Dec. 15, 1942. E. E. WINKLEY ET AL 2,304,983

SOLE DRYING APPARATUS

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Fig. 2.

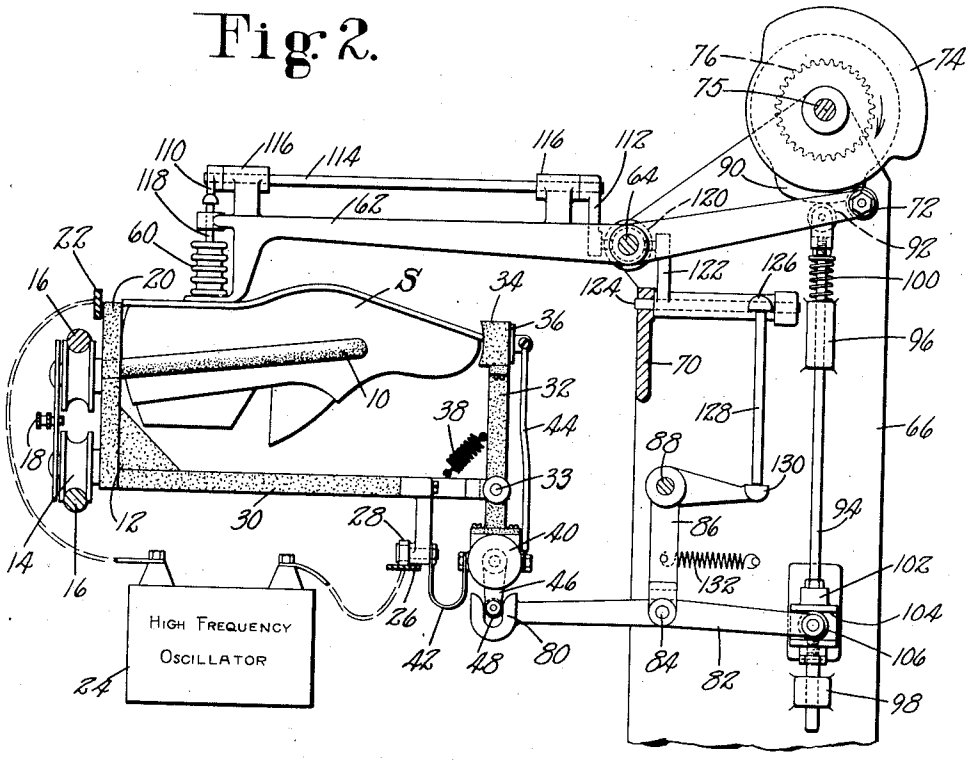
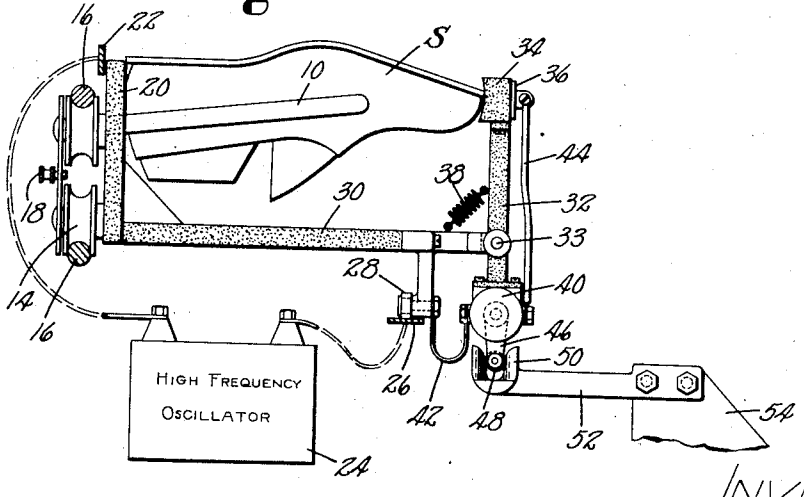


Fig. 1.



