Sept. 16, 1930. E. E. NAIRNE 1,776,006

COATING APPARATUS

Filed Feb. 10, 1928 3 Sheets-Sheet 1

Fig. 1

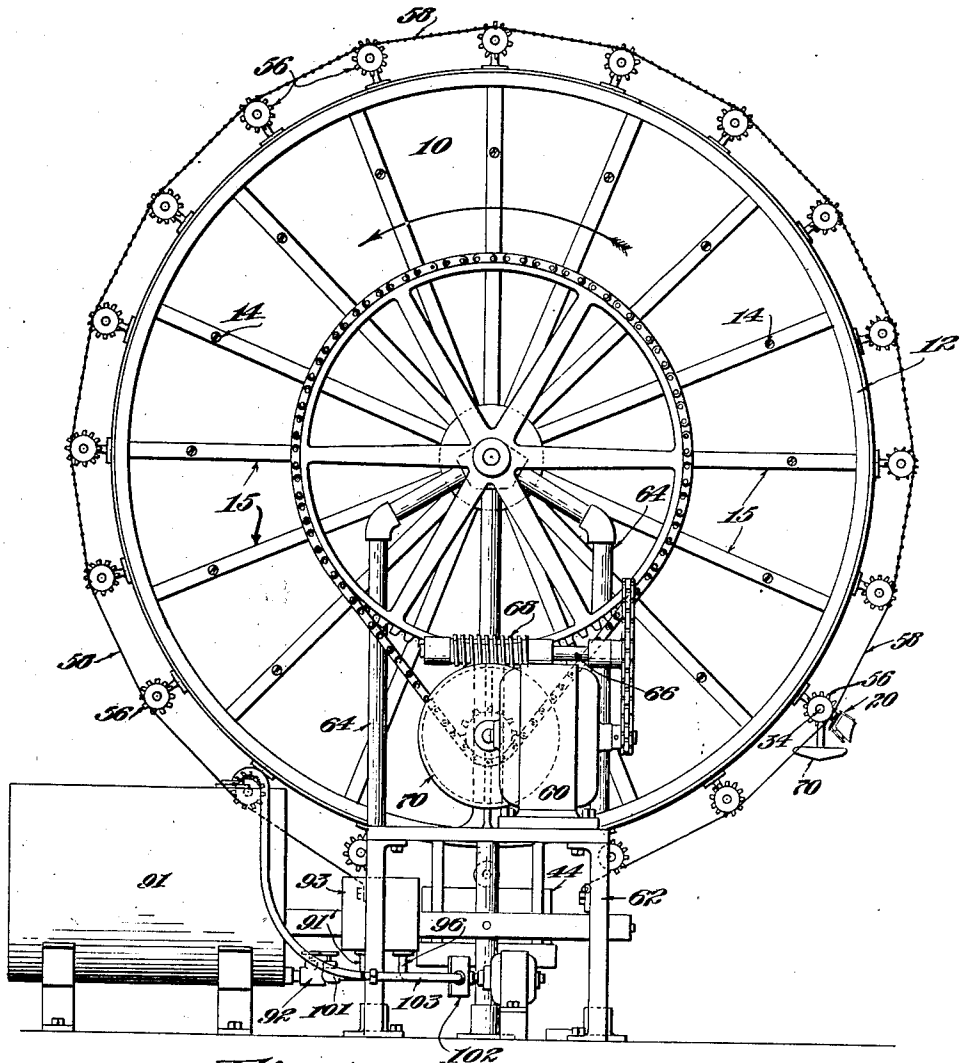
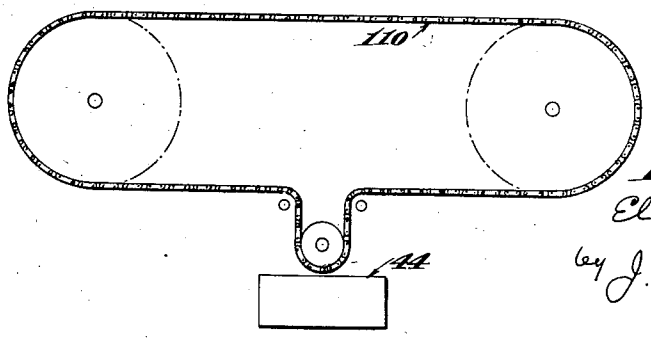


