Jan. 18, 1966 W. N. HADLEY 3,229,346

APPARATUS FOR SUEDING SHEET FABRICS

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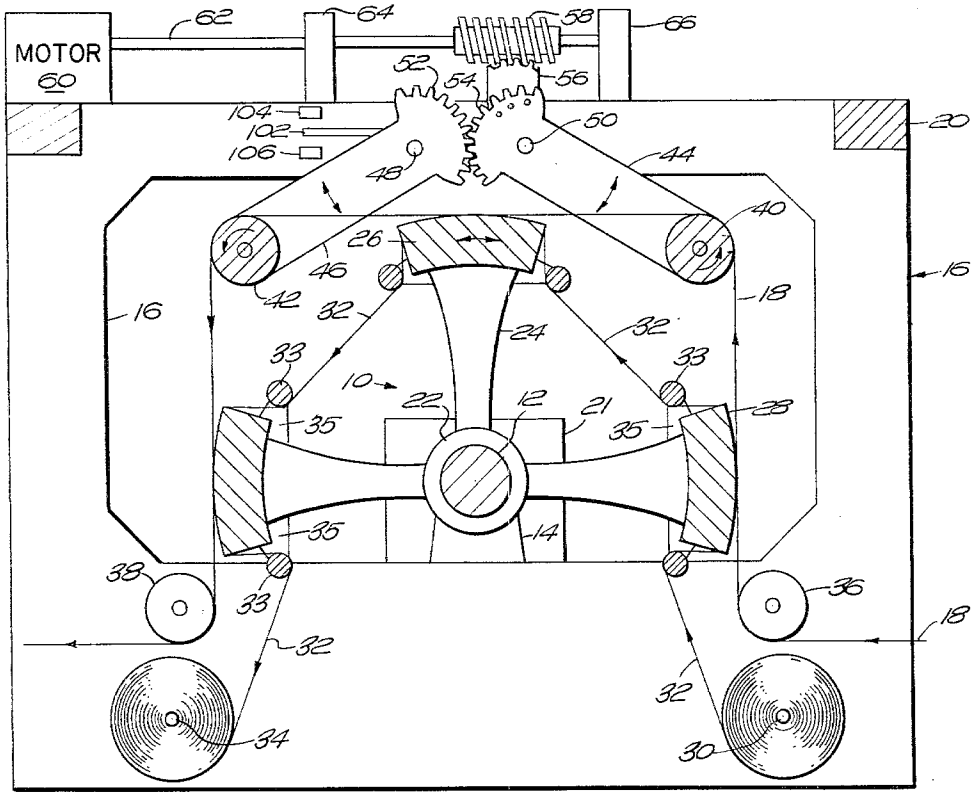


