Aug. 15, 1961 A. ACKERMAN 2,995,873

APPARATUS FOR CLEANING THE ENDS OF ABRASIVE BANDS TO ENABLE FORMATION OF ABRASIVE BELTS THEREFROM

Filed June 26, 1959 2 Sheets-Sheet 1

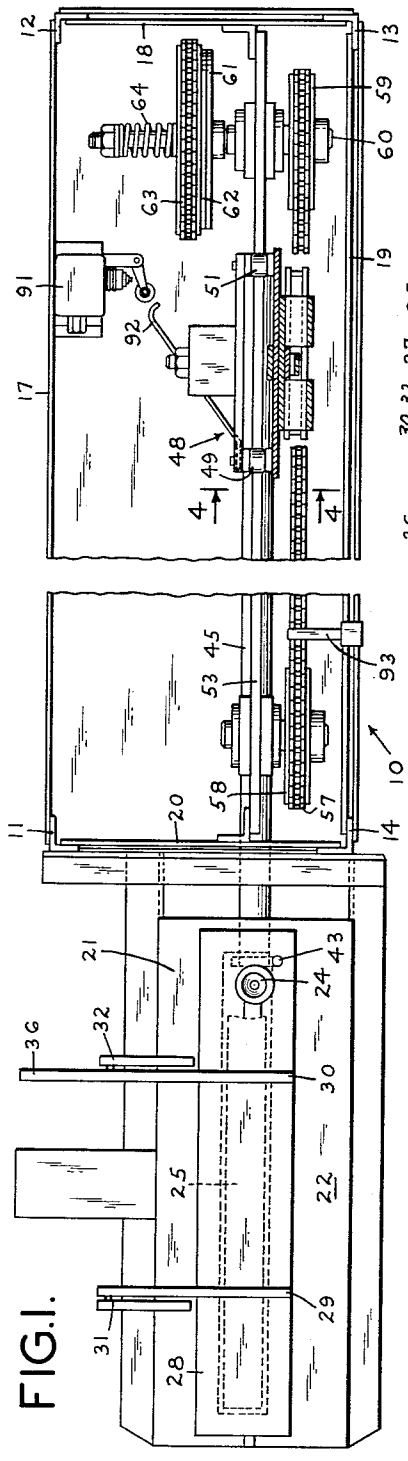


FIG. 1.

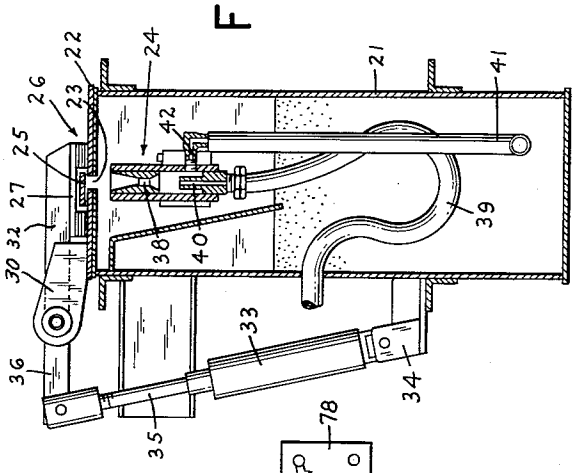


FIG. 3.

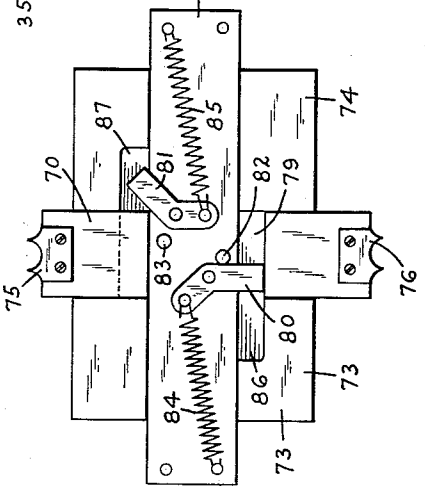


FIG. 5.

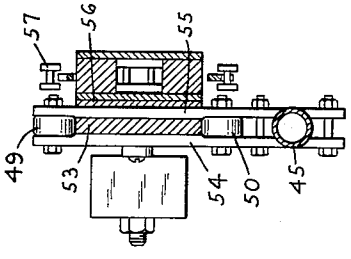


FIG. 4.