Fig. 12



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COATING APPARATUS

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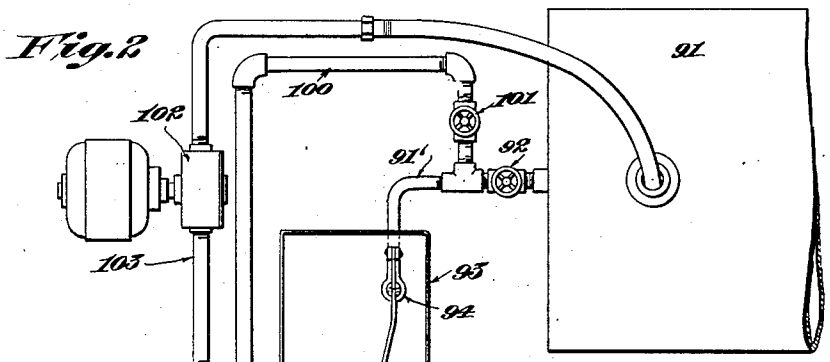
Fig. 2



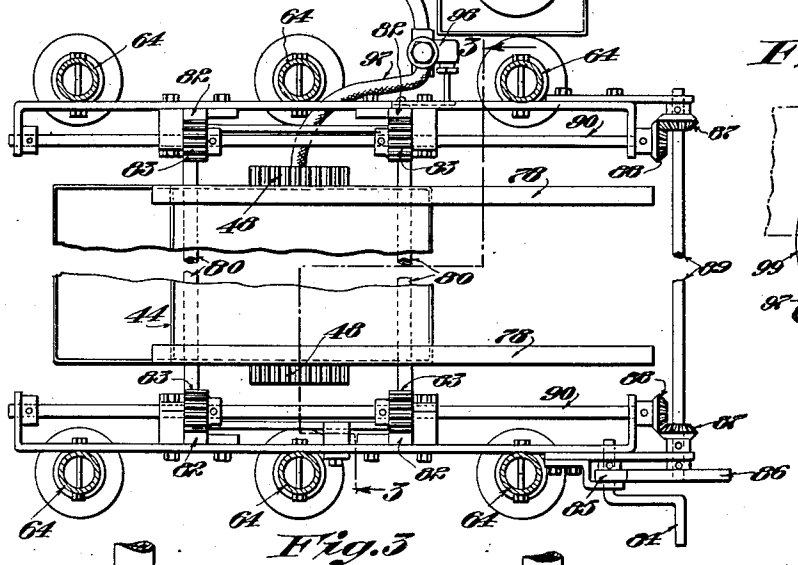


Fig. 4

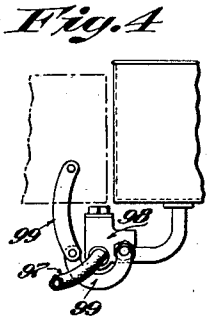
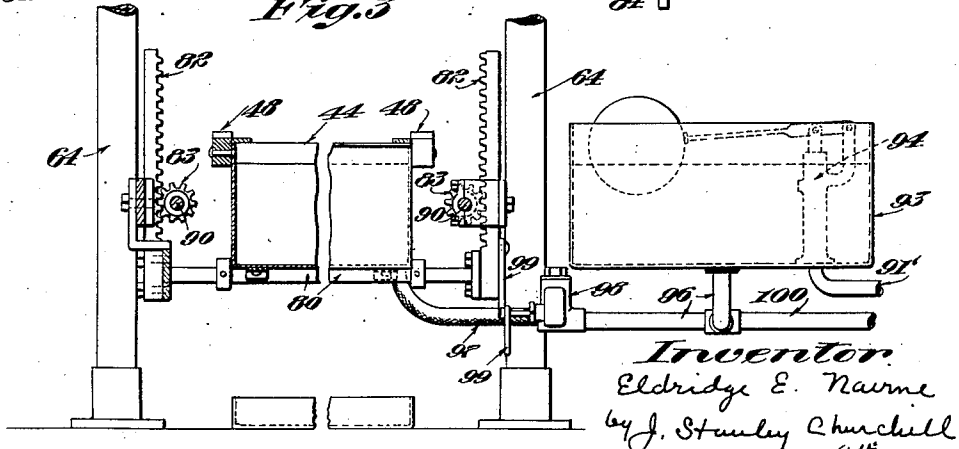