FIG. 1

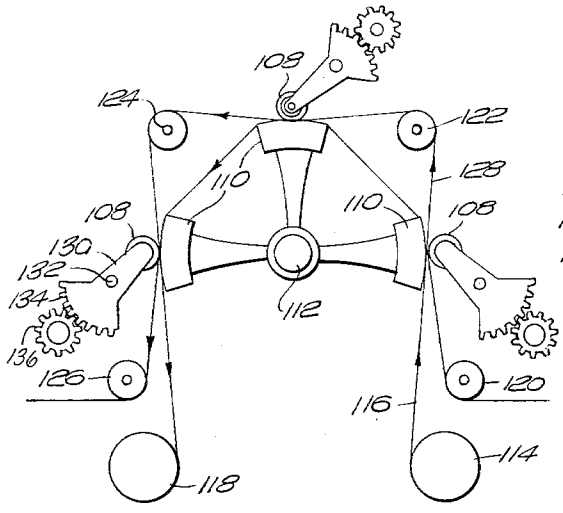


FIG. 2

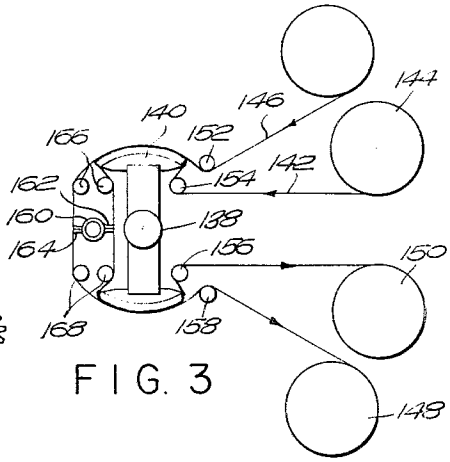


FIG. 3

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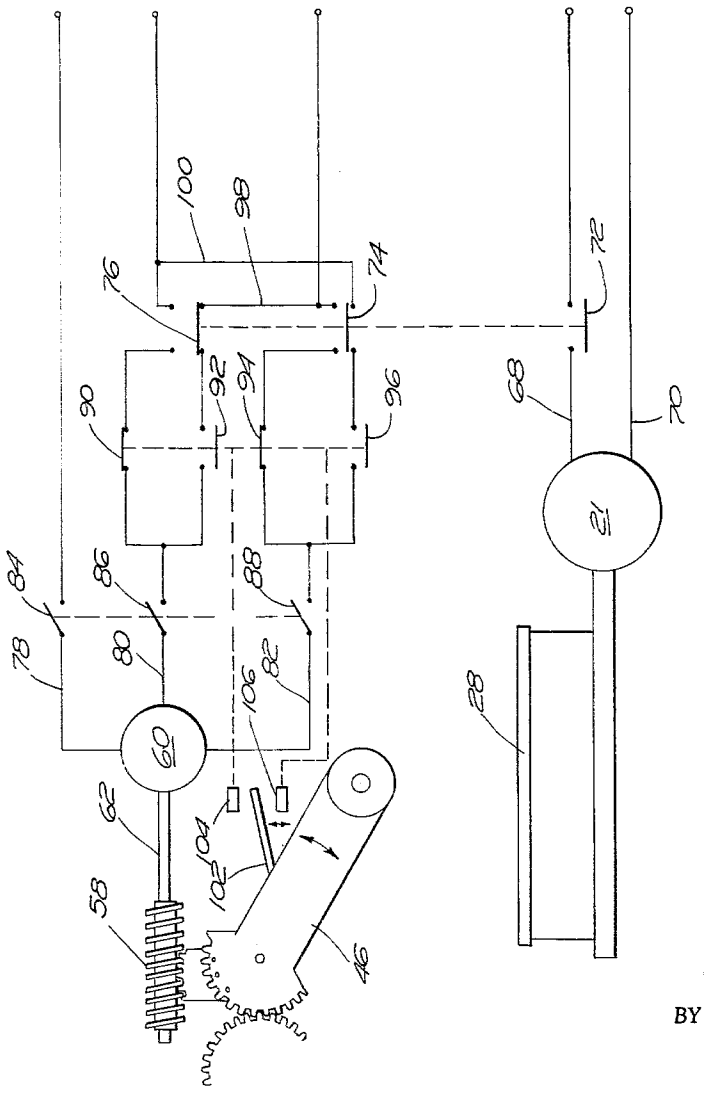


FIG. 4

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APPARATUS FOR SUEDING SHEET FABRICS

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6 Claims. (Cl. 26—28)

This invention relates generally to textile finishing and more particularly comprises a new and improved method and apparatus for sueding a fabric web uniformly throughout its entire length and width.

In the manufacture of many different types of woven and knitted fabrics, it is the practice to pass the cloth through a sueding machine in order to obtain a soft, smooth finish over the cloth surface. These sueding machines normally employ a large cylindrical drum over which the cloth is roven. Applied to the outer surface of the drum is a sheet of abrasive material and, as the cloth is advanced over the drum in one direction, the drum is rotated in a direction counter to that of the cloth. The resulting finish will depend upon several factors which include the speed of the drum, the characteristics of the abrasive sheet and the pressure between the fabric and the abrasive material.

One particular problem that has existed heretofore in surface finishing of fabrics by the above techniques stems from the gradual wearing down of the abrasive sheet on the outer surface of the drum. The wearing of the abrasive sheet results in the first portion of a length of fabric being sueded to a greater degree than the end portion. In other words, the fabric will not be uniformly sueded from end to end. This is, of course, objectionable particularly from a commercial standpoint since fabrics having non-uniform surface characteristics are not as marketable as those materials presenting a uniformly sueded surface.

