May 3, 1960 R. S. SCHAAB ET AL 2,934,809

ELECTRIFIERS FOR THE PROCESSING OF FUR AND PILE FABRICS

Filed Dec. 14, 1954 7 Sheets-Sheet 1

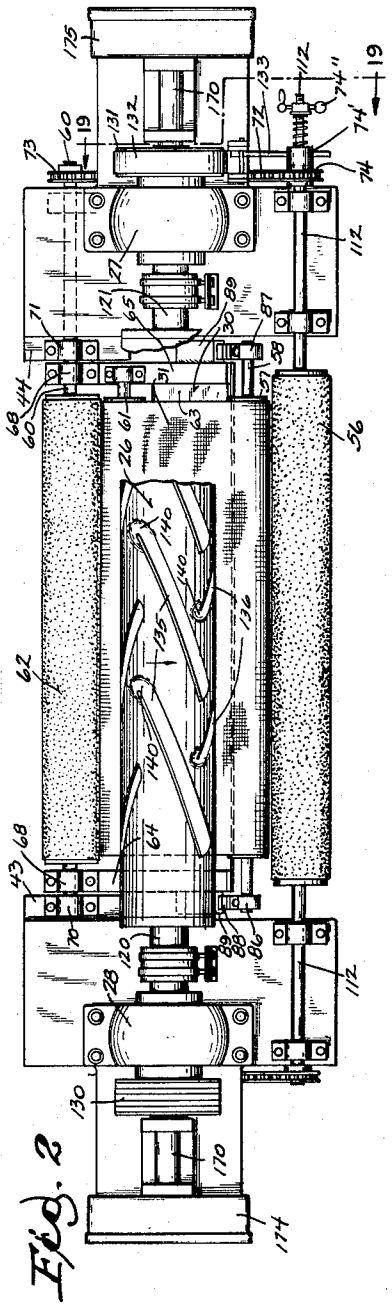

Fig. 2

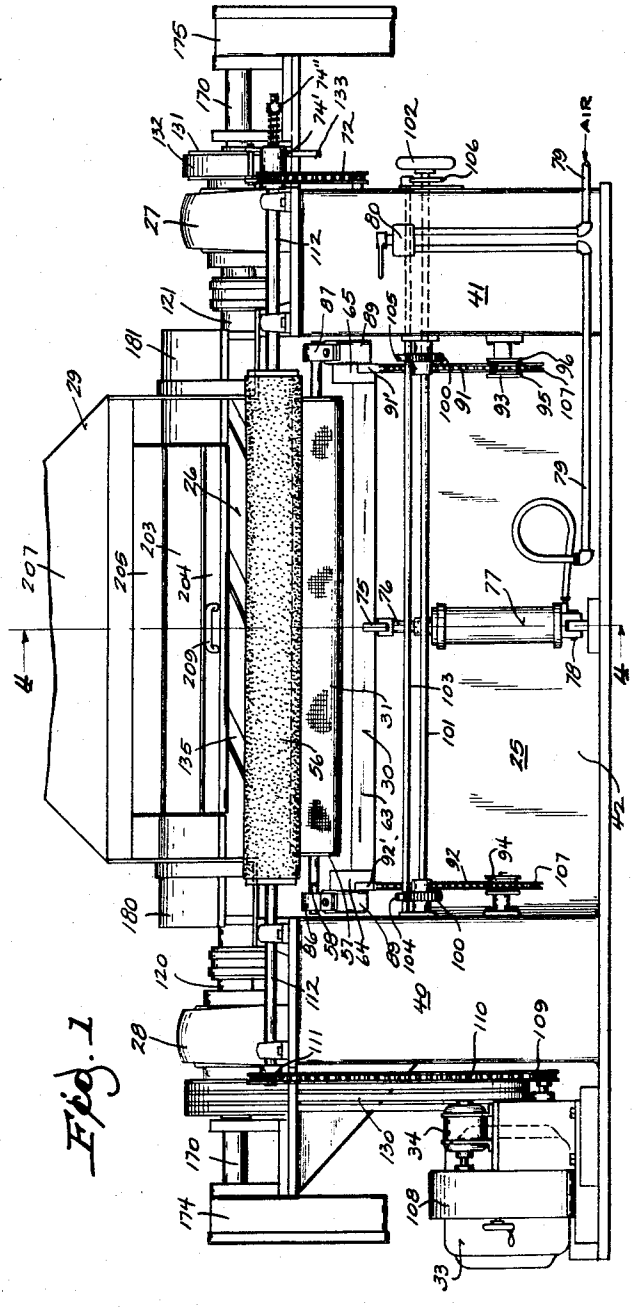

Fig. 1

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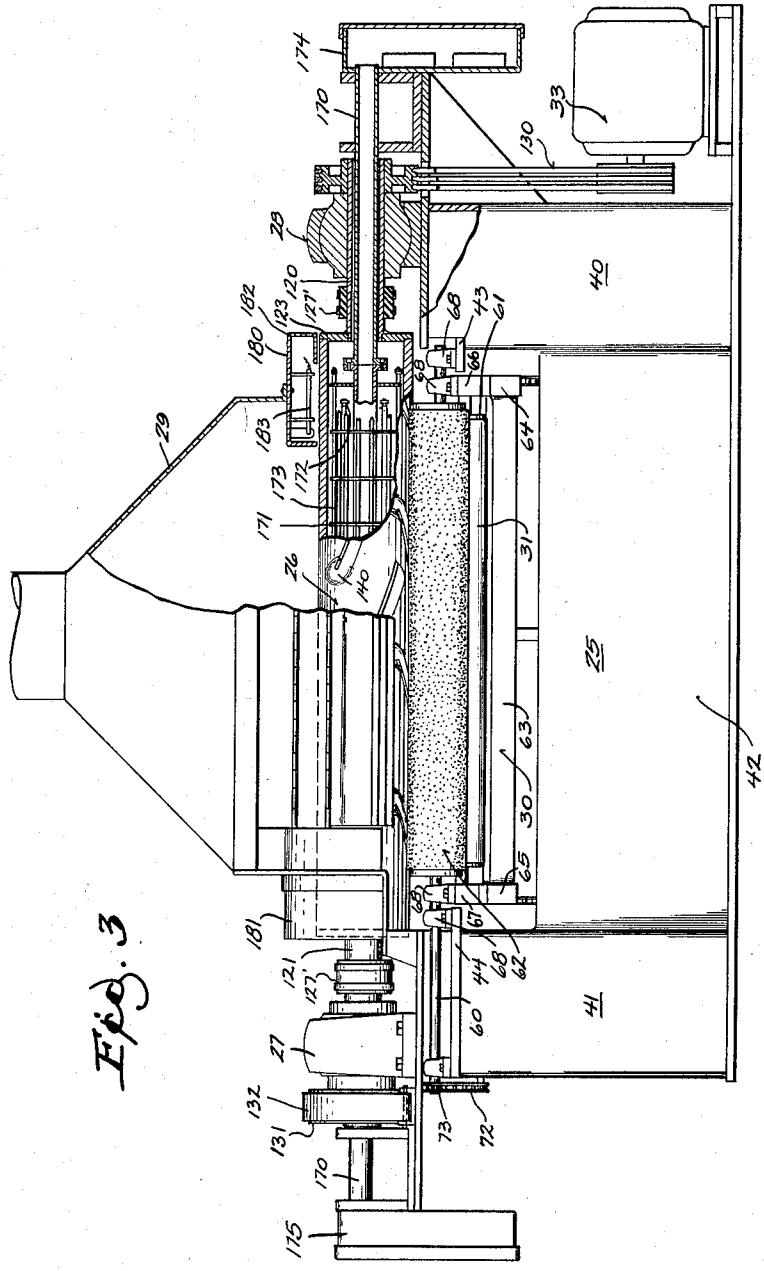