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Filed June 26, 1959 2 Sheets-Sheet 2

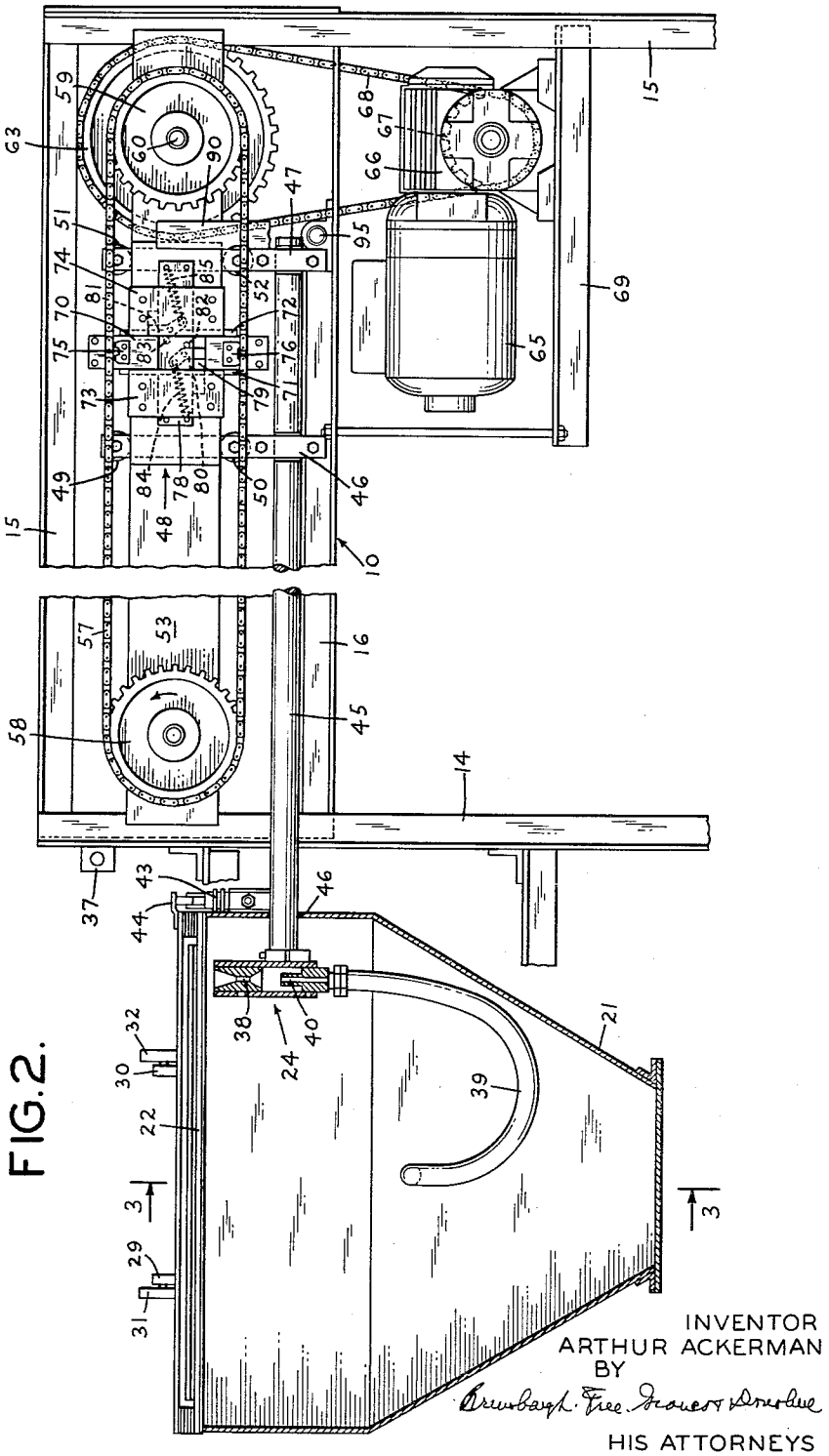


FIG. 2.