An additional problem connected with a sueding machine of the above type involves the replacement of the abrasive sheet. Since these abrasive sheets wear out in a relatively short time, it is necessary that they be replaced periodically. With the present equipment, it is necessary that the entire finishing operation be shut down while the worn abrasive sheet is removed from the drum and a fresh sheet is installed. This is both a difficult and time consuming operation and production must be stopped until the machine is readied for operation.

Accordingly, it is an object of the present invention to provide a novel method for surface finishing lengths of fabrics uniformly from end to end.

Another object of this invention is to provide a novel apparatus for surface finishing lengths of fabrics uniformly from end to end.

Still another object of this invention is to provide a fabric sueding apparatus which may be operated on a substantially continuous basis.

A more general object of this invention is to provide improvements in the art of cloth finishing.

More particularly, this invention features a method for finishing fabric surfaces comprising the steps of continuously feeding a web of abrasive material into face to face contact with a transverse portion of a strip of fabric to be sueded, advancing the fabric in a longitudinal direction and oscillating that portion of the abrasive web in contact with the fabric.

Another feature of this invention comprises a fabric finishing apparatus wherein a roll of abrasive strip material is mounted to continuously feed a fresh section of abrasive material onto one or more arcuate heads extending radially from a torsion shaft adapted to oscillate about its longitudinal axis. The fabric to be sueded is advanced over the arcuate heads in face to face contact with the vibrating abrasive surface. Both the abrasive web and the fabric being sueded are advanced over the oscillating heads so that a continuously fresh section of abrasive material is presented for the finishing action. This will result in the fabric being uniformly sueded throughout its entire length.

But these and other features of the invention, along with further objects and advantages thereof, will become more fully apparent from the following detailed description of the invention taken in connection with the accompanying drawings, in which:

FIG. 1 is a view in side elevation, partly in section, of a fabric finishing apparatus embodying the invention.

FIG. 2 is a view similar to FIG. 1 but showing a modification of the invention,

FIG. 3 is a view similar to FIGS. 1 and 2 but showing another modification of the invention, and,

FIG. 4 is a schematic diagram of a control system which may be employed in the FIG. 1 embodiment.

Referring now to FIG. 1 of the drawings, the reference character **10** generally indicates a vibratory apparatus organized about a torsion shaft **12**. The shaft **12** has its ends supported in bearings **14** mounted on spaced parallel frames **16** which are located on either side of the path of travel of a moving cloth web **18**. Typically, the frame members **16** are rigidly connected to one another as by cross braces **20** to form a rigid framework for supporting the vibratory apparatus and its associated equipment.

The torsion shaft **12** is drivingly connected to a vibratory motor **21** (FIG. 4) adapted to oscillate the torsion shaft about its longitudinal axis at a frequency of 3600 c.p.m., for example, with a displacement that may be varied from a fraction of an inch up to an inch or more and preferably set for a one half inch displacement for most applications. Keyed to the torsion shaft **12** is a hub **22** carrying a plurality of radially extending arms **24** at the end of each of which is a head element **26** presenting an arcuate outer surface **28** defining a cylindrical sector extending substantially the length of the shaft **12**.

Removably mounted near the base of the apparatus is a core **30** having its ends rotatably mounted to the frames **16** and carrying a roll of abrasive flexible sheet material **32**. As shown, the abrasive web **32**, which has a width that is equal to or slightly in excess of that of the cloth web **18**, is passed over the curved surfaces **28** of each of the three head elements **26** illustrated in the FIG. 1 embodiment. The leading free end of the abrasive web **32** is wound about a power driven take up roll **34** mounted to the frame **16**. In practice, the feed roll **30** is provided with a suitable drag device to provide a controlled amount of tension on the abrasive web **32** and to insure that the abrasive web will be held tightly against the curved surfaces of the head elements. It will be noted in FIG. 1 that each radial arm **24** is provided with a pair of idler rolls **33**, one on either side of each head **26** and extending the full width thereof. These rolls are mounted to the arm by means of brackets **35** and are positioned radially inwards of the head to insure that the abrasive web which is threaded under each idler, spans the full arc of the head and oscillates with it. This will insure full use of the abrasive material and vibratory heads. It will, of course, be understood that the abrasive web will have its abrasive surface facing outwardly as it passes over the head elements **26**.