Fig. 3

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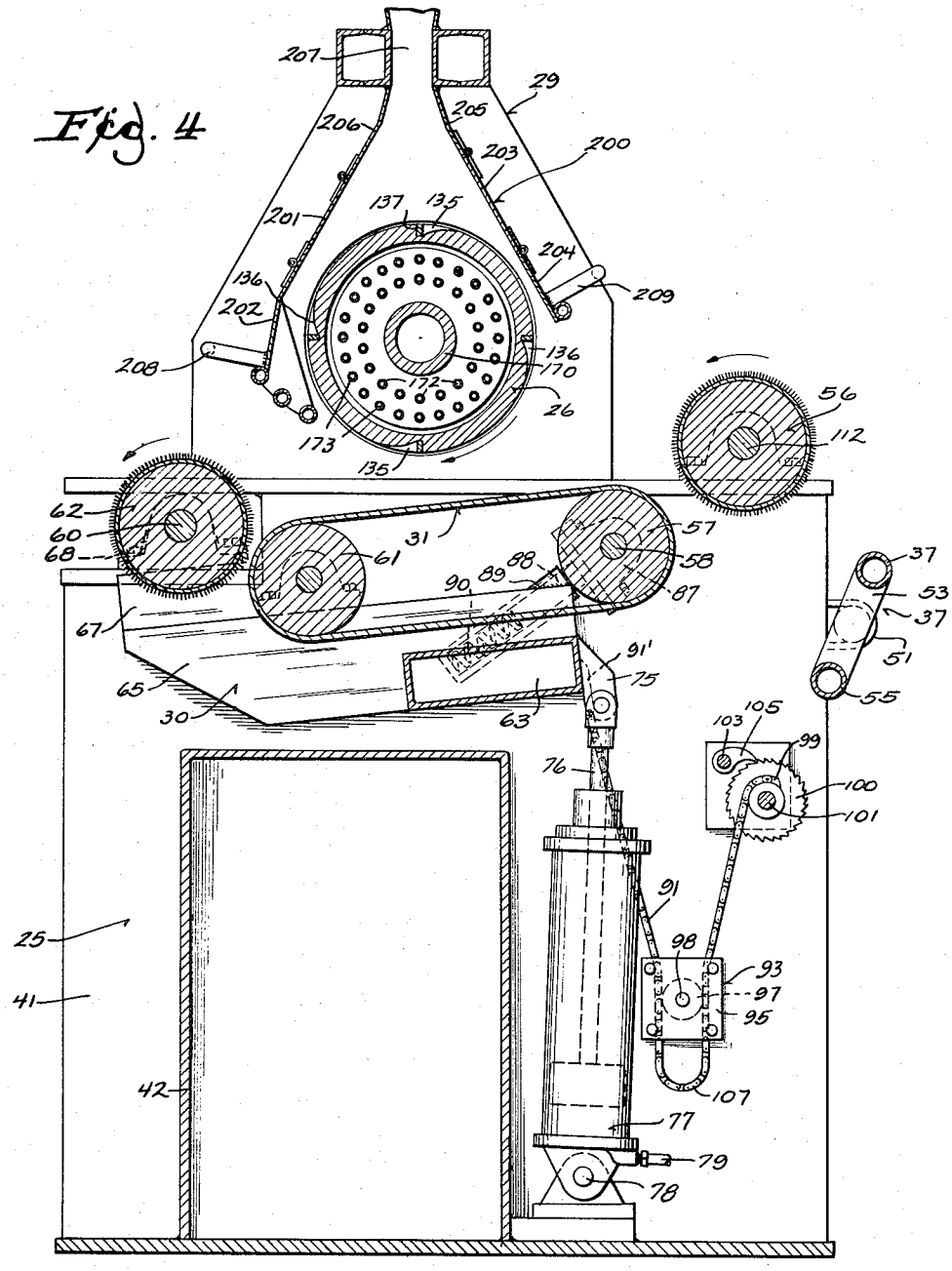
Fig. 4