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SOLE DRYING APPARATUS

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Fig. 3.

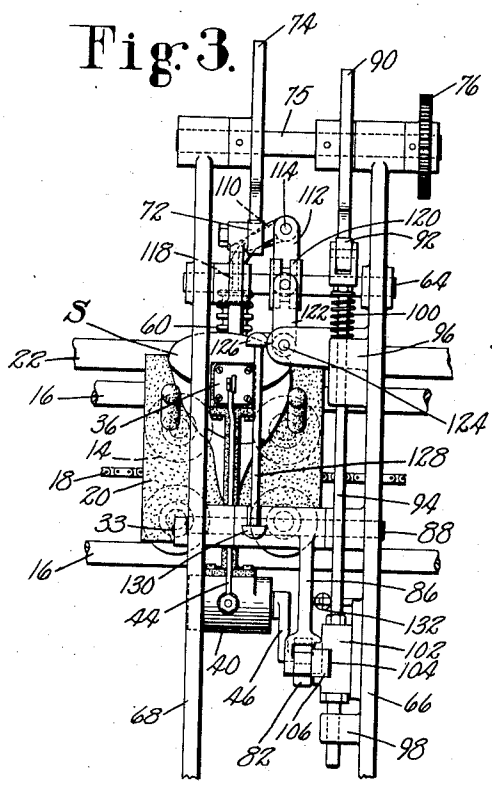


Fig. 4.

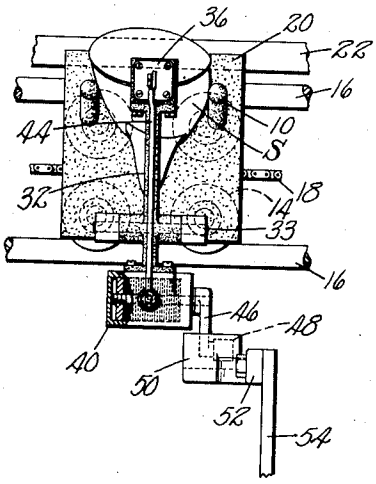
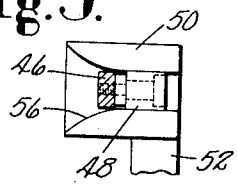


Fig. 5.



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UNITED STATES PATENT OFFICE

2,304,983

SOLE DRYING APPARATUS

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Application October 16, 1940, Serial No. 361,426

11 Claims. (Cl. 34—1)

This invention relates to apparatus for treating articles by means of an electrostatic field and is herein illustrated as embodied in an apparatus for drying shoe parts which, for ease of description, are designated herein as shoe soles, although it will be understood that the invention is also applicable to other shoe parts as well as to other articles.

In making shoes, it is desirable to have the shoe soles moist or in temper for certain operations, such as channeling, and for other operations, such as buffing, it is preferable that they be much drier. It is the practice, therefore, in many shoe factories, in order to accelerate manufacture, to provide special means for artifically drying the soles of a run of shoes. These soles will, however, differ radically in size and hence in length, and will also differ in the amount of moisture contained, irrespective of the size. This variance in water content will follow from the differences in density of various pieces of shoe leather or from the way in which they have been wet.

It has long been appreciated that a high-frequency electrostatic field may be utilized for treating articles to heat them and hence to dry them, if that is desired. However, previous devices arranged to treat a series of identical articles by passing them by conveyor through an electrostatic field between fixed electrodes in the form of fence-like plates cannot successfully be applied to the treatment of shoe soles, unless we are willing to remove from the conveyor those shoes which dry first and to permit the others to pass through the field for a longer time. This, besides involving unnecessary labor, is also disadvantageous because of the mixing up of groups or "lots" of shoes which it is desired to keep together during successive stages of manufacture.