Located above the rolls **30** and **34** are a pair of idler rolls **36** and **38** rotatably mounted to the frames **16**. In the illustrated embodiment, these idler rolls are so located that an imaginary vertical line will be tangent to the curved outer surfaces **28** of the right and left hand head

elements 26 and oppositely facing points on the rolls 36 and 38. As shown, the oncoming cloth web 18 is roven under the idler roll 36 and passes upwardly and over a pair of applicator rolls 40 and 42 then is passed downwardly under the idler roll 38. From this point the off coming cloth web 18 may be wound up on a take up roll or may be passed on to other machinery for additional tandem surfacing operations, as desired. The applicator rolls 40 and 42 will be seen to be mounted rotatably to the ends of a pair of lever arms 44 and 46 pivoted by pins 50 and 48 to the frame 16. The upper ends of each lever arm will be seen to terminate in a gear sector 54 and 52 in mesh with one another so that both lever arms 44 and 46 may be biased in unison. The lever arm 44 will be seen to carry a geared extension 56 rigidly connected thereto and pivoted about the pin 50. The gear portion of the extension 56 is in mesh with a worm 58 drivingly connected to a motor 60 by means of a rod 62. Suitable bearings 64 and 66 are provided to support the rod and the worm to the frame 16.

It will be noted that the applicator rolls 40 and 42 are located radially outward from the vibratory apparatus and between head elements 26 so that the cloth web 18, when tensioned between the rollers 36, 40, 42 and 38 will be generally tangent to the outer curved surfaces of each of the head elements. It will be readily understood that operation of the motor 60, one way or the other, will raise or lower the applicator rolls 42. In their raised positions, the applicator rolls will lift the cloth web 18 out of contact with the abrasive web 32 covering all three head elements 26. When the applicator rolls are lowered, the cloth web 18 will, of course, come into contact with each of the abrasive covered heads 26. In practice, the applicator rolls 40 and 42 will be in a lowered position while the apparatus is operating but if the machine should be stopped or the forward motion of the cloth be interrupted for any reason, the application rolls must lift the cloth out of contact with the vibratory apparatus to prevent concentrated sueding of one section of cloth. When the machine is being shut down, inertia will cause the vibratory heads 26 to continue oscillating for a limited period after its drive motor has been deenergized. For this reason, it is necessary to lift the cloth web away from the abrasive surfaces and thus prevent the formation of transverse ribs in the cloth.

In FIG. 4 there is shown a schematic diagram of a control system which may be employed to advantage in the operation of the apparatus. The system includes the motor 21 which oscillates the torsion shaft 12 and this motor is connected by leads 68 and 70 to a suitable power source. A switch 72 interrupts the lead 68 and is ganged to switches 74 and 76 forming part of the positioning system for the applicator rolls. The motor 60 which operates the applicator rolls is a three phase motor having leads 78, 80 and 82 with leads 80 and 82 comprising the control portion of the system. Switches 84, 86 and 88 interrupts leads 78, 80 and 82 and are ganged together for simultaneous operation. Switch 86 is serially connected to switches 90 and 92 and to switch 76 which is a double pole, double throw switch. Switches 90 and 92 are seen to be connected in parallel to one another and are ganged to switches 94 and 96 which, in turn, are connected to the switches 88 and 74, the latter being a double pole, double throw switch similar to the switch 76. Switches 74 and 76 will be seen to have cross-over leads 98 and 100 between their contact points whereby the motor 60 may be operated in a clockwise or counterclockwise direction depending upon the position of the switches.