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ELECTRIFIERS FOR THE PROCESSING OF FUR AND PILE FABRICS

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Fig. 5

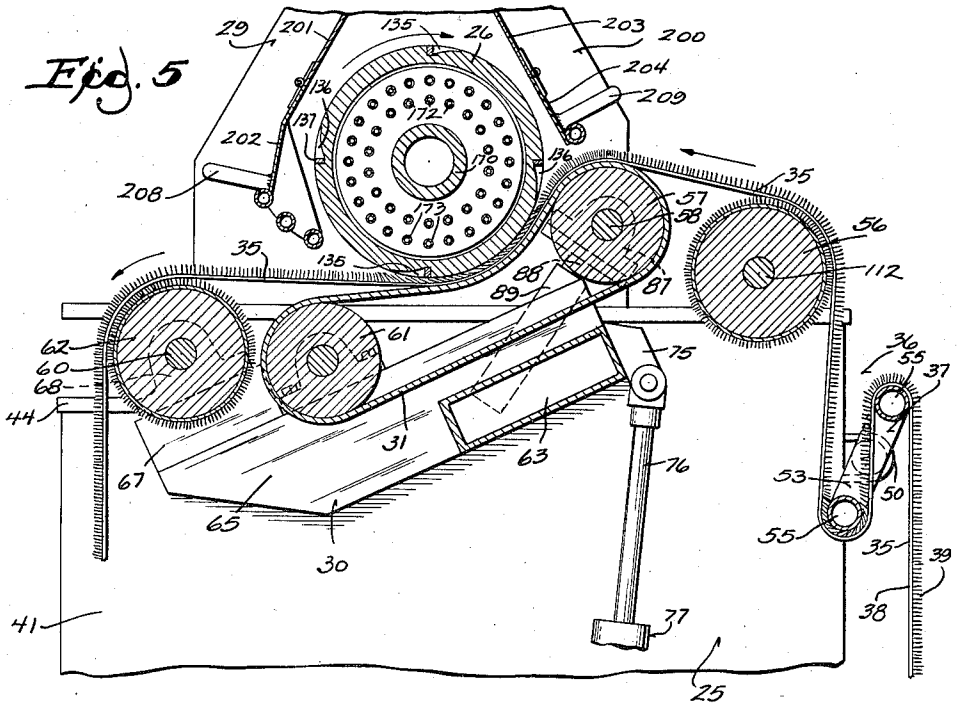
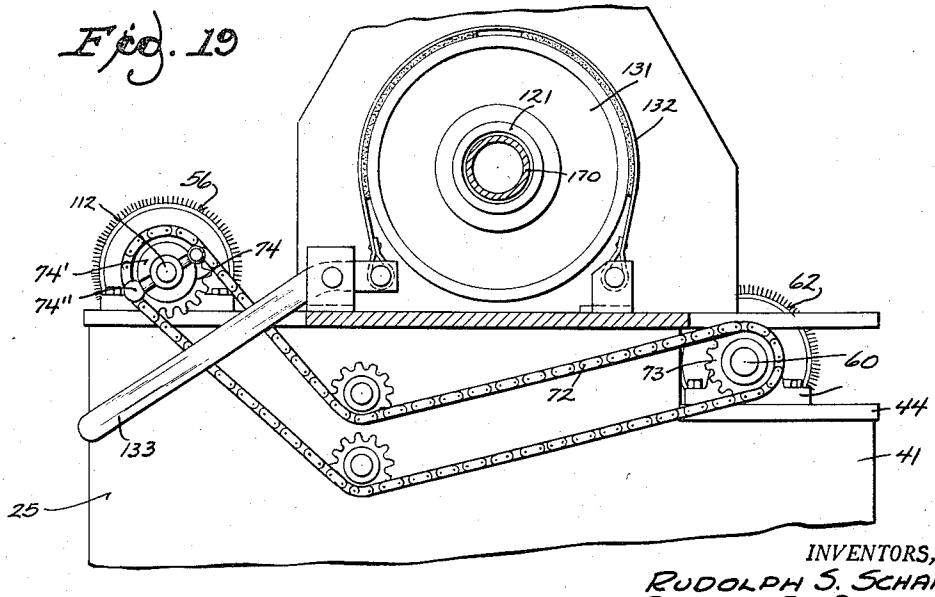


Fig. 19



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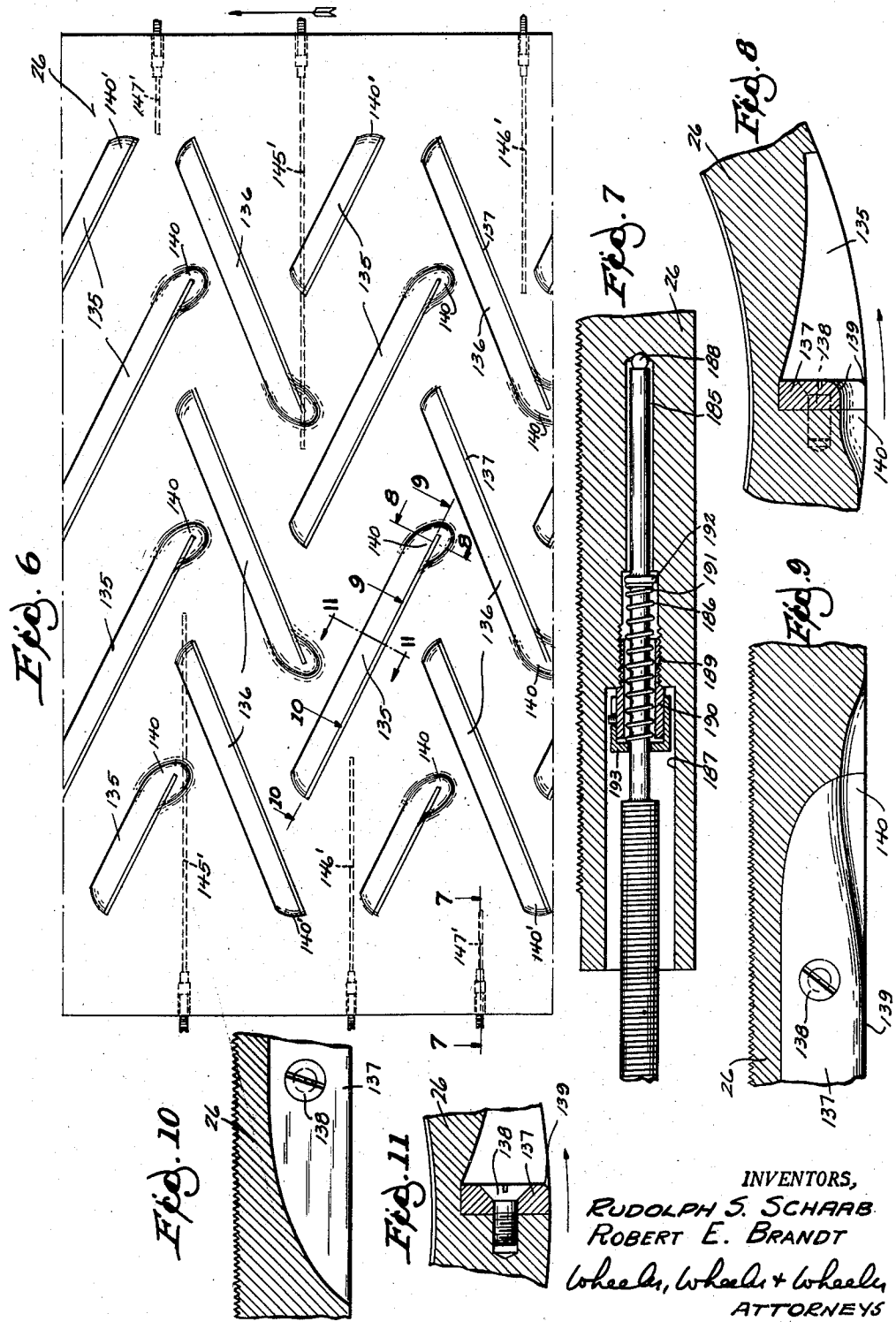

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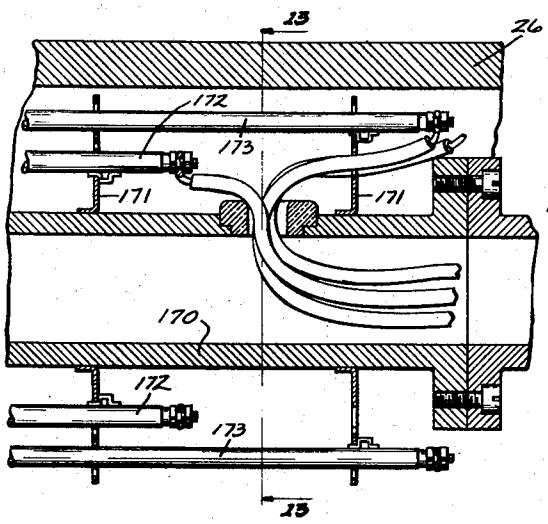