In view of the radical difference in the lengths of soles for different sizes of shoes, any arbitrary spacing between electrodes disposed at the ends of said soles will be suitable for only a part of the sizes. If, for example, the electrodes are spaced to receive the longest soles, being brought close enough thereto to be effective without being so close as to permit sparking, then the action of the field upon soles which are much shorter will be a great deal slower because of the greater spacing between the ends of these short soles and the electrodes.

Accordingly, an important object of the invention is the provision of apparatus permitting the easy regulation of the drying effect of an electrostatic field in accordance with physical characteristics, such as the lengths, of the specific articles.

To this end the electrode arrangement is preferably such that the spacing between the electrodes is readily adjustable to accommodate individual soles. In the illustrated arrangement one of the electrodes is movable and insulators are associated with the individual electrodes which provide a predetermined spacing between the electrodes and the ends of the soles as contact is established between these insulators and the toe and heel ends of each individual sole.

Another problem arises because of the different quantity of water carried by different soles, as a large sole contains a greater volume of water than does a small one, even when the soles are tempered to the same degree. More power will then be required to evaporate the water contained in a large sole in a given time than is required to evaporate the water in a small sole in that same time. It should also be understood that the greater the amount of water, the greater will be the heating and, since the temperature limit to which wet, vegetable-tanned sole-leather may be heated without injury is fixed at about 140° F., it is evident that the amount of power that can be supplied must be limited to the amount that will heat the longest shoe or sole to a safe temperature. This being true, specific corrective apparatus should be provided or the shorter soles will be heated to a lower temperature. The adjustment of the electrodes above mentioned will tend to correct this lack of uniformity, but there is no assurance that the quantity of water contained by any two soles is proportionate to the sizes of the soles. This results from the differences in density of the soles and from the fact that the ordinary methods of tempering the sole leather are not accurate or careful so that the amount of water per unit area of leather may vary markedly in different soles.

Still another object of the invention is the provision of automatic means responsive to the temperature and hence the water content of the article to be dried for varying the electrostatic field in which the article is positioned.

With this in mind, important features of the invention reside in improved controlling apparatus associated with successive articles to the end that the action of the electrostatic field upon each article may be adjusted by the automatic means which is provided for measuring the physical condition of the article. One part of this

control apparatus measures the length of the sole and sets a controlling device for regulating the strength of the field in a position determined by the length of the sole. Another part of the apparatus measures the temperature of the sole after an initial heating period and adjusts the control apparatus to regulate the effect of the electrostatic field in accordance with the temperature of the article which will correspond to the degree of moisture therein. Inasmuch as these devices act successively, the combined effect may be additive or it may be differential as is determined by the actual physical conditions encountered.

These and other features of the invention will best be understood from a consideration of the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a transverse section through a conveyor for shoes and illustrating means for setting a controlling device at a loading station or the like;

Fig. 2 is a similar transverse section at a later, or measuring, station of the conveyor and illustrating a thermostatic device for measuring the condition of the sole after an initial heating and mechanism connected thereto for adjusting the controlling device;

Fig. 3 is an end elevation of this mechanism, which is shown in Fig. 2, looking toward the toe end of the shoe;

Fig. 4 is an end elevation, looking toward the toe end of the shoe as seen in Fig. 1; and

Fig. 5 is a detail showing a fixed bracket for gripping the handle of the controlling device as in Figs. 1 and 4.