Fig. 3



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COATING APPARATUS

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Fig. 5

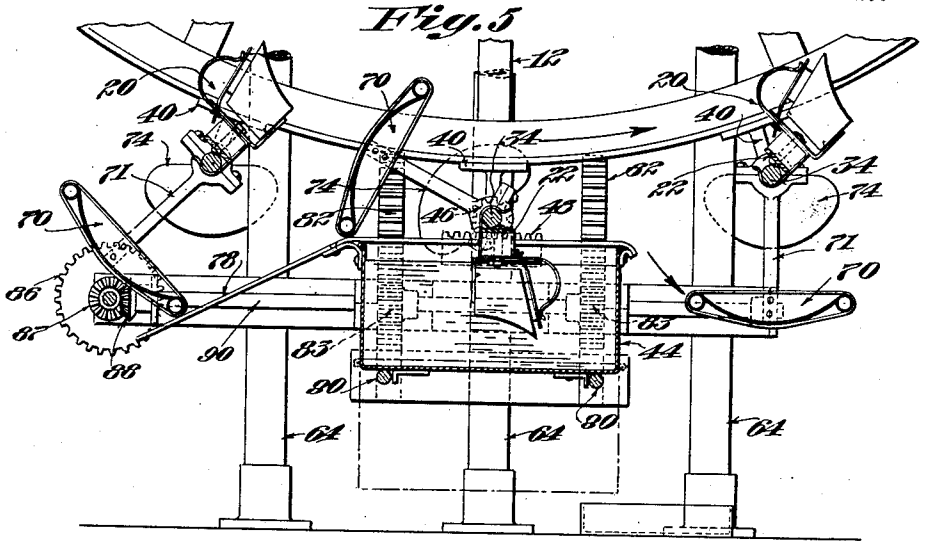


Fig. 6

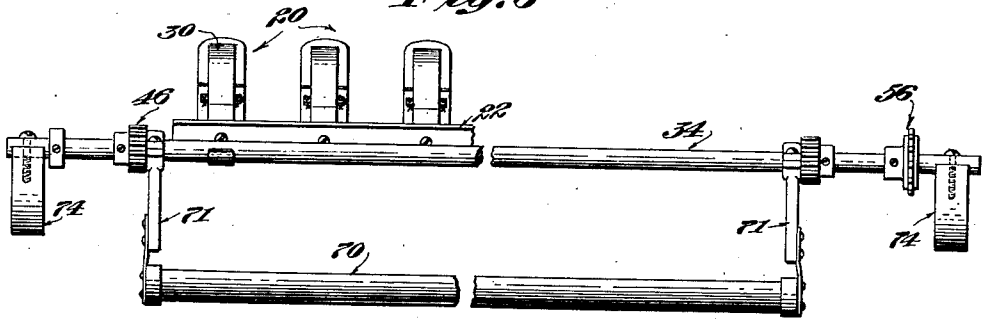


Fig. 7

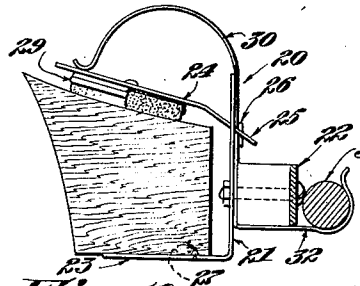


Fig. 8

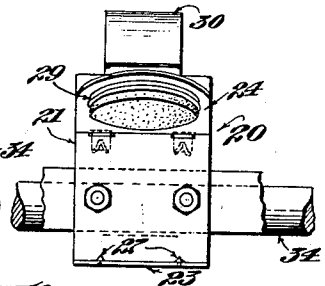


Fig. 9

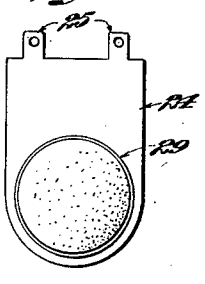


Fig. 10

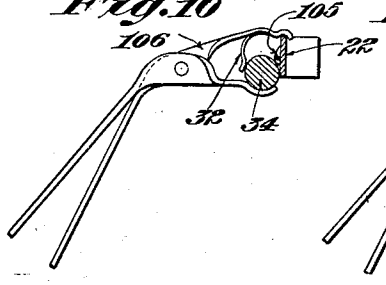
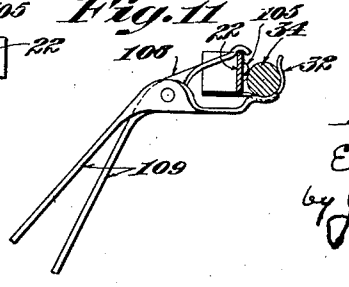


