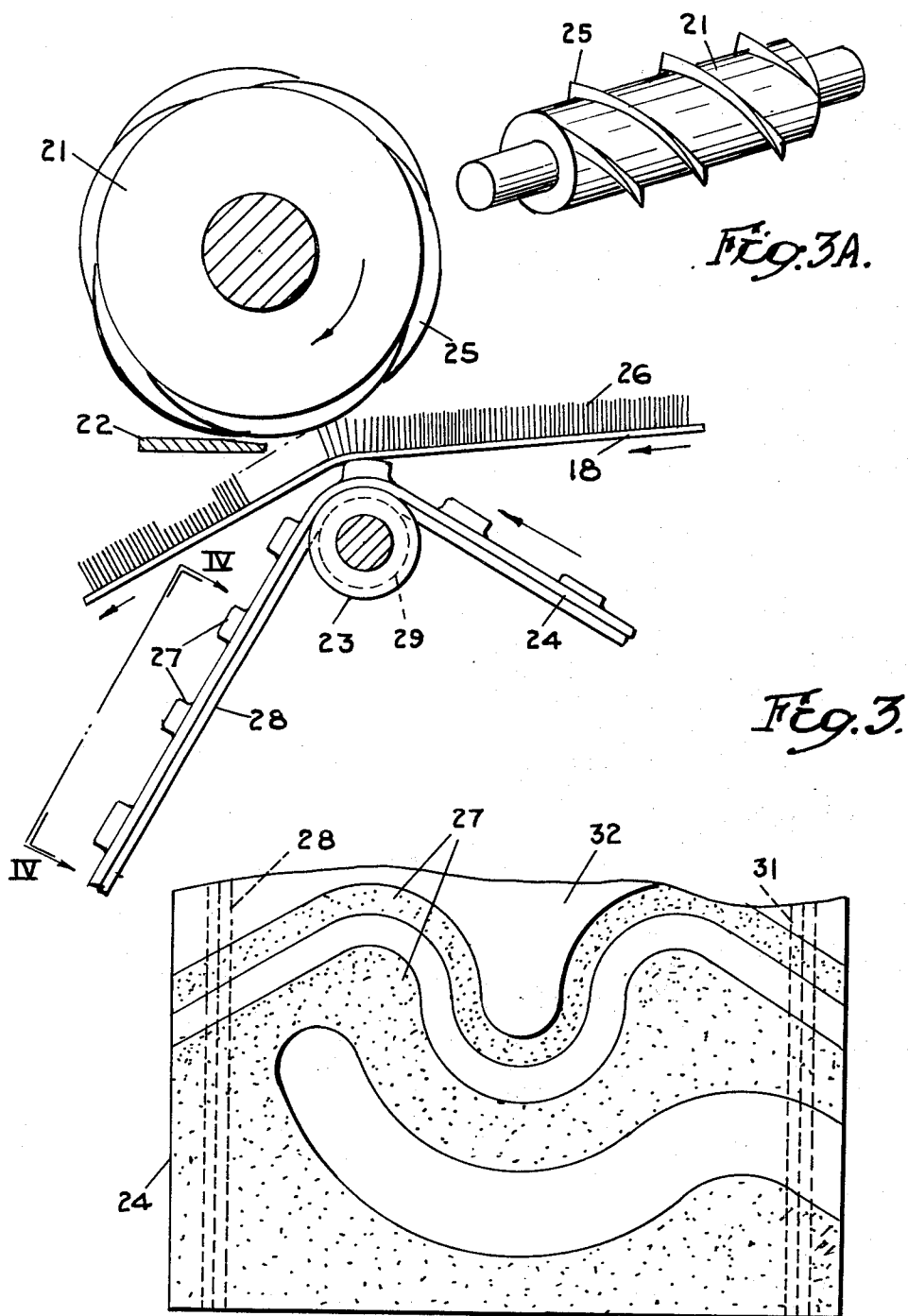
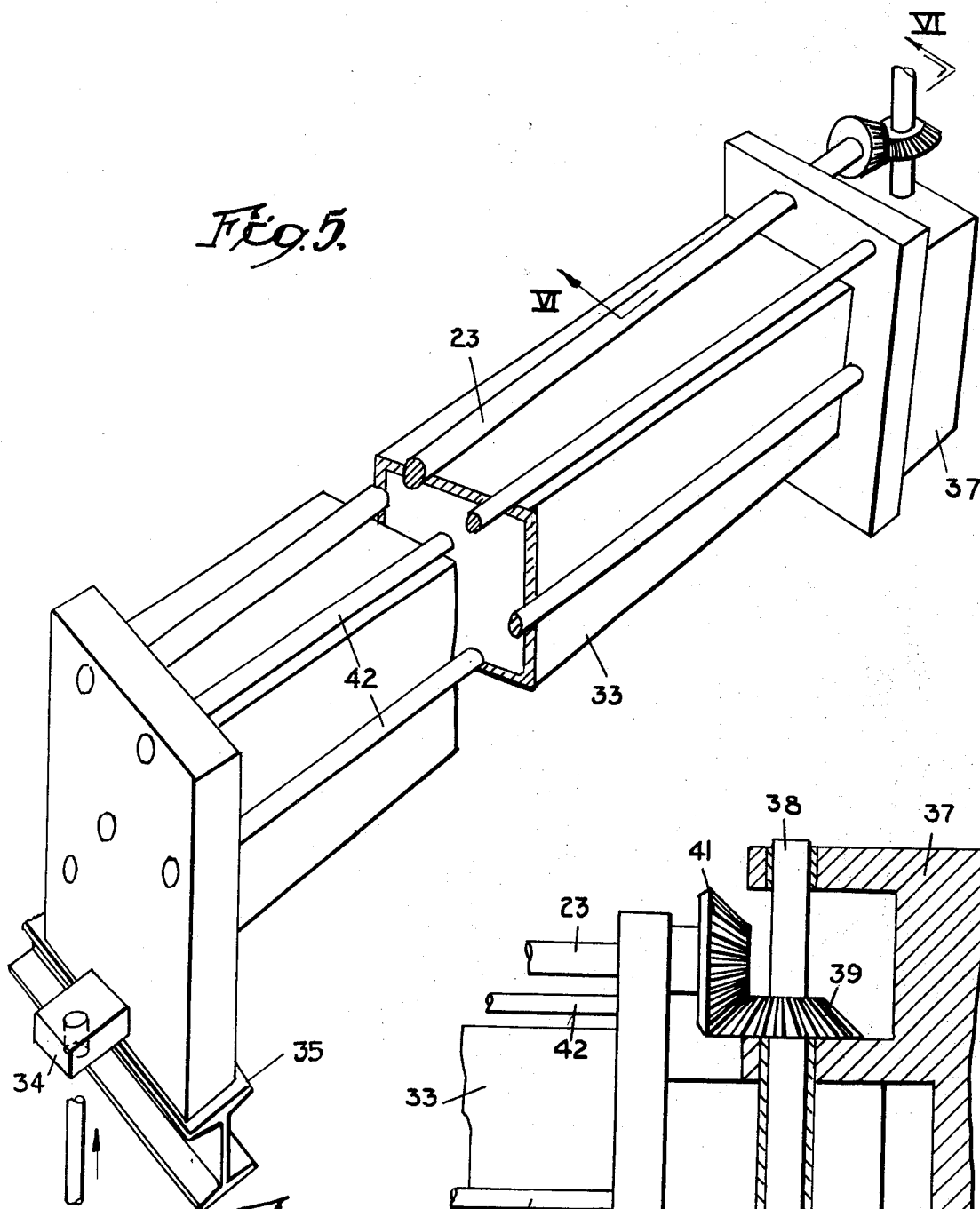