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United States Patent Office 2,995,873 Patented Aug. 15, 1961

2,995,873

APPARATUS FOR CLEANING THE ENDS OF ABRASIVE BANDS TO ENABLE FORMATION OF ABRASIVE BELTS THEREFROM

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Filed June 26, 1959, Ser. No. 823,043
8 Claims. (Cl. 51—8)

This invention relates to apparatus for manufacturing abrasive belts and it relates more particularly to apparatus for cleaning the ends of bands or strips provided with a surface coating of abrasive, to enable the ends of the bands to be joined by means of an adhesive to form endless belts for use in belt sanders and the like.

In the manufacture of abrasive belts of the type referred to above, it is customary to back-size a web of fabric with a suitable sizing composition. The face of the web is also given several coatings to improve its weight and is provided with a coating of abrasive grits. The sized and treated web is then cut into strips of a predetermined length and width and usually with the ends cut on a bias. In order to join the ends of the strips, to form abrasive belts, it is necessary to skive or otherwise remove the abrasive grits from a narrow band extending across one end of the strip and also to remove the size from a narrow zone of the back of the strip at its opposite end.

A suitable adhesive can then be applied to the cleaned surfaces to join the ends of the strip surfaces firmly so that the belt so formed will not fail in operation.

It has been customary in the past to remove the size on the back of the web by scrubbing the end of the belt with a brush and water to remove all of the size along a narrow band on the backside of the strip. After scrubbing, the strip must be dried before the adhesive can be applied thereto. Such a manual cleaning operation followed by drying greatly limits production of the belts and increases the cost of the same.

In accordance with the present invention, an apparatus is provided by means of which the back-sizing of the fabric can be removed quickly and expeditiously without scrubbing or wetting the fabric.

More particularly, in accordance with the present invention, an apparatus has been provided by means of which a narrow zone of the end of the strip of abrasive coated fabric is subjected to a sand blasting operation under controlled conditions thereby to remove the back-sizing completely from the zone without damaging the fabric itself and weakening it.

An apparatus of the type embodying the invention includes a table or other support having slot therein over which one end of the strip can be positioned. Beneath the slot and movable lengthwise thereof at a predetermined speed is a sand-blasting nozzle which effectively and uniformly removes the back-size composition from the edge of the fabric overlying the slot. Appropriate means is provided for timing the movement of the nozzle along the slot and for controlling the zone of the fabric strip which is exposed to the sand-blasting operation. In this way, each portion of the zone is subjected to essentially the same sand-blasting operation thereby to uniformly remove the sizing and condition the end zone of the fabric for the gluing operation.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which

FIGURE 1 is a plan view of a typical apparatus for cleaning the edge of a strip of fabric in accordance with the present invention;

FIGURE 2 is a side elevational view and partial sectional view of the apparatus;

FIGURE 3 is a view in section taken on line 3—3 of FIGURE 2;

FIGURE 4 is a view in the section taken on line 4—4 of FIGURE 1, and

FIGURE 5 is an enlarged view of a portion of the device illustrating the mechanism for controlling the movement of the sand-blasting nozzle.

The form of apparatus chosen for purposes of illustration includes a frame **10** including angle iron legs **11**, **12**, **13** and **14** which may be provided with appropriate reinforcing connecting and cross members **15** and **16** and metal side and end panels **17**, **18**, **19** and **20**, some or all of which may be removable to give access to the mechanism enclosed therein. Adjacent the left hand end of the frame **10**, as viewed in FIGURES 1 and 2, is a hopper **21**, for receiving a grit such as finely divided sand or other abrasive material. The top of the hopper is provided with a table or platform **22**, having a narrow slot **23** therein (FIGURE 3) through which the abrasive may be directed by a sand blasting nozzle **24** disposed within the hopper **21**. Overlying the slot **23** is a cover strip **25** which is joined at its left hand edge as viewed in FIGURE 3 to the table **22** and has its opposite edge spaced slightly from the top of the table **22** so that the edge of a strip of abrasive coated fabric can be slipped between the cover **25** and the table **22** into a position overlying the slot **23**. The area of the slot determines the area of the end of the abrasive coated strip or web, which is to be subjected to the sand-blasting operation described in greater detail hereinafter.