Fig. 11



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Patented Sept. 16, 1930 1,776,006

UNITED STATES PATENT OFFICE

ELDRIDGE E. NAIRNE, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-FOURTHS TO NATHALIE ARONSON, OF ROXBURY, MASSACHUSETTS

COATING APPARATUS

Application filed February 10, 1928. Serial No. 253,495.

This invention relates to apparatus for coating articles, and particularly to apparatus for lacquering wooden shoe heels.

One object of the invention is to provide novel and highly efficient apparatus by which articles may be economically coated with lacquer or other coating material to provide a uniform and highly attractive coating upon the same.

A further and more specific object of the invention is to provide a novel apparatus for economically lacquering wooden shoe heels to impart to the shoe heels the appearance of the shoe heels now on the market which are coated with sheet celluloid adhesively affixed to the surface of the heels, and with which apparatus the coating operation may be performed with a minimum consumption of coating material and a minimum amount of labor.

With these objects in view and such others as may hereinafter appear the invention consists in the apparatus and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Figure 1 is a side elevation of the novel heel coating machine; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a detail in section taken on the line 3—3 of Fig. 2 illustrating the manner in which the coating tank is raised and lowered, as will be described; Fig. 4 is a detail illustrating the manner of controlling the flow of coating material from the float chamber into the coating tank; Fig. 5 is a sectional view through the central portion of the machine, illustrating the operation of dipping the shoe heels into the coating liquid; Fig. 6 is a detail in elevation of one of the cross bars upon which a row of the heels are supported by novel clamping members; Fig. 7 is a side elevation of one of the clamping members for holding a shoe heel; Fig. 8 is a front view of the same; Fig. 9 is a detail of a portion of the heel clamp illustrating the protective member for preventing the heel seat from being covered with the coating material, to thereby preserve the legibility of the heel size; Figs. 10 and 11 are sectional details illustrating the use of a tool employed in loading the present machine, as will be described; and Fig. 12 is a diagrammatic view illustrating a portion of a modified form of machine embodying the present invention.

In general the present invention contemplates a coating apparatus by which a relatively large number of articles may be economically and efficiently coated with a minimum amount of labor and in a manner requiring minimum attention on the part of the operators, to the end that uniformly coated articles may be produced in as nearly an automatic manner as is practicable.

The different features of the invention may be best illustrated by description of the illustrated machine for lacquering wooden shoe heels to impart to them the appearance of those wooden shoe heels covered with sheet celluloid, now commonly used in the manufacture of shoes and slippers, and particularly patent leather slippers for women.

As is generally known, wooden shoe heels are covered with sheet celluloid by adhesively affixing the sheet celluloid to the shoe heels in order to impart to the shoe heel the appearance of patent leather. The application of the sheet celluloid covering material to the wooden shoe heels as now practiced, comprises a manual operation involving considerable labor and expense and consuming a relatively large amount of time.

In its preferred embodiment, the present invention contemplates the provision of an automatic machine for automatically coating a plurality of wooden shoe heels with lacquer or other coating material to provide the shoe heels with a uniform, smooth and highly attractive coating.

Referring more particularly now to Fig. 1, the machine therein illustrated comprises the supporting reel indicated generally at 10 and formed by two spaced apart wheels, one of which is shown at 12 in Fig. 1, and both of which are connected by cross rods 14 extended through and secured to the spokes 15 of each wheel.