Fig. 12

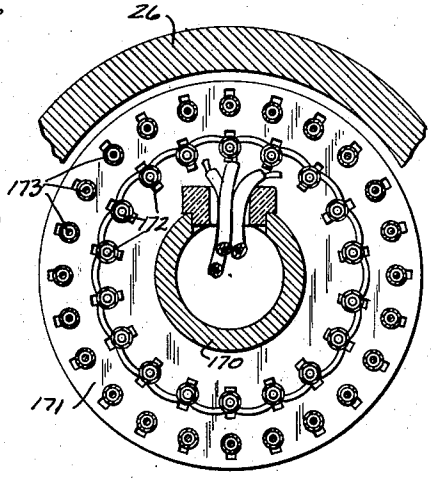

Fig. 13

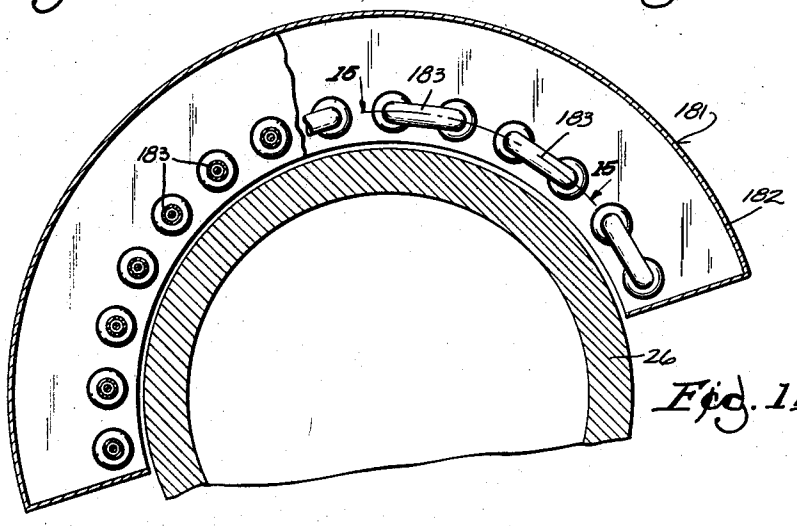

Fig. 14

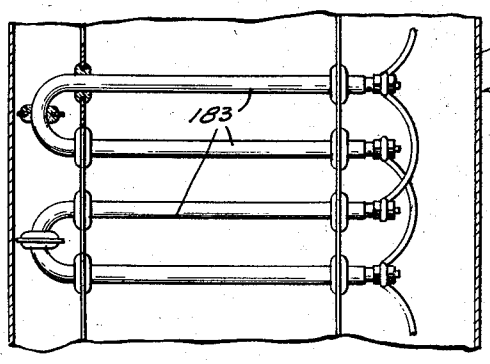

Fig. 15

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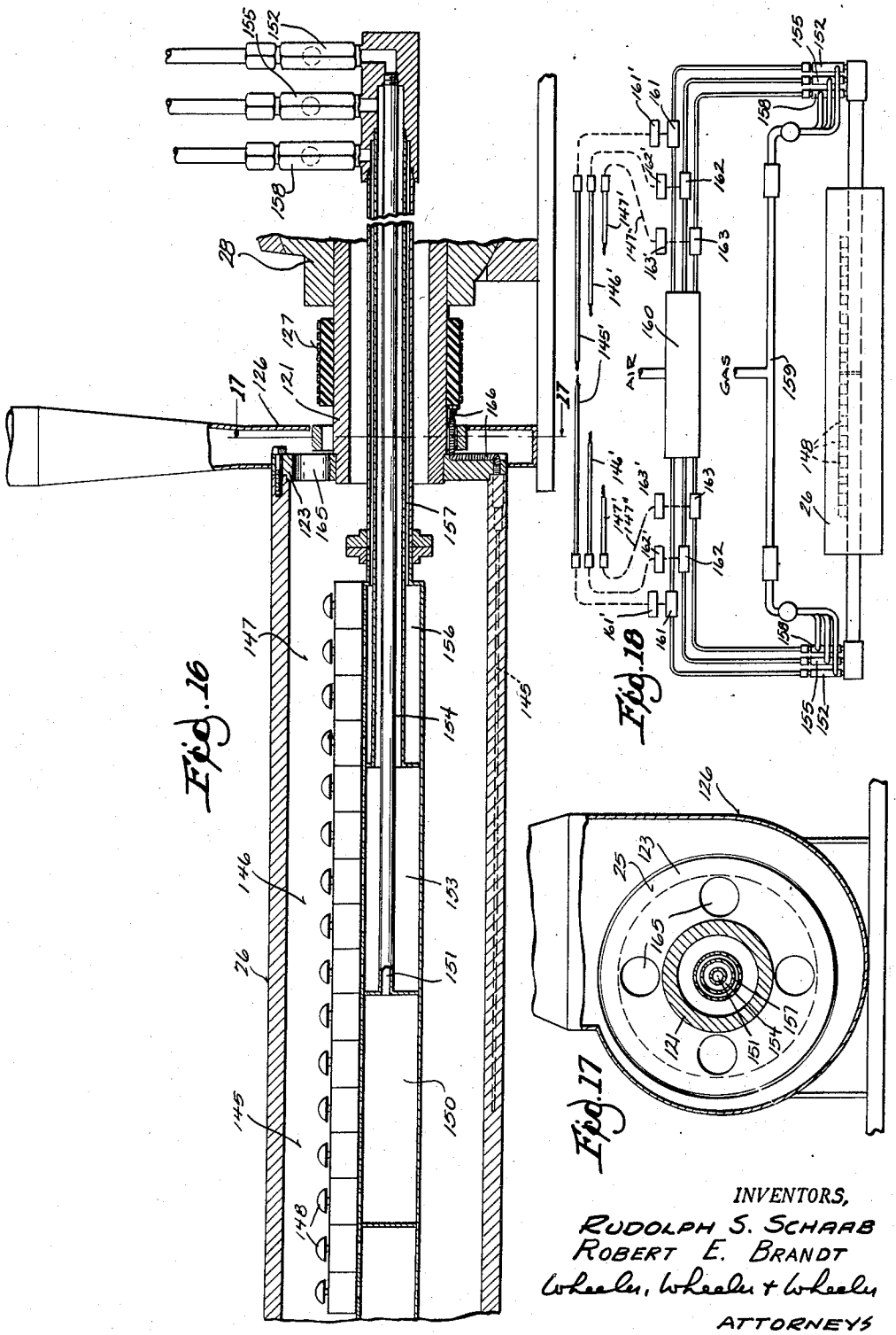

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United States Patent Office 2,934,809 Patented May 3, 1960

2,934,809

ELECTRIFIERS FOR THE PROCESSING OF FUR AND PILE FABRICS

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Application December 14, 1954, Serial No. 475,172

1 Claim. (Cl. 26—2)

This invention relates to improvements in electrifiers.