The strip of fabric is clamped to the cover **22** by means of a clamping head **26** including a plate **27** having a rectangular rubber frame **28** secured to its under-surface for engagement with the upper surface of the table **22**. The clamp **26** is carried by a pair of arms **29** and **30** which are pivotally supported on the arms **31** and **32** fixed to the table **22**. The clamping head **26** is raised and lowered by means of an air cylinder **33** which has one end pivotally connected to a bracket **34** fixed to the hopper **21** and the upper end of its piston rod **35** pivotally connected to a rearwardly extending portion **36** of the arm **30**. A manually-operated switch **37** (FIG. 2) controls a solenoid valve (not shown) to admit air to the cylinder **33** to lower the clamping head. Opening of the switch allows the air to escape from the cylinder raising the clamping head. In this way the clamping head **26** can be rocked counterclockwise as viewed in FIGURE 3 to release or admit the edge of the abrasive coated strip and rocked clockwise to clamp the abrasive coated strip on top of the table **22**. The clamping head also prevents abrasive from escaping into the surrounding area.

The sand blasting nozzle **24** can be of a conventional type including a converging-diverging or Venturi throat **38**, an air supply tube **39** by means of which a high velocity stream of air is injected by means of an internal nozzle **40** through the throat **38** thereby to create the reduced pressure for drawing finely divided abrasive through a downwardly extending tube **41** and coupling **42** to be carried by the air blast through the throat **38** and directed against the edge of the fabric overlying the slot **23**. Air is supplied to the nozzle and the air cylinder **33** by means of a compressor or air storage tank. Flow of air to the nozzle **24** is controlled, in part, by means of a switch **43** mounted on the side of the hopper and is moved from a normally "open" position to a "closed" position by means of a laterally extending finger **44** carried by the clamping head **26**. The switch **43** prevents sand from being blown from the nozzle when the clamping head **26** is raised.

The nozzle must be reciprocated lengthwise of the slot **23** to remove the sizing from the end of the fabric strip. To that end, the nozzle **24** is mounted on a shaft **45** which extends through an opening **46** in the end wall of the

hopper 21 and can slide relative thereto. The shaft 45 can be reciprocated in any suitable way, as, for example, by means of an air cylinder or a hydraulic cylinder, but the mechanical drive disclosed herein is preferred for the reason that it is less susceptible to damage by the abrasive grits which may escape from the hopper 21, and the mechanical drive can be timed more accurately. As shown in FIGURES 1, 2 and 4 the shaft 45 is supported at two points by means of downwardly extending brackets 46 and 47 on a carriage 48 including pairs of rollers 49 and 50 and 51, 52 which bear against the upper and lower edges of a track bar 53 which extends lengthwise of the frame 10. Rollers 49 and 52 are rotatably mounted between pairs of spaced plates 54 and 55 at each end of the carriage which also form the brackets 46 and 47 for supporting the shaft 45. As shown in FIGURE 4, the brackets 46 and 47 are connected by means of the carriage plate 56 thereby forming a rigid unit which is capable of movement along the track bar 53 with a minimum of tilting or chattering.

The carriage 48 is adapted to be connected selectively to the upper and lower flights of a chain 57 which extends around an idler pulley 58 and a drive pulley 59 rotatably mounted adjacent the opposite ends of the track bar 53. The pulley 59 is mounted on a shaft 60 which has a clutch plate 61 fixed to it. An opposing or cooperating clutch plate 62 is carried by a sprocket that is rotatably mounted on the shaft 60 but normally biased against the clutch plate 61 by means of a spring 64, and forms therewith a friction, slip clutch.

As shown in FIGURE 2, the sprocket 63 is driven by means of an electric motor 56 and a reduction gear 66 and a sprocket and chain drive 67, 68. A platform 69 is mounted on the frame 10 for supporting the motor 65 and the reduction gear unit 66 below the track bar 53 and the carriage 48.