The invention is herein illustrated and described in its application to the drying of soles upon shoes which are supported upon inclined arms 10 carried upon individual cars 12 of a conveyor. The details of construction of this conveyor are not important to the invention but for convenience it will be assumed that the conveyor is of the type illustrated in Letters Patent of the United States No. 2,132,362, granted October 4, 1938, on an application of J. E. Regan, to which reference may be had for a description of such parts of the conveyor as are not fully shown and described herein. Each car 12, as shown in the patented construction, is provided with four grooved rolls 14 (Figs. 2 and 4) which coact with spaced rails 16 mounted on a suitable frame (not shown). Movement of the cars along these rails is effected by means of an interconnecting chain 18 driven from a suitable source of power in such a manner that the motion of the conveyor is intermittent, halting the conveyor for a short interval at spaced stations such as those illustrated in Figs. 1 and 2. A rear portion 20 of each car forms an insulating spacer between the heel end of a shoe placed upon the inclined supports 10 and an electrode 22 in the form of a narrow plate which extends parallel to a run of the conveyor past a plurality of these cars. The inclination of the arms 10 makes it easy for the operator to slide a shoe against the spacer portion 20, thus insuring even spacing of the shoes from the electrode 22 which is adapted to be connected to one side of a high-frequency oscillator 24, the other side of which is joined to a horizontally disposed rail 26. This rail, extending along the conveyor run, lies beneath the cars and is contacted by trolleys 28 mounted on arms extending down from bases 30 on each of the cars 12. At the outer end of each of these bases there is pivotally mounted an arm 32 which carries at its upper end an insulating block 34 to which there is attached an individual electrode 36 coacting with the toe end of the sole of the shoe S on the car. The insulating block 34 is drawn into contact with the toe end of the sole by a spring 38 and fixes the distance between each electrode 36 and its sole, the spacing being great enough to avoid sparking. To the lower end of each arm 32 is attached a controlling device in the form of a rheostat 40, the casing of which is fastened to the arm by screws. This may be of any suitable type but is herein illustrated as a carbon-pile rheostat. One end of this rheostat is connected electrically to the roll of the trolley 28 by a flexible conductor 42 and the other end is connected to the electrode 36 by a conductor 44. Regulation of this rheostat is effected by a depending arm 46 on a rod threaded (Fig. 4) in a sliding washer of the rheostat and arranged to compress the carbon pile when rotated counterclockwise as viewed in Figs. 1 and 2. The lower end of this arm is provided with a roller 48 adapted to be received first in the abutment formed by the forked end 50 of a bracket 52 carried by a suitable support 54 at the loading station. It will be noted from Fig. 5 that the forked end 50 is flared at 56 to facilitate the entrance of the roller 48 as the conveyor car approaches this position. While the roller 48 is confined by the forked end 50 of the bracket 52 the operator will position a shoe upon the inclined supports 10 and slide the heel end into engagement with the insulator 20. He will then allow the spring 38 to draw the insulating block 34 into contact with the toe end of the sole, thereby swinging the measuring arm 32 to a degree controlled by the length of the sole and as a consequence, since the rheostat arm 46 is held in fixed position by the forked member 50, 52, the rheostat will be adjusted to a degree determined by the length of the sole so that the longer the sole the greater will the rheostat be compressed and hence the less will be the resistance which is interposed in the high-frequency circuit. This means that an electrostatic field of greater strength will be impressed upon a long sole than upon a short sole as is desired to make the drying times equal. It will be noted that the work-contacting face of the insulating block 34 is curved in order that it may coact as readily with a short sole as with a long sole.

Having thus provided for the control of the electrostatic field to care for variations due to differences in the length of the sole being treated, it becomes desirable to provide an additional and complementary mechanism for control of the electrostatic field as required by different degrees of wetness. These different degrees will become evident, after an initial period of heating between the loading station indicated in Fig. 1 and the measuring station indicated in Fig. 3, by reason of differences in the temperature of the sole, it being understood that the temperature will be substantially proportionate to the amount of moisture contained because of the fact that the more moisture there is, the faster the heating takes place and the higher the temperature which will result. With this in mind, we have provided a thermostatic element 60 in the form of a bellows and have provided apparatus, to be described, for bringing it into contact with the sole, holding it there long enough to assume the temperature of the sole, and for adjusting the

rheostat 40 in accordance with the condition found.