Provision is made for operatively supporting a plurality of the heels to be coated upon the periphery of the reel, and as herein shown each heel is removably secured in the heel clamping device indicated generally at 20 and illustrated in detail in Figs. 7, 8 and 9. Each heel clamping device 20 comprises a supporting piece 21 bolted to a cross bar 22 and having a flange 23 upon which the bottom of the heel is supported. The upper surface or heel seat is yieldingly engaged by a member 24 comprising a plate provided with lugs 25 extended through slots in the upright supporting piece 21 and retained from displacement by cotter pins 26 extended through holes in the lugs, the construction being that illustrated in Fig. 7 and the member 24 being adapted to pivot to permit the heel to be introduced into the clamping device and removed therefrom. The member 24 is arranged to be yieldingly held against the upper surface of the heel to clamp the heel between it and the bottom supporting flange 23 and the latter is preferably provided with prick points 27 for assisting in holding the heel in the clamping device. As herein shown a spring 30 is provided for yieldingly holding the member 24 against the upper surface of the heel, and the spring 30 is preferably formed as an integral part of a clamp 32 for holding the bar upon cross rods 34 mounted upon the periphery of the reel as will be described. In order to protect the central portion of the heel seat, the latter being the part of the heel in which the size numbers are stamped, so that during the coating operation the coating material will be prevented from covering the size numbers and rendering them illegible, the member 24 of the heel clamp is provided on its under surface with a retaining cup or ring 29 riveted thereto and in which a molded body of protecting material is received. In practice a composition of glue and glycerin which is insoluble in the coating solvents has been found suitable for this purpose.

In order to operatively support the heels upon the periphery of the reel, the latter is provided with a number of the cross bars or rods 34 above referred to and which are spaced apart and extended transversely across the reel. Each bar 34 is arranged to operatively support a row of heels, and as illustrated in Figs. 6 and 7, provision is made for removably clamping the bar to the rod by means of the spring clamp 32. Each rod 34 is mounted to be capable of rotation in bearings in hangers 40 secured to the periphery of the wheels, see Fig. 5.

In the operation of the machine the operator assembles the heels to be coated in different heel clamps 20 upon each clamping bar 22, and then secures each bar 22 and each row of the heels thus held, upon a cross rod 34. As the reel is slowly revolved, a particular set or row of the heels is brought by the reel into a position above a coating tank 44 and provision is then made for causing the immersion of the heels in the coating bath in the tank. As herein shown each cross rod 34 is as above stated rotatably mounted in hangers 40 and each rod is provided with a pair of pinions 46 secured thereon in a position such that when the rod is brought over the coating tank 44, each pinion 46 meshes with and runs on a rack 48 riveted to a side of the coating tank, as shown in Figs. 2, 3 and 5. As the reel continues to rotate the cross rod 34 is given a complete revolution thus causing the row of heels to be revolved into and out of the coating bath in a short period of time.

In order to insure uniform distribution of the coating material over the surface of the heels, provision is made for rotating the heels during the interval between the time that the heels are removed from the coating bath after having been revolved therethrough as above described until the reel makes substantially a complete revolution to again bring the particular row of heels into a position over the coating tank where they are again revolved through the coating bath for the application of the second layer of coating material. As herein shown the rotation of the heels is produced by the cooperation of a sprocket 56 secured upon one end of each cross rod 34 with a fixed chain 58 arranged as illustrated in Fig. 1 and extended over all of the sprockets 56. The ends of the chain are secured to portions of the supporting frame of the machine as illustrated. With this arrangement as a particular row of heels leaves the coating bath, the coating being freely flowing in its nature, is caused to flow uniformly over the surface of the heel by the continued rotation of the individual cross rod 34 as the reel continues to revolve in a counter-clockwise direction as viewed in Fig. 1. In practice in the production of lacquered shoe heels it is preferred to operate the machine to apply a substantial number of successive coatings of the lacquer to the surface of the heels, and it has been found that satisfactory results are produced using the standard lacquers embodying between 80 and 85% of solvents. With a rapid drying lacquer of this character it is found that the reel may be revolved at a speed such that a particular row of heels is dipped into the coating bath once each six and one-half minutes, and it has been found that by rotating the individual rows of heels as they leave the coating bath, and up to the time that a row of heels is about to enter the coating bath for a succeeding dip therein, the coat of lacquer is afforded ample opportunity to dry sufficiently for the application of a succeeding coat. As above stated the rotation of the heels insures the production of a uniform

coat over the surface of the heel and eliminates the formation of any drip points.