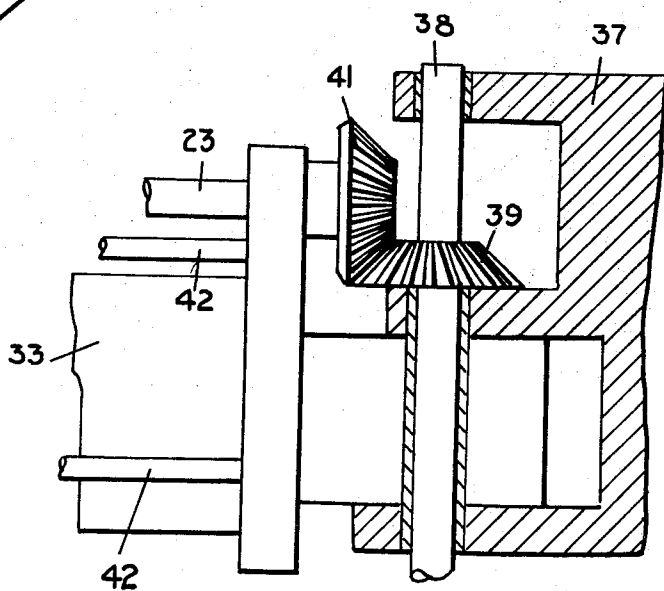