As shown in FIGS. 1 and 4, the lever arm 46 is provided with a control finger 102 which extends between a pair of spaced switch actuators 104 and 106 which are mounted to the frame 16. The lowermost actuator 106 is mounted for vertical adjustment by a suitable micrometer screw mechanism for reasons set forth below. Both of the actuators 104 and 106 are mechanically connected to

the ganged switches 90, 92, 94 and 96. In practice, the lever arms initially will be in a raised position so that the cloth web 18 will be out of contact with the abrasive covered heads 26. In this position the actuator 104 will cause switches 90 and 94 to be closed and switches 92 and 96 to be opened. Ganged switches 84, 86 and 88 will be manually closed when the machine is being started. Thereafter switch 72 will be closed to energize the motor 21. On the closing of switch 72 the ganged switches 74 and 76 will be moved to complete a circuit through switches 90 and 94 respectively, thereby energizing the motor 60 to rotate in a direction which will lower the lever arms 44 and 46 so that the cloth web 18 will come into contact with the abrasive covered heads 26. As the applicator rolls 40 and 42 approach a lowered position, the control finger 102 will engage the switch actuator 106 which will open switches 90 and 94 and close switches 92 and 96. This will open the circuit to the motor causing it to stop and the sueding machine will operate normally under these conditions. When the motor 21 is to be stopped, switch 72 will be opened and this will reverse the positions of switches 74 and 76 so that the motor 60 will again be energized but, under these conditions, the crossover leads 98 and 100 will be utilized to reverse the motor and thereby lift the applicator rolls 40 and 42 and disengage the cloth web 18 from the heads 26.

By mounting the switch actuator 106 for vertical adjustment relative to the control finger 102, it is possible to vary the limit of downward movement of the applicator rolls and thus vary the degree of contact between the cloth web 18 and the heads 26. It will be understood that by lowering the switch actuator 106 the motor 60 will run for a longer period of time so that the applicator rolls will move downwardly and inwardly and the cloth web 18 simultaneously will wrap over the arcuate surfaces 28 of the heads to a greater extent. This will, of course, increase the sueding effect on the web. By varying the position of the actuator 106, it is possible to control precisely the desired finish that will be produced on the web 18.

In the above described apparatus, the cloth web is applied to the sueding points under a longitudinal tensioning of the cloth. In FIG. 2 there is illustrated a modification of the invention and in this embodiment the cloth web is applied to the vibratory heads by means of pressure rollers 108, riding behind the cloth at the sueding points. As in the principal embodiment, the vibratory mechanism includes three arcuate heads 110 adapted to oscillate on a torsion shaft 112. Also, as in the principal embodiment, a feed roll 114 of abrasive sheet material 116 feeds a continuously fresh supply of abrasive material over the heads 110 to be wrapped up on a take-up roll 118.

In the FIG. 2 embodiment idler rollers 120, 122, 124 and 126 are mounted in fixed position so that a moving cloth web 128, roven under roller 120 over rollers 122 and 124 and under roller 126, will normally be out of contact with the heads 110. However, upon bringing to bear each of the pressure rollers 108 against the outer surface of the cloth web 128 the cloth will be pressed against each of the heads for sueding action. Typically, the pressure rollers 108 are provided with a resilient surface of plastic or rubber for example, and are mounted for free rolling and pressing of the cloth onto the sueding heads. It will be understood that several rollers may be utilized for each of the heads depending upon the length of arc of the sueding area.

In the illustrated embodiment, the rollers 108 are mounted for movement to and away from the heads 110 by means of a positioning mechanism which includes levers 130 which support the ends of the rollers 108. Each lever is pivotally mounted for rotation about a pin 132 and is formed with a gear sector 134 in mesh with a pinion 136. It will be understood that rotation of the pinion will move the roller 108 either to or away from the head 110 depending upon the direction of rotation. A driving

system, similar to that illustrated in FIG. 4 in use with the FIG. 1 embodiment, may be readily adapted to control the positions of the rollers **108**.

In FIG. 3 there is illustrated still another modification of the invention and in this embodiment a torsion shaft **138** is provided with two vibratory heads **140** each having an arcuate surface over which is roven a length of outwardly facing abrasive strip material **142**. As in the previous two embodiments, the abrasive strip is fed from a supply roll **144** to provide a continuously fresh section of abrasive material over the heads **140**. Also, as in the principal embodiment, a web of cloth **146** is fed over the abrasive covered heads **140** and drawn off onto a take-up roll **148** or continued onto other finishing operations, as desired. The abrasive strip is wound up on a take-up roll **150** in the same manner as the embodiments of FIGS. 1 and 2. In the apparatus of FIG. 3 idler rolls **152** and **154** are employed to guide the feeding of the cloth web **146** and the abrasive strip **142** onto the heads **140**. Similarly idler rolls **158** and **156** are employed to guide the off-coming cloth web and abrasive strip onto their respective take-up rolls as shown.