To bring the thermostat bellows 60 against the work, we have mounted it at the end of an arm 62 which is pivoted on a rod 64 supported between the side plates 66 and 68 of a supplemental frame. These side plates are interconnected by a web 70. The shorter end of the arm 62, which extends to the right in Fig. 2, is provided with a roll 72 arranged to contact a cam 74 which is supported for rotation at the top of the supplemental frame and may be rotated in any suitable manner, as, for example, by a gear 76 driven from the conveyor motor (not shown). This cam 74 is so designed that it will lower the thermostat 60 into contact with the sole in order that it may measure the temperature thereof while the shoe is stationary at this measuring station and will lift the arm 62 to carry the thermostat 60 away from the shoe after the completion of an adjustment to be described.

It will be remembered that the control apparatustus which is positioned at the loading station of Fig. 1 provides a forked member 50 for engagement with the roll 48 on the arm of the control rheostat and inasmuch as this forked member 50 is carried in a fixed position the arm 46 attached to the roll 48 will leave the loading station hanging directly downward so that it may readily be engaged by a forked member 80 having flared sides or cam-like portions, and this member is carried on a lever 82 fulcrumed at 84 in the forked lower end of a bell crank 86. This bell crank is pivotally mounted on a rod 88 extending between the side members 66 and 68 of the supplemental frame and is arranged to shift the position of the forked member 80 horizontally to regulate the control rheostat in accordance with the condition of the thermostat 60.

To this end connecting mechanism is provided between the movable end of the bellows 60 and the bell crank 86 which is so arranged that the hotter the sole and the greater the expansion of the element 60, the more will the bell crank 66 be rotated to thrust the connecting lever 82 to the left as seen in Fig. 2, thereby eventually rotating the arm 46 of the control rheostat clockwise as viewed in that figure, thus inserting more resistance in the circuit of the electrodes and cutting down the electrostatic field, which is applied to this particular sole. The connecting mechanism comprises a bell crank having separated arms 110 and 112 mounted on the opposite ends of a rod 114 which is journaled in brackets 116 extending upwardly from the lever 62. The arm 110 overlies a pin 118 on the thermostatic element 60 while the arm 112 has a projecting pin received between the flanges of a spool 120 slidable on the cross rod 64. The movement of this spool is imparted to a pin projecting from the upstanding arm 122 of a bell crank pivoted to the supplemental frame at 124. The other arm 126 of this bell crank overlies a thrust rod 128, the lower end of which is recived at 130 in a depression in the end of a substantially horizontal arm on the bell crank 86. After the above-described adjustment has been obtained, the continued rotation of another cam 90 with the cam shaft 75 causes its hump to depress a roller 92 (Fig. 3) at the upper end of a reciprocable rod 94 mounted in guides 96 and 98 which are integral with the frame plate 66. A spring 100 surrounding this rod holds the roll 92 in contact with the peripheral face of the cam 90. On the rod is a grooved slide 102 which is recessed at 104 to receive a roll 106 attached to the right end of the lever 82 as viewed in Fig. 2. The action of this cam-operated slide is to tilt the lever 82 about its fulcrum 84 to lift the forked end 80 into engagement with the roll 48 on the rheostat arm and thus cause the cam-like portions on the lever to adjust the arm by forcing the roll to enter the fork. A spring 132 between the bell crank 86 and the frame tends to draw the bell crank back to an initial position after the cam shaft 75 has been rotated far enough to detach the fork 80 from the control rheostat. Later the thermostatic element 60 will be lifted away from the shoe by the cam 74.