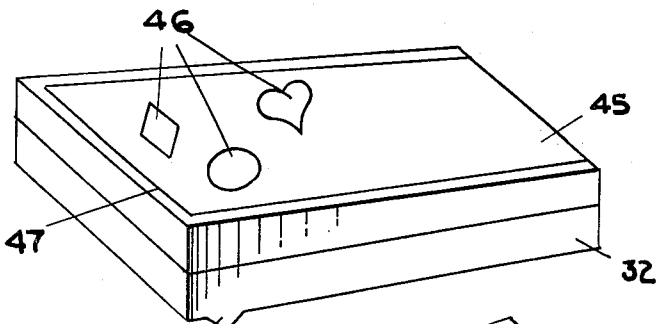
Fig. 4.

*Fig. 5.*

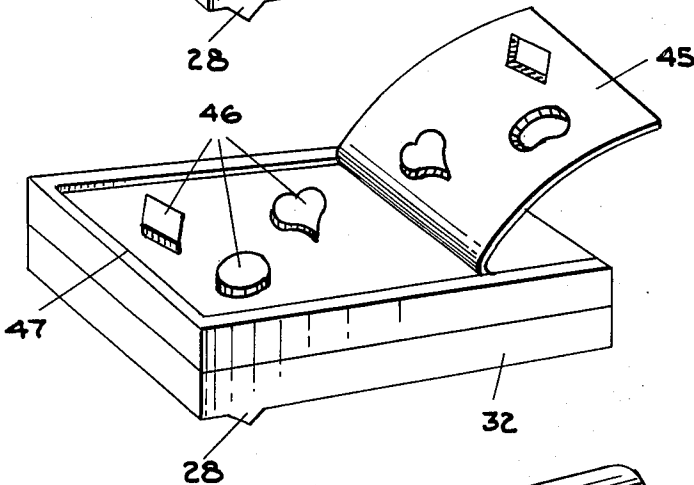


*Fig. 6.*

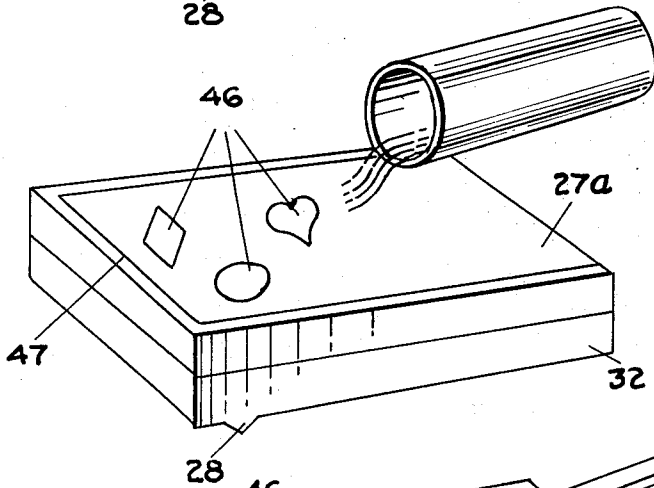




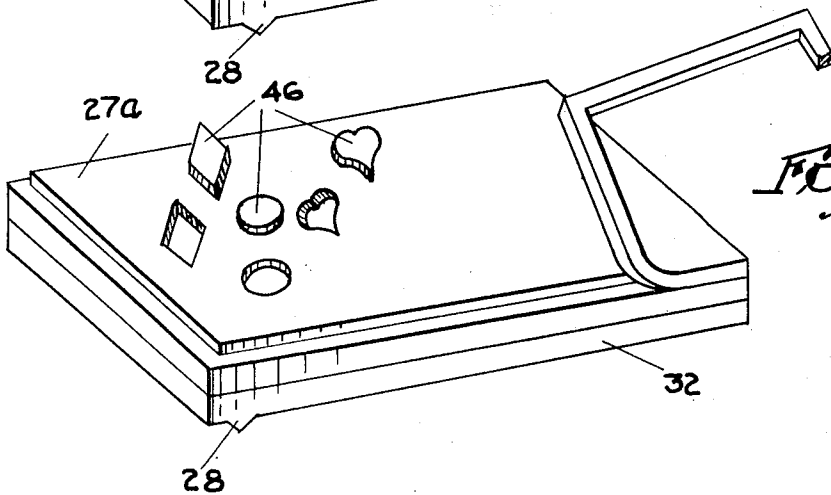
*Fig. 7.*



*Fig. 8.*



*Fig. 9.*



*Fig. 10.*

## PATTERN SHEARING DEVICE FOR PILE FABRICS

## BACKGROUND OF THE INVENTION

In the manufacture of textiles and, particularly pile fabric, it is common practice to make the pile to a shorter length in some areas than in others to provide a "sculptured" surface. This can be done when the pile is formed on a tufting machine, but in such a case, the pattern is substantially built into the machine, so that it is difficult to obtain any variety in sculpturing by this method. Furthermore, such machines are very expensive and difficult to maintain. It has been suggested in the past that the tufted fabric be manufactured on the machine with tufts that are all of the same size and, then, in a secondary operation, to obtain the sculpturing by cutting. The project of accomplishing it in this way is particularly desirable because of the fact that shearing is a necessary secondary operation in any case. This has been done by introducing into the conventional shear an added configured roll over which the tufted fabric passes. The high spots in the roll press the tufts closer to the shear and the low spots allow it to pass by the shear at a greater distance. The difficulty experienced, however, has been that, when such a configured roll was small in diameter, the cutting of the tufts took place adequately, but the pattern repeated itself every circumference of the roll and variety in pattern was not possible. When attempts were made to make the roll larger in diameter (so that the circumference would be greater and the pattern repeatability less frequent), the shear was not able to cut the tuft adequately because the fabric was not passing around a sharp enough radius in the vicinity of the shear. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a textile shear for producing a sculptured pile fabric having substantial variety in pattern.

Another object of this invention is the provision of a textile shear for use with pile fabric in which the distance within which the pattern repeats can be as long as desired.

A further object of the present invention is the provision of a shear for use with pile fabric in which the fabric is held on a sharp radius of curvature at the point of shearing and yet the pattern does not repeat frequently.