In order to rotate the reel at the desired relatively slow speed, the machine is provided with an electric motor 60 secured upon a supporting framework indicated generally at 62 and the reel itself is journalled in suitable bearings supported upon uprights 64 forming a part of said framework 62. The electric motor 60 is connected by a driving chain running over a small and a large sprocket on the motor shaft and a worm shaft 66 respectively. This drive insures one reduction in the speed of the motor shaft. The rotations of the worm shaft 66 are transmitted through the worm 68 through a worm wheel 70, so that a second reduction in the speed of the motor shaft takes place at this point. The worm wheel is provided upon its shaft with a small sprocket and a driving chain is arranged to run over the small sprocket and over a large driving sprocket secured to the shaft upon which the wheels 12 of the reel 10 are secured, thus effecting a third reduction in the speed of the motor shaft, and as a result of the combined reductions in speed, the reel 10 is arranged to be revolved at a speed such that intervals of substantially six and one-half minutes occur between successive applications of the coating material to a particular set of heels.

In order to catch any drip which may run from the heels during the movement thereof after leaving the coating tank 44 a drip pan 70 is provided for each row of heels, and as herein shown each drip pan is supported upon the ends of a pair of hangers 71 loosely mounted upon the cross rods 34 as illustrated in detail in Fig. 6. Each cross rod 34 is provided with a counter-weight 74 at each end thereof and the counter weights serve to hold the row of heels as it leaves the coating tank in an elevated position such as is illustrated at the right in Fig. 5. With the heels maintained in this elevated position as they are leaving the coating tank 44, the drip pans are positioned so that any drip will be caught in the pan. With a rapid drying lacquer it has been found that substantially all of the drip takes place during the movement of the heels a short distance from the coating tank so that by the time the heels are caused to revolve by the engagement of the sprocket wheel 56 with the fixed chain 58 substantially all of the drip will have taken place, and thereafter as the heels are rotated the coating of lacquer soon becomes dry. During the movement of a particular row of heels from the coating tank until these heels reach a position illustrated at the left in Fig. 5, the drip pan stays in a uniform position under the heels and when the position is reached, as illustrated at the left in Fig. 5, provision is made for swinging the drip pan out of the way in order to permit the row of heels to be revolved through the coating bath within the coating tank 44. As herein shown, the drip pan is arranged to engage a pair of guides 78 extending downwardly from the coating tank 44, and as the reel continues to move the row of heels into a position above the coating tank the drip pan rides up the guides 78, being swung into a position such as is illustrated in Fig. 5, where it rests upon horizontal portions of the guides 78 extended across the top of the coating tank 44. After the drip pan has been moved into the position shown, the row of heels is rapidly revolved through the coating bath by the engagement of the pinions 46 with the racks 48, and during such revolution of the heels the counter weights are also revolved as illustrated in Fig. 5. After the heels emerge from the coating bath the counter-weights hold them in an elevated position until such time as the sprocket 56 is brought into engagement with the fixed chain 58 as will be apparent from an inspection of Figs. 1 and 5.

In utilizing the present machine for the production of lacquered shoe heels, it has been found desirable to impart to the shoe heels successive applications of the lacquer and to employ a relatively thin rapid drying lacquer composed of a large percentage of solvents. Because of the nature and strength of the solvents of these nitro-cellulose lacquers, it has been found that the length of time that the heels remain in the coating bath should be maintained below a predetermined limit for the reason that if the heels are permitted to remain for any length of time above such limit, the solvents exert a cutting action upon the previously applied coating of lacquer, and as a result it has been found impossible, working with a lacquer containing some 80% of solvents, to apply successive coats to the heels for the reason that each coat would be washed off during the application of the next succeeding coat. It has been found desirable to maintain the length of time that the heels remain in the coating bath within a limit of three seconds, and in practice it is preferred to operate the machine so that the heels remain in the bath for substantially two seconds.

In operating the machine with a rapidly drying lacquer, it has been found desirable to continue the rotation of the reel after the requisite number of coats of the lacquer have been applied to the heels in order to afford opportunity for the heels to become completely dry. Accordingly provision is made for raising and lowering the coating tank 44 into and from the position illustrated in full lines in Fig. 5, and in order to thus raise the tank the latter is supported upon cross members 80 affixed to racks 82 and the latter arranged to be moved by cooperating pinions 83 rotated from a crank 84 through cooperating gears 85, 86, and sets

of bevel gears 87, 88 on shafts 89 and 90 respectively, as illustrated in detail in Figs. 2 and 3. At the start of the operation of the machine the operator turns the crank 84, raising the tank to the position shown in full lines in Fig. 5, and after a sufficient number of coats have been applied, the operator again lowers the tank into the position illustrated in dotted lines in Fig. 5.