In the processing of pile fabrics, fur, and similar yardage to place the fur or pile in the proper finished condition, a machine known as an electrifier is used. Generally speaking, the function of an electrifier is the brushing, combing, beating, and polishing or ironing, which is accomplished by the application to the pile or fur of a rapidly rotating heated roll which has a grooved surface as will be described below. The work pieces are fed to the roll with the pile or fur faced toward the roll, and an apron of canvas or other suitable material in the shape of a conveyor is so mounted with respect to the roll that the fabric is fed between the apron and the roll.

The temperature of the surface of an electrifier roll usually must be very critically controlled, and one of the important features of the instant invention is the control of surface temperature not only with reference to the general temperature of the working area of the roll, but also the temperature of each portion of that area. It has been found that there are many factors causing variation of the temperature of specific parts of the roll. For instance, in a roll 77 inches in length, it is impractical to actually apply heat to more than approximately 67 inches of that length. Then, too, in a particular fabric treating operation, the fabric may be of less width than the 67 inch portion of the roll which is receiving direct heat from the heating source. Furthermore, it has been found that the end portions of the roll sometimes need a greater heat supply because the fabric marginally applies less pressure against the roll, and, if the fabric is moist, the heat requirements are different adjacent the edge of the material than they are more centrally of the length of the roll. Furthermore the friction between the roll and the fabric develops some heat and is variable.

A feature of the invention is the application of heat to the interior of the electrifier roll with zoning of the heat generation and special control for such zoned heat generation plus an application of heat exteriorly to the roll.

Another feature of the invention relates to the application of pressure with which the fabric or fur is applied against the electrifier roll, and this involves not only a special mounting of the apron, but also the adjustment of the apron toward and away from the roll with what may be termed micrometer adjustment and the limitation of movement of the apron toward and about the roll. This phase of the invention also relates to the timing of the application of the material to the roll since the apron control functions to determine "wrap-around" of the apron, and, therefore, the time during which the material is treated as it is fed against and past the roll.

Another feature of the invention relates to the ventilation, aeration and humidifying apparatus for maintaining proper ambient conditions under a hood in which the electrifier roll is operated.

Finally, there is a very important feature of the invention involved in the grooves of the roll itself whereby any tendency of the roll to streak the surface of electrified fabric or fur is eliminated. Previously, it has been impossible to treat certain materials in an electrifier without a resulting streaking of the treated surface in the direction of travel of the material. This invention includes novel surface configuration of an electrifier roll whereby to avoid such streaking.

In the drawings:

Fig. 1 is a front elevation of the electrifier embodying this invention. The top portion of the hood being foreshortened.

Fig. 2 is a plan view of the electrifier shown in Fig. 1 but with the hood removed to expose the electrifier roll and other apparatus normally housed by the hood, a portion of the right end of the electrifier roll being broken away to disclose apparatus therebeneath.

Fig. 3 is a rear view of the electrifier with a portion of the hood broken away and parts of the electrifier being shown in section to disclose electrical heating mechanism within the roll.

Fig. 4 is a section on line 4—4 of Fig. 1, parts of the pneumatic apron cradle actuation mechanism being shown in dotted lines.

Fig. 5 is a view somewhat similar to Fig. 4 but showing the apron cradle in upper position and showing some yardage of pile fabric as it is fed through the electrifier.

Fig. 6 is a developed view of the surface of the electrifier roll and showing the grooves as they would appear if the surface of the roll were laid out flat.

Fig. 7 is a section on line 7—7 of Fig. 6 and showing a thermocouple embedded in the surface of the roll.

Fig. 8 is a section on line 8—8 of Fig. 6 to show the contour and curvature of a groove.

Fig. 9 is a section on line 9—9 of Fig. 6 and showing features of the groove related to the elimination of streaking of treated surfaces.

Fig. 10 is a section on line 10—10 of Fig. 6.

Fig. 11 is a section on line 11—11 of Fig. 6.

Fig. 12 is an enlarged fragmentary detail of a portion of an electrically heated roll.

Fig. 13 is a cross-section showing fragmentarily the disposition of heating elements in an electrically heated roll.

Fig. 14 is a fragmentary end view of an arcuate shaped supplementary heating element for the end portion of an electrifier roll.

Fig. 15 is a section on line 15—15 of Fig. 14.

Fig. 16 is a vertical section through a gas heated electrifier roll and portions of the shaft and bearing support therefor.

Fig. 17 is an end elevation of the evacuator flue and end closure member for a gas heated electrifier roll.

Fig. 18 is a diagrammatic view of the electrical connections and gas burner feed apparatus of the type of electrifier roll shown in Fig. 16.

Fig. 19 is a section on line 19—19 of Fig. 2.

The larger structural elements of the electrifier include a frame 25, an electrifier roll or cylinder 26 revolubly mounted in suitable pillow blocks 27 and 28 carried by the frame, a hood 29 to cover the cylinder and working zone of the machine, an oscillatable cradle frame 30 to carry mechanism which supports and adjusts a belt-like apron 31 used to carry and apply work pieces against the cylinder, and heating control means (Figs. 11–17) for the cylinder. A large motor 33 drives the cylinder, and a smaller motor 34 drives the feed rolls.

In this description, the work to be performed by the electrifier will be assumed to comprise the electrification of pile fabric 35 shown somewhat diagrammatically in Fig. 5 as it enters the machine at 36 over a tension bar 37. It will be understood that the web of pile fabric 35 is approximately 56 inches wide, and includes a base

of textile or knitted material 38 having a pile 39 of natural or synthetic fibers. Obviously the electrifier may also be used to work upon many types of natural or synthetic fabrics, furs and other webs of material.

The frame

Although it is not considered that features of the frame 25 include patentable subject matter, it will clarify the description below to have it initially understood that the main frame includes spaced pedestals 40 and 41 at the left and right respectively as viewed from the front or input face of the electrifier. Between these pedestals there extends a box-like stretcher 42 the dimension of which, as to height and depth are less than the pedestals. The pedestals are symmetrically rectangularly box-like except for a lower shelf-like portion at 43 (pedestal 40) and 44 (pedestal 41) for the support of the shaft of an output feed roll as will be described below.

Work feeding mechanism

The broad purpose of the work feeding mechanism is to advance the web 35 of material through the machine and against the rotating cylinder 26. Compensation for shrinkage or expansion of the web, adjustment of the extent of "wrap-around" of the web in relation to the cylinder, control of pressure of the web against the cylinder are some of the problems to be met by this mechanism.