In the use of the apparatus, a shoe will be positioned in inverted position upon the inclined arms 10 of the car 12 at the loading station shown in Fig. 1 and pushed or allowed to slide against the end 20 of the car to bring it to a fixed distance from the electrode 22. The electrode 36 will then be adjusted with respect to the toe of the shoe by bringing the insulating block 34 against the toe and this movement will adjust the control rheostat 40 for regulation of the electrostatic field in accordance with the length of the sole. After an intermittent movement has been imparted to the car 12 by the conveyor to carry this car to the measuring station (Fig. 2), the rotation of the cam 74 will lower the thermostatic element 60 into engagement with the sole. Owing to the initial heating which has occurred between the two stations, the thermostatic element will expand in accordance with the temperature of the sole and, hence, in accordance with its degree of wetness. The other cam 90 then acts to adjust the rheostat 40 to a position determined by the thermostatic element 60. After a sufficient interval for this to take place, the continued rotation of the cams will detach the fork 80 and lift the thermostat 60, whereupon intermittent movement will again be imparted to the conveyor to move this car onward and to bring other shoes into the respective stations above described. The result of this regulation of the electrostatic field will be to bring each sole to a uniform condition at the end of a predetermined interval of time, when it is desired to remove the shoes from the conveyor at another point, with the assurance that the condition of the various soles will be alike.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In an apparatus for drying shoe soles, substantially parallel spaced electrode plates, a sole support between said plates holding a sole in a plane substantially normal to said plates as an electrostatic field is passed through said sole, means for connecting said electrode plates to opposite sides of a source of high-frequency current, a field-controlling device connected in circuit adjustably to determine the strength of the field between said plates, said device having a movable member, and means for measuring the distance across said sole, said means including a measuring member arranged to engage one edge of the sole and operatively connected to the movable member of said controlling device, said measuring means being arranged to adjust the strength of the field in proportion to a transverse dimension of the sole which has been measured.

2. In an apparatus for drying shoe soles, an electrode adjacent to the heel end of a sole being treated, a support for said sole, another electrode adjacent to the toe end thereof, means for mov-

ably supporting one of said electrodes, means for connecting said electrodes to opposite sides of a source of high-frequency current, and control means electrically connected to one electrode and having a movable member actuated by the movable electrode-supporting means for varying the intensity of the electrostatic field between said electrodes.

3. In an apparatus for drying a succession of shoe soles, a conveyor upon which the soles are supported and operating to carry the soles past successive stations, electrodes cooperating with individual soles on said conveyor to pass electrostatic fields through said soles, means for connecting said electrodes to opposite sides of a source of high-frequency current thereby to heat soles on the conveyor, controlling means individual to said electrodes for determining the strength of the field applied to a particular sole, said controlling means being electrically connected to an associated electrode thereby to control the strength of the field emanating from that electrode, means at one station for adjusting the controlling means for a sole in accordance with the length of the sole, temperature-measuring means at another station including a thermostat, means for intermittently supporting the thermostat adjacent to the sole which is at the latter station and which has been heated during its passage between the two stations, in order to measure its temperature, and additional means regulated by said thermostat for again adjusting said controlling means in accordance with the measured temperature of the sole.

4. In an apparatus for drying shoe soles attached to shoes, in an electrostatic field, a conveyor provided with a series of supports for shoes positioned on the conveyor at an angle to the direction of movement of the conveyor, an electrode extending substantially parallel to a run of the conveyor and adjacent to one end of a plurality of said soles, individual electrodes movably mounted on said conveyor and arranged to be brought into coacting relation with the other ends of said soles, means for connecting the electrodes at opposite ends of a sole to opposite sides of a source of high-frequency current, and unit control devices electrically connected in circuit with each of said individual electrodes to control the intensity of the electrostatic field emanating from that electrode to which it is connected.

5. In an apparatus for drying shoe soles attached to shoes, in an electrostatic field, a conveyor provided with a series of supports for shoes positioned on the conveyor at an angle to the direction of movement of the conveyor, an elongated electrode extending substantially parallel to a run of the conveyor and adjacent to one end of said soles, individual electrodes movably mounted on said conveyor and arranged to be brought into coacting relation with the other ends of said soles, means for connecting the elongated electrode to one side of a source of high-frequency current and the individual electrodes to the other side thereof, unit field-controlling devices connected in circuit with said individual electrodes, and means positioned beside the conveyor constructed and arranged to set a controlling device in accordance with the position of the movable electrode associated therewith.