The present invention contemplates the provision of automatic mechanism for maintaining a substantially uniform level of coating material in the coating tank 44, and as herein shown a bulk supply of the lacquer or other fluid coating material is contained within a supply drum or tank 91. The lower part of the supply tank 91 is connected through a pipe line 91′ including a valve 92 to the bottom of an intermediate or control tank 93 and the flow of the coating material from the tank 91 is arranged to take place by gravity into the control tank 93, being controlled by a standard and known construction of float operated valve indicated generally at 94. As long as a substantial head of the coating material remains within the supply tank 91, the level of the coating fluid will be maintained uniform within the control tank 93, and as herein shown the control tank 93 is connected by a pipe line 96 and flexible hose 97 to the bottom of the coating tank 44, see Figs. 2 and 3. With this arrangement, when the coating tank 44 is in its elevated and operating position, it will be understood that a direct connection exists through the pipe line 96 and hose 97 from the control tank 93 to the tank 44, thus maintaining a uniform level of the coating lacquer within the tank 44, and as the supply of lacquer in the tank 44 is consumed, additional lacquer flows into the control tank by the operation of the float actuated valve so that the level is maintained uniform during the continued operation of the machine, thus contributing toward uniform application of the lacquer to the heels during the operation of the machine. When the tank 44 is lowered for any reason, a cut-off valve of normal construction indicated generally at 98 and positioned between the pipe line 96 and the hose 97 is arranged to be operated by direct connection through the levers 99, see Fig. 4, to the coating tank 44. In filling up the coating tank at the beginning of a day's run, it may be desirable to permit the lacquer to flow directly into the coating tank 44 from the supply tank 91, and accordingly a by-pass 100 having a control valve 101 is provided, see Fig. 2. At the end of a day's run the coating lacquer may be removed from the coating tank 44 and from the control tank 93 by the operation of a motor driven pump of usual construction indicated generally at 102 and which is herein shown as located in a pipe line 103 leading from the pipe line 96 back to the top of the supply tank 91. It will be understood of course that the valves 92 and 101 will be closed during the pumping back of the coating liquid into the supply tank. In the operation of the machine the operator first loads a plurality of the wooden shoe heels by inserting them in the clamping devices 20 mounted upon the bars 22. Each bar 22 supports a row of the shoe heels and in the machine a relatively large number of bars are supported upon the cross rods 34, as above described. During the continued operation of the machine additional or auxiliary bars 22 may be loaded while a machine load of heels is being lacquered so that the operator may remove one of the bars 22 carrying a row of finished heels and substitute therefor a bar carrying a row of unlacquered heels, and in practice this substitution may take place without interrupting the rotation of the reel or the operation of the machine.

In order to assist an operator in securing the bar 22 to one of the cross rods 34 a suitable tool indicated generally at 106 and illustrated in Fig. 10 is utilized to force the clamping device 32 over the cross rod 34 so that the bar may be secured upon the cross rod by the cooperation of the spring clamp 32 and the heads 105 of the bolts by which the heel clamps 20 are secured to the bar 22. The tool is preferably provided with specially formed jaws and is arranged so that when the operating handles 107 are squeezed together, the bar is forced into its operative position. In removing the bar 22 from the machine, another tool 108 of the construction illustrated in Fig. 12 may be used and which is arranged so that when the handles 109 thereof are squeezed together, the bar with its spring clamps 32 are disengaged from the cross rod 34.

From the description thus far it will be observed that the illustrated machine has a capacity for handling a relatively large number of the wooden heels to be coated, it being understood that in a moderate size machine some twelve to fourteen hundred heels constitute a load for the machine. A single operator may load and unload the machine with minimum effort and with a minimum amount of interruption in the continuous operation of the machine. Because of the automatic nature and operation of the machine, the labor cost incident to lacquering the heels is reduced to a minimum so that it is possible to provide lacquered heels at a considerably less manufacturing expense than is possible in the manufacture of the heels now upon the market which are covered with sheet celluloid. In addition the manner of dipping the heels and of automatically handling them during the drying operation insures a uniform distribution of the coating material and

the production of highly attractive heels equal in appearance if not superior to the sheet celluloid covered heels now upon the market.