The first guiding element over which the web 35 is fed is the set of tension bars 37 referred to above. It is carried in bearings of which the bearing 50 shown in Fig. 5 comprises the bearing at the right of the frame. This bearing and its corresponding bearing at the left of the frame are mounted to the respective frame pedestals. Bars 55 forming the set of tension bars are not power rolls. They are supported by the rockers of which rocker 53 at the right-hand end is shown in Fig. 4.

From the rocker bars 55 the web passes to infeed holdback roll 56. This roll is power driven, as will be described below, but actually performs the function of guiding and retarding somewhat the feed of the web to the cylinder. Exteriorly the roll 56 is "clothed" with stiff bristles, usually wire, intended to pentrate the fabric 35 sufficiently to assure web travel at a rate dictated by the actual surface speed of the roll.

From roll 56 the web passes to pressure roll 57 the shaft 58 of which is adjustably and resiliently mounted from cradle 30. Cradle 30 is a frame-like member oscillatable about shaft 60. It not only carries the pressure roll but also an idler roll 61. Output roll 62 is mounted on shaft 60 as described below.

The cradle has a stiff, box-like cross frame member 63 provided at each end with a heavy plate 64—65 each having an upward extension 66—67 at its rear upper corner to provide a mounting for a pillow block 68 through which extends shaft 60 for output roll 62. Thus this shaft serves as power and supporting shaft for roll 62 and also, by reason of its support in pillow blocks 70 and 71 on the lower shelves of pedestals 40 and 41 provides the axis about which cradle 30 may oscillate.

Output roll 62 is clothed in the same manner as input roll 56, and both of these rolls are powered by a chain 72. A sprocket 73 on shaft 60 has twenty-three teeth and sprocket 74 on the shaft of input roll 56 has twenty-four teeth, thus assuring that the web 35 between these rolls will be maintained in tension despite stretching of the web.

The rolls 62 and 56 are of the same diameter. A spring loaded slip clutch at 74', adjustable by means of the manual crank 74'' connects sprocket 74 to shaft 112, described below, so that excessive tension on the web 35 may not be developed by reason of the faster rotation of roll 62 as compared with roll 56.

Rigidly outstanding centrally of the length of the cradle cross frame member 63 is a bracket 75 against which upward pressure is applied by a pneumatically actuated ram 76 forming part of a cylinder and piston assembly shown at 77 in Fig. 4. This assembly is based adjacent frame stretcher 42 and mounted to a pin 78 for limited oscillation as shown in the drawings. Pressure of air supplied through suitable conduits 79 under control of a hand operated supply and relief valve 80 enables the operator to force the front of the cradle upwardly or relieve the pressure and permit the cradle to oscillate downwardly as desired and under control of pressure and limit mechanism now to be described.

Shaft 58 of pressure roll 57 is mounted in bearings 86 and 87 respectively at the ends thereof. Each of these bearings is carried by a plunger 88 shown in dotted lines in Fig. 4. Each plunger is guided in a cylinder 89 provided with a compression spring 90 to bear against the plunger and force it outwardly of the cylinder, and since belt-like apron 31 is mounted on pressure roll 57 and idler roll 61, the pressure of springs 90 controls the tension of the apron.

As the pneumatically controlled cylinder and piston assembly is operated by manual control of valve 80 to swing the pressure roll and the forward part of the apron upward toward the cylinder 26 the apron, but not the roll, will ultimately bear against the cylinder, or will press the web 35 between the apron and the cylinder if a web is being fed through the electrifier. Increased pneumatic pressure in cylinder 77 will press the cradle oscillatably upwardly and a greater degree of "wrap-around" of the web against the cylinder is obtainable when springs 90 compress to permit more "slack" in the apron.

Since the pressure and increased time of contact against heated cylinder 26 are often critical in the treatment of modern fabrics and materials, a "micrometer" adjustment of the cradle is provided. This adjustment is in the form of a limit stop upon the upward movement of the cradle and apron toward the cylinder 26. The limit stop mechanism directly connected to the cradle has a pair of stop chains 91 and 92 attached to the cradle at 91' and 92' respectively. Each chain extends from the cradle downwardly to a slack box 93—94 respectively. The slack box includes two spaced plates 95—96 held apart by a spool 97 on rivet 98 and each corner of the box is provided with a through-bolt as shown in Fig. 4. The chain 91 is looped through, between the plates and around the spool, so that the end of the chain can extend upwardly to a point of attachment at 99 beside a ratchet wheel 100 keyed to a shaft 101 that extends across between the frame pedestals. Supporting bearings mounted to the pedestals carry the shaft 101 and the ratchet wheels are keyed to this shaft. At the outer face of the right hand pedestal 41 (see Fig. 1) the shaft 101 terminates in a calibrated hand wheel 102 used to turn the shaft and the ratchet wheels 100. Another shaft 103 parallel to shaft 101 has pawls 104 and 105 positioned to engage the respective ratchet wheels, and at the right of the pedestal 41 the pawl shaft 103 terminates in a short lever 106 close to wheel 102 for use in manually controlling the pawls. Thus the valve 80 may be used to pass air under pressure from supply line 79 to the cylinder 77 to push cradle 30 upwardly in an oscillating movement about shaft 60, but the limit of that movement for any particular adjustment of shaft 101 is determined by the amount of chain slack at 107 below the spool. When the slack loop is raised by the upward movement of the cradle to the limit provided by the spool, the chain prevents further upward movement of the cradle and during operation of the electrifier the valve 80 remains in position to hold the air pressure in cylinder 77 for firm, but resilient upward pressure of the apron against the cylinder 26 (see Fig. 5).

There is no power drive of the apron 31 but motor 34 and a reduction drive (such as a Reeves drive in box 108) provides power for driving the sprocket 109 connected by chain 110 to sprocket 111 on shaft 112 comprising the input roll shaft (see Fig. 1). At the other (right hand)

end of the shaft 112 is the twenty-four tooth sprocket 74 described above. This sprocket drives chain 72 for rotation of the output roll.

The cylinder

Cylinder 26 is hollow, is about 77 inches long in the particular electrifier here being described, and is mounted upon a pair of main stub shafts 120 and 121. These are tubular shafts and they extend outwardly axially of the cylinder from the point of attachment to cylinder end pieces such as 123.

Since the cylinder is 12 inches in diameter with a one inch thick outer wall, carries electric or hydrocarbon heating units and controls, and is expected to rotate at 850 revolutions per minute, it is necessary to support shafts 120 and 121 in heavy bearing supports 27 and 28 carried by the respective pedestals 40 and 41. Sufficient space is provided between end piece 123 and bearing 28 so that a flue gas evacuating shroud 126 is receivable about and adjacent the end piece. Also there is room for a slip ring assembly 127 (see Fig. 16) forming part of the heater apparatus.

Main power supply for the rotation of cylinder 26 is derived from motor 33 through V-belts 130 over appropriate pulleys on the motor shaft and cylinder shaft 120. A predetermined motor speed for rotation of the cylinder at 850 revolutions per minute is usually satisfactory since variations in treatment may be secured by means of the possible changes in feed of material and wrap-around as will be apparent from the above description and as will be seen from the description below relative to temperature control of the cylinder itself.