It is another object of the instant invention to provide a shear for producing a sculptured effect on pile fabric in which the pattern change takes place at long distances along the length of the fabric and does not make use of a configured roll of large diameter.

A still further object of the invention is the provision of a shear for use in sculpturing tufted fabric in which the pattern produced is easily changed.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

## SUMMARY OF THE INVENTION

In general, the invention consists of a textile shear having a rotary knife mounted for rotation about a first axis and a bed knife located adjacent the path of the knife as it rotates. A roller is mounted for rotation

about an axis which is parallel to and spaced from the said first axis and an endless belt extends around the roller and has an embossed surface directed toward the rotary knife.

More specifically, the roller is mounted for swinging action about one end on occasion on an axis which is perpendicular to the said first axis.

The invention also consists of a method for pattern-shearing a tufted fabric consisting of the steps of passing the tufted fabric under tension between a rotary knife and a roller having a radius of curvature substantially less than that of the rotary knife; the fabric is drawn over the roller away from the rotary knife to subtend a substantial portion of the periphery of the roller and the fabric is interposed between the roller and an embossed element.

The invention also includes a belt for the pattern-shearing of tufted fabric having an endless driven portion of substantial width formed of relatively inelastic material and a carved portion fastened to one surface of the driven portion and formed of a relatively elastic material.

The invention also includes a method of forming a carved belt comprising the steps of providing an endless portion of substantial width formed of a relatively inelastic material and providing a layer of easily carved material for attachment to one surface of the said portion. A pattern is then applied to the surface of the layer, parts of the layer are removed in accordance with the pattern to form recesses exposing the said surface of the element, and pouring an elastic plastic into the recesses for attachment to the surface of the element exposed by the surfaces. The remainder of the said layer is then removed.