As indicated above, the carriage 58 is connected selectively to the upper or lower flight of the chain 57 to cause it to be reciprocated lengthwise of the track bar. To that end, the carriage includes a vertical slide member 70 having lateral flanges 71 and 72 which are received behind the undercut edges of the spaced apart plates 73 and 74 which are mounted on the carriage plate 56, thereby enabling the slide to move up and down. Fixed to the slide are tooth sections 75 and 76 which are adapted to mesh with the links of the chain 57, but are spaced apart a distance less than the spacing between the upper and lower flights of the chain so that when, for example, the tooth section 76 engages the lower flight of the chain 57, the tooth section 75 is out of engagement with the links of the upper flight of the chain. As shown in FIGURES 2 and 5, the slide member 70 can be shifted vertically by a shifter mechanism which includes a second slide member 78 disposed in a notch 79 in and between the ends of the vertical slide 70. The slide member 78 is supported and guided by the plates 73 and 74. At about the mid-portion of the slide 78 are pivotally mounted a pair of bell cranks 80 and 81, which are biased towards the stop pins 82 and 83 on the slide 78 by means of the springs 84 and 85 which have their outer ends attached also to the slide 78. As shown in FIGURE 5, the ends of the bell cranks project laterally beyond the edges of the slide plate 78 and to accommodate them, the supporting plates 73 and 74 have recesses 86 and 87 therein. Therefore, the bell cranks can be withdrawn alternately into the recess 86 and 87 when they are in contact with their corresponding stop pins 82 and 83.

Also, as illustrated in FIGURES 2 and 5, the width of the slot 79 in the vertical slide 70 is about equal to the width of the horizontal slide 78 and the length of the projecting end of one of the bell cranks 80 or 81. The slide 70 is reciprocated as follows by the operation of the structure just described. With the carriage 48 and with the horizontal and vertical slides in the position shown in FIGURE 2, the nozzle 24 is at the end of a stroke following a sand blasting operation. The motor 65 is in operation and the sprocket 63 is driven but the clutch 61, 62 slips so that no motion is imparted to the chain 57 and the carriage 48 is stationary. Assuming that the operator slips the edge of a piece of abrasive coated fabric under the cover strip 25, and overlying the slot 23, the apparatus is then set into operation as follows.

Adjacent to the right-hand end of the horizontal slide 78 is a vertically extending lever 90 which can be rocked by means of a foot pedal in a counterclockwise direction into engagement with the right-hand end of the horizontal slide 78, thereby pushing it to the left. As the slide 78 moves to the left as shown in FIGURE 5, the bell crank 80 slides laterally toward the recess 86 while the bell crank 81 engages the vertical slide adjacent to the upper right-hand end of the slot 79 and is rocked in a clockwise direction tensioning its biasing spring 85. When the end of the bell crank 80 clears the vertical slide 70, the bell crank 81, due to its inclination and the biasing effect of the spring 85 cams the slide 70 upwardly until the bell crank 81 can snap into engagement with the upper edge of the slot 79, thereby locking slide 70 against downward movement. Upward movement of the slide 70 engages the tooth portion 75 with the chain 57. Inasmuch as the upper flight of the chain 57 is driven towards the left as viewed in FIGURE 2, the carriage 48, the shaft 45, and the nozzle 24 supported thereon move therewith to the left. At the same time, the micro-switch 91 which is held open by the switch actuator 92 mounted on the carriage 48 closes. Switch 91 is connected in series with switch 43 between a source of electrical energy and a solenoid controlled air valve (not shown) by means of which air is supplied to or shut off from the nozzle 24. Accordingly, when the clamping head 36 is lowered by pressing and holding the switch 37 closed and the switch 91 is closed in response to movement of the carriage 48, air is supplied to the nozzle 24 and a sand-blasting operation is initiated. The carriage and the nozzle move lengthwise of the slot until the now projecting left-hand end of the horizontal slide 78 engages a reversing finger 93 (FIGURE 1) which is mounted for adjustment lengthwise of the frame 10. Continued movement of the carriage 48 to the left causes it to move relative to the horizontal slide bar 78 which thereby disengages the bell crank 81 from the slide 70 and causes the bell crank 80 to cam the slide 70 downwardly. The carriage 48 is then connected to the lower flight of the chain 57 and is moved to the right until the carriage reaches the position shown in FIGURE 2 where it engages an abutment 95 (FIGURE 2) and is stopped thereby. Slippage between the clutch element 61 and 62 enables the motor to continue in operation until another cleaning cycle is started.

As the carriage approaches the abutment 95, a switch actuator 92 on the carriage 48 opens the switch 91 and thereby actuates the solenoid valve to shut off air to the nozzle 24. The switch 37 is released to allow the clamping head to raise. It will be understood that the switch 37 can be used to actuate a relay or may be of the type requiring separate manual operations to move it to "closed" position and "open" position so that the operator need not hold it closed during a sand blasting operation.

The cleaned fabric can be removed from the table 22 when the clamping head 26 is raised.