In the FIG. 3 embodiment, a suction box **160** is interposed between the two heads **140** of the vibratory apparatus. The suction box is provided with a pair of slit openings that extend the entire width of the abrasive strip and cloth web. The slit openings are indicated by the reference characters **162** and **164** and are located on opposite sides of the suction box to engage the opposing surfaces of the cloth web and the abrasive strip. Mounted above and below the suction box **160** are two pairs of idler rollers **166** and **168** which are employed to separate the cloth web and the abrasive strip to pass each over its respective slit opening. It will be appreciated that the suction box will be employed to clean the opposing surfaces of both the cloth web and the abrasive strip of particulate materials such as loose fibers and the like in order to facilitate the sueding operation and to improve the finish on the cloth. Obviously, the suction cleaning arrangement may be added to either of the embodiments in FIGS. 1 and 2, if desired.

The invention described herein will impart to a cloth web a smooth finish of a uniform quality throughout its entire length and width and with any selected degree of sueding. It will be appreciated that by feeding in a continuously fresh strip of abrasive material the sueding action will be constant on any run of cloth. It will also be appreciated that the machine may be readily adapted for tandem operation with other machines and that the cloth web may be finished on both sides by passing it through a second sueding machine and reversing the threading to bring the opposite side of the cloth against the abrasive heads. A variety of abrasive webs may be employed and the supporting ply for the grit particles may be of cloth or paper. Preferably, a tough, flexible ply of cloth is desired since the cloth backing is normally more durable than paper, is more flexible and may be recoated with a fresh layer of abrasive grit particles after the original layer has been worn down. Obviously, a wide selection of abrasive surfaces may be employed depending upon the material that is being finished and the desired effect.

While the invention has been described with particular reference to the illustrated embodiments, it will be understood that numerous modifications thereto will appear to those skilled in the art. Also, it will be understood that the above description and accompanying drawings should be taken as illustrative of the invention and not in a limiting sense.

Having thus described the invention, what I claim and desire to obtain by Letters Patent of the United States is:

1. A fabric sueding apparatus, comprising
(a) a shaft,
(b) a plurality of heads mounted to said shaft and extending radially outwards therefrom,
(c) means for oscillating said shaft about its longitudinal axis,
(d) a length of abrasive strip material roven over each of said heads,
(e) means for advancing said material over said heads to cover said heads with a continuously fresh section of abrasive material,
(f) and means for advancing a length of fabric over each of said heads and in face-to-face contact with said abrasive material.

2. A fabric sueding apparatus according to claim **1** including means for selectively moving said fabric into and out of contact with the abrasive covered heads.

3. A fabric sueding apparatus according to claim **1** including vacuum cleaning means disposed between said heads and adapted to clean opposing surfaces of said abrasive material and said fabric.

4. A fabric sueding apparatus, comprising
(a) a torsion shaft,
(b) a plurality of arcuate heads mounted to said shaft and extending radially outwards therefrom,
(c) means for oscillating said shaft about its longitudinal axis,
(d) a supply of abrasive flexible strip material associated with said apparatus and having a portion roven over the outer surface of each of said heads,
(e) means for advancing said material over said heads to cover said heads with a continuously fresh section of abrasive material,
(f) and means for advancing a length of fabric over each of said heads and in face-to-face contact with said abrasive material.

5. A fabric sueding apparatus according to claim **4** including a plurality of idler rolls engaging said fabric, said idler rolls being mounted for movement to and away from said heads for moving said fabric into and out of engagement with the abrasive covered heads.

6. A fabric sueding apparatus according to claim **5** including a pair of idler rolls mounted on each of said heads radially inward of the arcuate outer surfaces thereof, said abrasive strip being roven under each of said rolls and over each of said arcuate outer surfaces.

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