## BRIEF DESCRIPTION OF THE DRAWINGS

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated by the accompanying drawings, in which:

FIG. 1 is a perspective view of a textile shear incorporating the principle of the present invention,

FIG. 2 is a vertical sectional view of the invention taken on the line II—II of FIG. 1,

FIG. 3 is a vertical sectional view of a portion of the textile shear,

FIG. 3A is a perspective view of a portion of the shear,

FIG. 4 is a view of a portion of the shear taken on the line IV—IV of FIG. 3,

FIG. 5 is a perspective view of a portion of the shear,

FIG. 6 is a sectional view of the shear taken on the line VI—VI of FIG. 5, and

FIGS. 7 through 10 illustrate various steps of forming the belt, which is part of the shear.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, wherein are best shown the general features of the invention, the textile shear, indicated generally by the reference numeral 10, is shown in use with a metal detector apparatus 11, a front frame 12, a front shear section 13, a guiding system 14, a guider sensor and positioner 15, all leading, finally, to the textile shear 10, which is the subject of the present invention. Both the shear 10 and the front shear section

13 are provided with vacuum lint operators 16 and 17, respectively.

Referring to FIG. 2, it can be seen that the guiding system 14 is provided with a roll 30 over which the fabric 18 passes, this roll being provided with a brake for providing a drag on the fabric as it passes through the various pieces of equipment. The shear 10 is provided near its output with a drive roll 19 which pulls the fabric through the main operating parts of the shear 10. An idler roll 20 is resiliently mounted between the operative area of the shear and the drive roll 19. The shear 10 is provided with a rotary knife 21, a bed knife 22, and a roller 23, as well as a belt 24 passing around the roller 23 and hanging down into the body of the housing of the shear.

In FIG. 3 it can be seen that the rotary knife 21 is provided with helical blades 25 and is mounted for rotation about a horizontal axis. A bed knife 22 is mounted adjacent the rotary knife 21 with its operating edge lying almost exactly under the horizontal axis about which that knife rotates. The roller 23 is mounted about a horizontal axis which is parallel to and spaced from the axis of the rotary knife 21 and the endless belt 24 passes over the roller 23 in the same direction that the fabric 18 passes. The fabric 18 is shown as in the form of tufted fabric having tufts 26 which are directed toward the blades 25 of the knife 21, the undersurface of the fabric engaging the belt 24 which is provided with upwardly extending bosses 27. For the purposes of this application, the expression "bosses" is used to indicate raised portions of the belt, but may have any desired pattern or configuration. The underside of the belt 24 is provided with a ridge 28 which engages a suitable V-shaped groove 29 formed at one end of the roll 23 to guide the belt against movement longitudinally of the axis of the roll 23.

FIG. 4 shows the appearance of the belt 24 including the raised portions or bosses 27. It also shows the location of the ridge 28 at one end of the belt as well as a similar ridge 31 at the other end of the belt. The belt consists of a driven portion 32 of substantial width formed of a relatively inelastic material and a carved portion consisting of the bosses 27 fastened to the upper surface of the driven portion and formed of a relatively elastic material which, in the preferred embodiment, is polyurethane of 50 durometer. The basic belt or driven portion 32 is the fabric impregnated with rubber.

As is evident in FIGS. 5 and 6, the roller 23 is mounted for swinging action about one end on occasion, the axis of swinging being vertical or at right angles to the horizontal plane in which the rotary shear 21 is rotated. The roller has a diameter which is substantially smaller than that of the blade 25 of the rotary knife 21 and is rotatably mounted on a beam 33 which swings about the same axis. The beam 33 at the other end is provided with a latching mechanism 34 to hold it in place during normal operation. The bottom of the beam 33 adjacent the latching mechanism 34 slides along and is supported by a horizontal beam 35 forming part of the framework of the housing of the machine.

Extending from the housing of the shear is an abutment 37 having a vertical drive shaft 38 suitably mounted in bearings acting both as a hinge pivot and as a drive shaft. The top of the shaft 38 is provided with a bevel gear 39 which engages a bevel gear 41 on the

roller 23. Suitable guide shafts 42 extend parallel to the surface of the beam 33, so that the inner surface of the belt 24 has smooth, round surfaces to pass around. The roller 23 and the drive roll 19 are driven by the same motor 43 and a drive means 44 connects the motor to the roller 23 and the drive roll 19 to cause the roller to have a peripheral speed substantially less than that of the drive roll, so that the drive roll controls the speed of the fabric 18.