It will be understood that the movement of the nozzle along the slot 23 can be adjusted by properly timing the operation of the motor and by providing appropriate reduction gearing between the motor and the chain 57. Moreover, the extent of movement of the nozzle along the slot can be varied by adjusting the position of the reversing finger 93. Likewise, the sand blasting operation can be varied in intensity by varying the air blast and the type of abrasive grains used in the operation. Therefore, it will be understood that the form of the invention disclosed herein is susceptible to considerable modification

in its operation and structure and that the form of the invention described is illustrative.

I claim:

1. Apparatus for cleaning an end of a strip of coated fabric comprising a table having a slot therein, hopper means in sealed relation with one side of said table and encompassing said slot, clamping means on the opposite side of said table for positioning and holding said fabric with an end thereof overlying said slot, a nozzle disposed within said hopper means for directing a stream of abrasive grits through said slot against the fabric, and means for moving said nozzle lengthwise of said slot at a predetermined speed and within said hopper means.

2. Apparatus for cleaning an end of a strip of coated fabric comprising a table having a slot therein, hopper means in sealed relation with one side of said table and encompassing said slot, means on the opposite side of said table for positioning said fabric with an end thereof overlying said slot, means for clamping said fabric against said table and engaging said fabric and said table around said slot, a nozzle disposed within said hopper means for directing a stream of abrasive grits through said slot against the fabric and means for moving said nozzle lengthwise of said slot at a predetermined speed and within said hopper means, said clamping means and hopper means in combination confining abrasive material from being scattered around and contaminating adjacent equipment.

3. Apparatus for cleaning an end of a strip of coated fabric comprising a table having a slot therein, hopper means in sealed relation with one side of said table and encompassing said slot, clamping means on the opposite side of said table for positioning and holding said fabric with an end thereof overlying said slot, a nozzle disposed within said hopper means for directing a stream of abrasive grits through said slot against the fabric, a shaft supporting said nozzle, and means for moving said shaft axially to move said nozzle lengthwise of said slot and within said hopper means.

4. Apparatus for cleaning an end of a strip of coated fabric comprising a table having a slot therein, hopper means in sealed relation with one side of said table and encompassing said slot, clamping means on the opposite side of said table for positioning and holding said fabric with an end thereof overlying said slot, a nozzle disposed within said hopper means for directing a stream of abrasive grits through said slot against the fabric, a shaft supporting said nozzle and movable through a wall of said hopper means, but in sealed relation therewith, means supporting said shaft for movement axially thereof, an endless chain having upper and lower flights extending substantially parallel with said shaft, and means on the shaft supporting means for connecting the latter alternately to said upper and lower flights to reciprocate said nozzle lengthwise of said slot and within said hopper means.

5. Apparatus for cleaning an end of a strip of coated fabric comprising a table having an elongated slot therein, hopper means in sealed relation with one side of said table and encompassing said slot, clamping means on the opposite side of said table for clamping a strip of fabric to said table with an end of said strip overlying said slot, a track member extending substantially lengthwise of said slot, a carriage mounted on said track member for movement therealong, a shaft fixed to said carriage, a nozzle mounted on said shaft and movable with said carriage along said slot but within said hopper means for directing a stream of abrasive grits through said slot against said fabric said shaft being movable through a wall of said hopper means but in sealed relation therewith, a chain adjacent to said track member and having upper and lower flights, means for driving said chain at substantially constant speed, and means on said carriage for selectively connecting said carriage to said upper and lower flights to reciprocate said nozzle lengthwise of said slot.

6. The apparatus set forth in claim 5 comprising adjustable means on said track member for regulating the movement of said nozzle lengthwise of said slot.

7. The apparatus set forth in claim 5 comprising means for actuating said clamping member to clamp said fabric to said table, and means responsive to actuation of said clamping member and movement of said carriage along said track member in one direction from a starting point for supplying air to said nozzle for directing grits through said slot.

8. The apparatus set forth in claim 5 comprising means for actuating said clamping member to clamp said fabric to said table and for releasing said clamping member, means responsive to actuation of said clamping member and to movement of said carriage along said track member in one direction from a starting point for initiating operation of said nozzle to direct grits through said slot, and means responsive to return movement of said carriage to said starting point for discontinuing operation of said nozzle.

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