6. In an apparatus for drying shoe soles in an electrostatic field, a conveyor, a shoe support thereon arranged at an angle to the direction of movement of a run of the conveyor, an electrode alongside said run of the conveyor adjacent to one end of a shoe on said support, an electrode swingably mounted on said conveyor, said latter electrode carrying an insulating spacer for contact with the other end of said shoe and a field-controlling member electrically connected to said latter electrode and having an operating arm, means for connecting said first electrode and said field-controlling member and hence its connected electrode across a source of high-frequency current, a member positioned beside the conveyor and arranged to hold one end of said arm against movement when, during movement of said conveyor, said shoe support is opposite said member, and resilient means for moving said swingably mounted electrode to bring its insulating spacer into engagement with the end of a shoe and to effect relative movement between said controlling device and its arm.

7. In a sole-drying apparatus, a conveyor, a series of supports thereon for shoes having soles, said supports being positioned on the conveyor transverse to the direction of movement of the conveyor, a rail extending alongside said conveyor, electrodes individual to said supports, rheostats, swinging arms pivoted on said conveyor adjacent to the ends of soles on the supports and carrying said individual electrodes at the sole ends of the arms and said rheostats at the other ends, an elongated electrode at the other ends of said soles for completing an electrostatic field through said soles from toe to heel, contact members on the conveyor adjacent to said shoe supports and resting on said rail, means for connecting said rheostats to said contact members and said swinging electrodes, means for connecting said elongated electrode and said rail across a source of high-frequency current, said rheostats having outwardly extending operating arms, an abutment beside said conveyor for engagement with a rheostat-operating arm, and means for swinging said rheostat-carrying arms a distance determined by the lengths of the shoe soles to bring said individual electrodes into operative relation to the adjacent ends of the soles.

8. In an apparatus for drying shoe soles, substantially parallel spaced electrode plates, a sole support between said plates on which a sole is positioned in a plane subtsantially normal to said plates for passing an electrostatic field through said sole, means for connecting said electrodes to opposite sides of a source of high-frequency current, a control device embodying two relatively adjustable parts for controlling the effect of the field upon an individual sole, a measuring device associated with said sole and having a movable member displaced as it makes a measurement, a member mounted in fixed position on the apparatus and cooperating with one part of the control device, and connections between the movable member of said measuring device and the other part of the control device variably to adjust the device.

9. In an apparatus for drying shoe soles, spaced electrodes, a support between the electrodes on which a sole is positioned for passing an electrostatic field through said sole, means for connecting said electrodes to opposite sides of a source of high-frequency current, a thermostatic measuring device, displaceable means for supporting said device adjacent to said sole, said device having a movable member adapted to be displaced as it measures the temperature of the sole, a controlling device for varying the strength of the field passed through said sole, and means

for connecting said thermostatic movable member to said controlling device to vary the effect of the latter.

10. In an apparatus for drying shoe soles, a sole support, electrodes at opposite ends of a sole on said support for passing an electrostatic field through said sole, means for connecting said electrodes to opposite sides of a source of high-frequency current, said connecting means including an adjustable field-controlling member, a device for measuring the temperature of the sole, means for movably supporting said measuring device, means for moving said support to bring the device adjacent to the sole to measure its temperature, and means controlled by said temperature-measuring device for adjusting said field-controlling member.

11. In an apparatus for drying shoe soles, spaced electrodes, means for connecting said electrodes to opposite sides of a source of high-frequency current, means for supporting a sole between said electrodes to be dried by the action of the electrostatic field set up between the electrodes, a thermostat having a movable member adapted to be displaced as it measures the temperature of a sole, means for supporting said thermostat adjacent to said sole to determine its temperature, electrical control means connected to an electrode to determine the strength of the electrostatic field between the electrodes, said control means having a movable member, a tiltable lever for operating the movable member of said control means, means operated by the movable member of the thermostat for shifting the fulcrum of said lever in response to the temperature of the sole, and means for then tilting said lever about its fulcrum to adjust the control means.

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