The operation of the invention will now be readily understood in view of the above description, the apparatus provides a method for pattern-shearing of a tufted fabric consisting of the steps of passing the pile fabric 18 under tension between the rotary knife 21 and the roller 23 having a radius of curvature substantially less than that of the rotary knife. The fabric 18 is drawn over the roller 23 as shown in FIG. 3 and directed away from the rotary knife 21 to subtend a substantial portion of the periphery of the roller, the fabric 18 passing between the roller 23 and its belt 24, on the one hand, and the rotary knife 21, on the other hand. The roller 23 is driven at a peripheral speed which is substantially less than the linear speed of the fabric as it passes between the rotary knife and the roller. The bosses 27 on the belt 24 cause similar portions of the fabric 18 to be raised higher than the portions which have no bosses, so that the rotary knife 21 by means of its blade 25 operative with the bed knife 22 can shear the raised parts of the tufts 26 shorter than the others. After the fabric passes the roller 23 and the belt 24, the fabric returns to its former condition, but the raised tufts are now shorter and constitute cavities in the tufted fabric.

Referring now to FIGS. 7 through 10, it can be seen that a method is described for forming the belt 24 for the pattern-shearing of tufted fabric. The belt consists of an endless driven portion 32 of substantial width formed of a relatively inelastic material which, in the preferred embodiment, is a fabric which is rubber-impregnated. A suitable V-shaped ridge 28 is provided for guiding the belt on the roll 23.

Referring to FIG. 10, a carved portion 27a remains after the operation is completed. In FIG. 7, a sheet 45 of relatively easily carved material, such as expanded polyethylene, is applied to the upper surface of the driven portion 32. A pattern or design 46 is drawn on its surface and a cut is made down to the upper surface of the driven portion 32. In the preferred embodiment, a margin 47 is left.

In FIG. 8, the remainder part of the sheet 45 is drawn away leaving the bosses 46 and the raised margin 47. Then, as shown in FIG. 9, liquid polyurethane is poured into the cavity and brought up to the same level as the elements 46 and 47, thus forming the carved portion 27A. Finally, the rest of the expanded polyethylene elements 46 and 47 are removed, as shown in FIG. 10, pulled away and discarded, leaving the recesses which lie between the bosses or carved portion 27A. The upper surface of the driven portion 32 can be seen exposed in the recesses that are left. Normally, this operation would be done with a complete loop, but it is possible to do so with the ends of the belt unattached, so that the driven portion 32 is a flat plate. After the operation is completed, it is then necessary to fasten the ends together to form the belt 24.

It can be seen that the present invention provides a very desirable and flexible manner of providing a patterned cutting or shearing of the tufted fabric 18. When

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it is necessary to change the pattern, it is only essential to change the belt 24 by releasing the latching mechanism 34 and swinging the roller 23 along with its beam 33 outwardly about the pivot shaft 38. The new belt is slid on and the beam 33 swung back into its original position transversely of the shear and the latching mechanism 34 re-fastened. The belt 24 can be made as long a loop as is desirable to provide for infrequent change of pattern or low repeatability. The method of making the belt is inexpensive and allows a great latitude in selection of pattern. Furthermore, the making of a belt can take place in the textile plant in which the shear is used so that a changeover of pattern takes very little time.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A textile shear comprising:

- a. a rotary knife mounted for rotation about a first axis,
- b. a bed knife located adjacent the path of the rotary knife as it rotates,
- c. a roller mounted for rotation about an axis which

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is parallel to and spaced from the said first axis, the roller being also mounted for swinging action about one end on occasion about a second axes which is perpendicular to the said first axis the roller having a diameter substantially smaller than the rotary knife and being rotatably mounted on a beam which swings about the second axis,

d. a belt extending around the roller and having an embossed surface directed toward the rotary knife, the driven portion of the belt having a plurality of longitudinal ridges that engage peripheral grooves formed on the roller to prevent the belt from sliding longitudinally of the roller, the belt consisting of a drive portion that lies against the roller and a carved portion that carries a tufted fabric and holds it against the rotary knife, the carved portion being substantially more elastic than the driven portion,

e. a drive roll and a tension roll provided to direct a tufted fabric through the space between the rotary knife and the belt at a controlled tension.

2. A textile shear as recited in claim 1, wherein the other end of the roller and beam is provided with a latching mechanism to hold it in place during normal operation.

3. A textile shear as recited in claim 1, wherein the roller is driven for rotation by a shaft that is coaxial of the said swing axis.

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