While the different features of the invention have been illustrated as embodied in a machine utilizing a revoluble reel, nevertheless viewed in the broader aspects of the invention other forms of conveyors may be used, as for example an endless conveyor chain 110 such as is illustrated in Fig. 12, it being understood that suitable provision is made for supporting the shoe heels thereon to insure the requisite distribution of the coating material during the lacquering operation.

While the invention is preferably embodied in the illustrated machine for lacquering shoe heels, it will be understood also that viewed in its broader aspects, the invention contemplates other forms of apparatus for coating other articles, within the scope of the following claims.

Having thus described the invention what is claimed is:—

1. A heel coating machine having, in combination, a stationary coating tank for containing a coating bath, a plurality of heel clamps having provision for holding the heels to be coated, means for simultaneously rotating a plurality of the heels thus held to cause them to enter the coating bath and to be then removed therefrom, and means for rotating said heels and clamps after they have been withdrawn from the coating bath.

2. A heel coating machine having, in combination, a stationary coating tank for containing a coating bath, an endless conyevor, a plurality of rows of heel clamps mounted at spaced intervals on the conveyor, and means operable when a row of heel clamps is brought above the coating tank, for rotating the clamps and heels to cause the heels to enter the coating bath and then to be removed therefrom.

3. A coating apparatus having, in combination, a rotatable reel, means for rotating the same at a relatively slow speed, a coating tank, means for operatively supporting a plurality of heels upon the periphery of the reel including a plurality of cross rods rotatably supported on the reel at spaced intervals around the periphery thereof, a rigid supporting member removably secured to each cross rod to be capable of rotation therewith and provided with a plurality of heel clamping devices, and means for causing successive rows of heel clamping devices and the heels supported thereby to be passed through the coating bath.

4. A coating apparatus having, in combination, an endless conveyor, a coating tank for containing the coating bath, a plurality of heel clamping devices mounted on the conveyor, means for rotating each heel clamping device when in a position adjacent and above the tank to cause the heel clamping device to be passed into through and from the bath, and means for rotating each heel clamping device during the interval after it has left the bath and is being moved by the conveyor to a position where it is about to enter the bath for the application of a succeeding coat.

5. A heel coating machine having, in combination, an endless conveyor, a plurality of rigid members detachably and rotatably secured to the conveyor at spaced intervals upon the same, a plurality of heel holding devices removably mounted upon said members to be movable therewith for supporting a row of heels upon each of said members, a coating bath, means for moving the conveyor, and means for rotating said rigid members and the heels supported thereby during travel of the conveyor between successive dipping operations.

6. A coating machine having, in combination, an endless conveyor, a plurality of rigid members removably mounted upon said conveyor, a plurality of article holding devices mounted upon said rigid members whereby each member supports a row of the articles, a coating tank, and means for rotating said rigid members during the travel of the conveyor between successive dipping operations.

7. A coating apparatus having in combination an endless conveyor, means for moving the same at a relatively slow speed, a coating tank, means for operatively supporting a plurality of heels upon the periphery of the endless conveyor, including a plurality of crossrods rotatably supported on the endless conveyor at spaced intervals around the periphery thereof, a rigid supporting member removably secured to each crossrod to be capable of rotation therewith and provided with a plurality of heel clamping devices and means for causing successive rods of the heel clamping devices and the heels supported thereby to be passed through the coating bath.

8. A heel coating machine having in combination an endless conveyor, a plurality of rigid members detachably and rotatably secured to the conveyor at spaced intervals upon the same, a plurality of heel holding devices removably mounted upon said members, to be movable therewith for supporting a row of heels upon each of said members, a coating bath, means for moving the conveyor, means for rotating said rigid members and the heels when over the bath, to cause the heels to be rotated into, through and from the bath, and means for rotating said rigid members and the heels supported thereby during the travel of the conveyor between successive dipping operations.

In testimony whereof I have signed my name to this specification.

ELDRIDGE E. NAIRNE.