As a safety provision there is included in the cylinder control apparatus a hand operated brake including a brake drum 131 a contractible brake band 132 and a hand lever 133 shown most clearly in Fig. 19.

Exteriorly of the cylinder itself there are helically arranged grooves 135 and 136 shown most clearly in Figs. 2, 6, and 8 to 11 inclusive. The direction of rotation shown by the arrow in Fig. 6 establishes grooves 135 as being right hand grooves in terms of the direction in which loose fibers or moisture will be laterally moved by the "combining" action of these grooves and the associated equipment described below. Grooves 136 are left hand grooves since they "work" the surface of a treated fabric toward the left.

The material of the cylinder 26 is cut away to form a groove, and the contour of the groove is seen in the various cross sections in Figs. 8 to 12 inclusive. The "trailing" wall of each groove is abruptly radially shouldered throughout most of the groove length, and a metal wear blade 137 is mounted securely against this shoulder by means of screws 138. The exposed corner of the blade is rounded slightly at 139, since this corner provides the greatest abrasion against the treated material of any work piece and there must be no severe scraping or tearing action.

It will be noted that the trailing end of each groove which terminates interiorly of the end portions of the cylinder is peripherally enlarged at 140 to provide a spreader zone. This configuration is distinguished from the contour of the trailing end of a groove such as that at 140' at the left end of a groove 136 or at the right end of a groove 125. Here the terminal portion of a groove is merely tapered out in the simplest manner by lifting the milling cutter fairly abruptly in the manufacturing process.

Continuous straight grooves parallel with the axis of the cylinder, or at an angle less than 20 degrees to said axis are ineffective. Furthermore, grooves may not cross one another. Therefore, since a cylinder having a diameter greater than 16 inches does not provide abrupt enough heating and combing action, it is necessary to provide interrupted, non continuous grooves, which are preferably helical, but the terminals of these interrupted grooves caused streaks. A first attempt to avoid streaking of the treated web included the staggering of the interrupted grooves so that the trailing end of each succeeding groove and wear plate 137 applied to the material would not perpetuate the streak, but this alone was not enough. It was then discovered that the flared and shallower trailing ends corrected the streaking tendency.

The flared groove ends have an exceedingly important function. If they are not provided, the material being treated will be streaked. With the flared groove ends 140 no streaking results from an electrification even though moisture treatment of the fur or fabric accompanies or precedes the electrification process. It is believed that a spreading of wiped moisture at the trailing ends of the grooves has something to do with the success of a non streaking cylinder equipped with these flared groove ends.

In the particular cylinder shown in the drawings, the cylinder is 12 inches in diameter, the grooves are 24 inches long and two inches wide. The dimensions of the developed view in Fig. 6 are proportionately accurate.

The heater

Because portions of cylinder 26 dissipate heat faster than others during a working period, and because accurate control of heat is an extremely important requirement for successful electrification especially where synthetic fibers in modern fabrics are to be treated, the heating means and controls, therefore, are an important feature of this invention.

The hollow interior of the cylinder 26 is divided into zones, which will be described initially in connection with the gas burner source of heat as shown in Figs. 16 and 18, although it will be understood that many of the principles discussed will apply as well where electrically heated elements such as Calrods are used.

In the gas heated cylinder, one half of which is shown in Fig. 16, there are six zones of which zones 145, 146 and 147 are shown. Each has a set of individual burner heads, of which 148 is an example and it is fed with a gas and air mixture suitable for efficient combustion as it issues at the head 148. A chamber 150 below the heads in zone 145 receives fuel from fuel tube 151 extending parallel with and along the axis of cylinder 26 from a proportional mixer valve 152 at the extreme right end of tubular shaft 121. It will be understood, of course, that the burners and these fuel feed tubes do not rotate with the cylinder.

The burners in zone 146 receive their fuel from chamber 153 supplied by conduit 154 annular in cross section and extending from mixer valve 155. And burners in zone 147 have fuel supply chamber 156 connected by conduit 157 supplied by proportional mixer valve 158.

As shown in the diagram, Fig. 18, the mixer valves receive their gas through a conduit 159 and their air supply through a conduit 160, and it is a feature of the burners and mixers here shown (and being no part of the instant invention) that it is possible by controlling the supply of air to any one of the mixer valves 152, 155 or 158 to assure proper volumetric mix for burner consumption. Therefore, a separate air valve at 161 for mixer 152, an air valve 162 for mixer 155 and air valve 163 for mixer 158, each need only be controlled by a thermocouple located in accord with this invention to dictate the proper supply of heat to the respective zones of the cylinder 26 when coupled to electronic controls as at 161', 162' and 163'.

Assuming, therefore, as is so often the fact, that zone 147 at the end of the cylinder requires more heat, a thermocopule 147' embedded in that portion of the outer wall of the cylinder will cause to close a circuit 147'' as shown in Fig. 18 to open air valve 163 wider for greater air supply to mixer 158, thus supplying a larger fuel volume to burners 148 fed through the conduit 157 and chamber 156.

Other thermocouples corresponding in position to zones

145 and 146 are shown at 145' and 146'. They control the respective mixers for the corresponding zones.

As indicated above, there is a set of slip rings at 127. These are individually connected to the thermocouples as indicated at 166 and are served by appropriate brushes to pass current in accord with the circuits shown in dotted lines in Fig. 18.

Figs. 16 and 17 show the means for evacuating flue gases from the cylinder. Ports 165 through the end piece 123 vent the gases to the shroud 126 and this is provided with a flue pipe served by an evacuating fan (not shown).

To accomplish the same zoning and control of heat with electrical means as shown in Figs. 12–15 inclusive and Fig. 3, a strong supporting carrier tube 170 made up in suitable coupled sections extends non-rotatively through the tubular shafts 120 and 121 and completely axially through the cylinder 26. This supporting carrier not only provides a mounting for Calrod grids 171, but it provides a conduit for the electrical leads extending to Calrods for zones of heat dissipation. The Calrods are grouped as to short and long heat elements 172 and 173 to serve the zones, but it is novel to arrange the heater elements annularly as shown in Figs. 12 and 13.

The various leads to conduct current to the elements 172—173 extend to junction boxes 174—175 at each end of the tube 170 where appropriate controls connected to the thermocouples assure accurate heating of the respective portions of the surface of the cylinder.

It has been found to be of special value for supply of heat to the end zones of the cylinder to provide semi-annular oven-like heaters 180 and 181 encompassing part of the ends of the cylinder. In these, the heating elements are arranged as shown in Figs. 14 and 15 as will be readily understood. The housing 182 provides radiant reflector surfaces directing the heat of the elements against the surface of the roll, and the control of the elements 183 directly from a thermocouple such as 147' assures quick and accurately supplied requirements.

It will be noted in the drawings that the electrical heating means such as Calrods are arranged in a pattern (Figs. 12 and 13) of long elements 173 (for instance, 24 in number) and of short elements 172 (for instance, 18 in number). To control such a pattern of heat producing elements, it has been found especially effective to group fifteen long elements 173 and all the short elements 172 on one circuit to be controlled by thermocouples 145', and to group the remaining (nine) long elements and the semiannular reflective heaters 180 and 181 on another circuit controlled by thermocouples 147'. Thus the end portions of the cylinder can receive additional heat as needed.

Figure 7 shows the manner in which the thermocouples are inserted in the wall of the cylinder 26 each in a bore 185, counterbored at 186 and doubly counterbored at 187. The extreme tip 188 of the thermocouple unit abuts the inner extremity of the bore and the counterbore wall is threaded at 189 to receive a bayonet sleeve 190. This provides a receptor for a compression spring 191 abutted against thermocouple shoulder 192 and compressed by bayonet cap 193 as will be readily understood. The bores for thermocouples 145' and 146' are very deep, and a special tool is used to apply cap 193 when the thermocouple is bottomed in its bore 185. Thus the thermocouples are situated close to the surface of the cylinder 26, but in protected housing within the bronze or other material of which the cylinder may be made.

Ventilation

Materials to be treated by this electrifier are often in such condition that fine particles or fibers are released and thrown by the action of the cylinder against them and against the surrounding fur or pile of which the material is composed. Also the treatment involves the vaporization of moisture carried by the treated material and expected, during the treatment in the electrifier, to be vaporized or at least heated to a certain degree by the heated cylinder. For the protection of the operator and to control moisture conditions adjacent the cylinder is a shroud 200 in generally inverted V shape as seen clearly in Figs. 4 and 5. The shroud 200 is made in sections 201—204 mounted on hinges as shown. At the front of the machine, the shroud sections are supported by a fixed section 205 and at the rear of the machine, the sections are supported by a fixed section 206.

At the top of the shroud 200, the narrow portion of the taper merges into the throat 207 connected to an evacuating fan (not shown), and since the lower sections are hingedly adjustable under control of an operator using handles 208—209 secured to the lowermost sections 202 and 204 respectively to adjust the opening between these sections and the surface of the cylinder 26, it is possible to provide a wide opening along the cylinder for entry of air at relatively low velocity or to narrow the opening for small volume of air and greater velocity.

The ventilation under the controls thus made possible will also have some cooling effect upon the cylinder, and this may be important at times when the heating apparatus is idle, or when the heating apparatus has been operating at full capacity just prior to a cessation of material treatment and the cylinder must be cooled at a controlled rate.

Operation

Assuming a cold cylinder, the electronic controls are set for the desired cylinder temperature for treatment of the material to be passed through the electrifier. Air and gas will then be passed through the respective fuel feed ducts 151, 154 and 157 to the chambers out of which the burner heads 148 are fed. The burner heads are lighted in any suitable manner, whether automatic or manual, and the cylinder 26 is soon brought up to the desired temperature while it is rotated by the motor 33.

As soon as the cylinder 26 is up to temperature, the thermocouples and their connected electronic controls for the respective portions will cut down the air supply and, of course, the gas supply to a pilot to stand by basis.

The operator will in the meantime adjust wheel 102 to provide the proper amount of slack at 107 in chain 91. Motor 34 will be energized to cause the input and output rolls to be operated at the correct speed as dictated by the reduction drive control at 108.

The evacuating fan for ventilation will have been actuated and feed of material over bars 55 to the input roll 56 and thence over roll 57 will be instituted as soon as valve 80 has been opened to provide air pressure in cylinder 77 for the elevation of the cradle to the desired position, as, for instance, the position shown in Fig. 5. The fabric 35 will be moved through the bite of apron 31 and cylinder 26 with contact against the cylinder governed by the setting of the ratchet controlled shaft 101. If a greater amount of slack at 107 is released by counterclockwise rotation of shaft 101 (as viewed in Fig. 4), then the thrust of the ram 76 of piston assembly 77 will raise the roll 57 to a higher position, overcoming the compression spring 90 to a degree. Obviously, a greater extent of "wrap-around" means a longer time interval in which the treated material is in contact with the cylinder, and because of the increased compression of spring 90, there is some increase in the pressure with which the material is brought to bear against the cylinder. These variables are often critical, and the operator of this electrifier is able, by adjusting chains 91 and the speed of operation of the feed rolls to obtain what may be termed a "micrometer" adjustment providing the exact treatment that is desired.

During the progress of a web of material 35 through this electrifier, the treatment may cause some stretching possibly resulting in a looseness of the web at the trailing end of the apron, but this is compensated by the slightly increased speed of rotation of output roll 62 as compared with input roll 56.

During a heavy run of wide webs of material **35**, a considerably increased requirement for heat will be encountered, and often a surprisingly large heat requirement will develop in certain portions of the surface of the cylinder. Especially this is true at the ends of the cylinder, but with the thermocouples **147'** positioned at each end zone, an accurate control is maintained automatically whereby greater gas or hydrocarbon fuel is fed to the burners in zones **147**, or, if electric elements **183** are needed to be energized to supplement electric elements at the ends of the interior of the cylinder these are "cut in" to help meet the greater heat requirements. It will be clear from the above description that the semi-annular heaters **181**, **182** supply quick automatic response to unusual demands in the area which they serve.

The direction of rotation of cylinder **26** as noted on the drawings presents each groove to the treated material in a gradual "pulling" action tending to draw the material into the groove in a "rippling" movement ending, as to each point in the material, in an abrupt rubbing or combing action by the somewhat rounded edge of blade **137**. In treatment of pile fabrics, the pile is caused to be straightened and made more erect. In fact, a newly manufactured pile fabric having a "lay" of the pile in one direction can have this lay corrected by passing the fabric through this electrifier, preferably in a direction in which the combing action referred to is contra to the lay.

As to each cylinder groove tending, by reason of its helical configuration, to wipe or comb the material centrally of the web, left or right as the case may be, such grooves end in the spread, shallow groove terminals as shown in Figs. 8 and 9. In combination with the short, helical grooves, these terminals have solved one of the most serious problems heretofore encountered in the electrification of materials. Materials have been so streaked during moist treatment, and even in some dry treatments that electrification has been unsuccessful, but with the terminals described, a streakless electrification has been regularly accomplished.

We claim:

A rotatable electrifier roll having a plurality of helically arranged grooves in its surface in sets of right and left curvature, certain of said grooves being arranged with trailing terminal portions positioned centrally of the roll, said terminal portions having widened contour relatively to the other parts of said grooves.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,934,809 May 3, 1960

Rudolph S. Schaab et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 43, for '"combining"' read -- "combing" --; line 64, for "125" read -- 135 --; column 6, line 69, for "thermocopule" read -- thermocouple --.

Signed and sealed this 4th day of October 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents