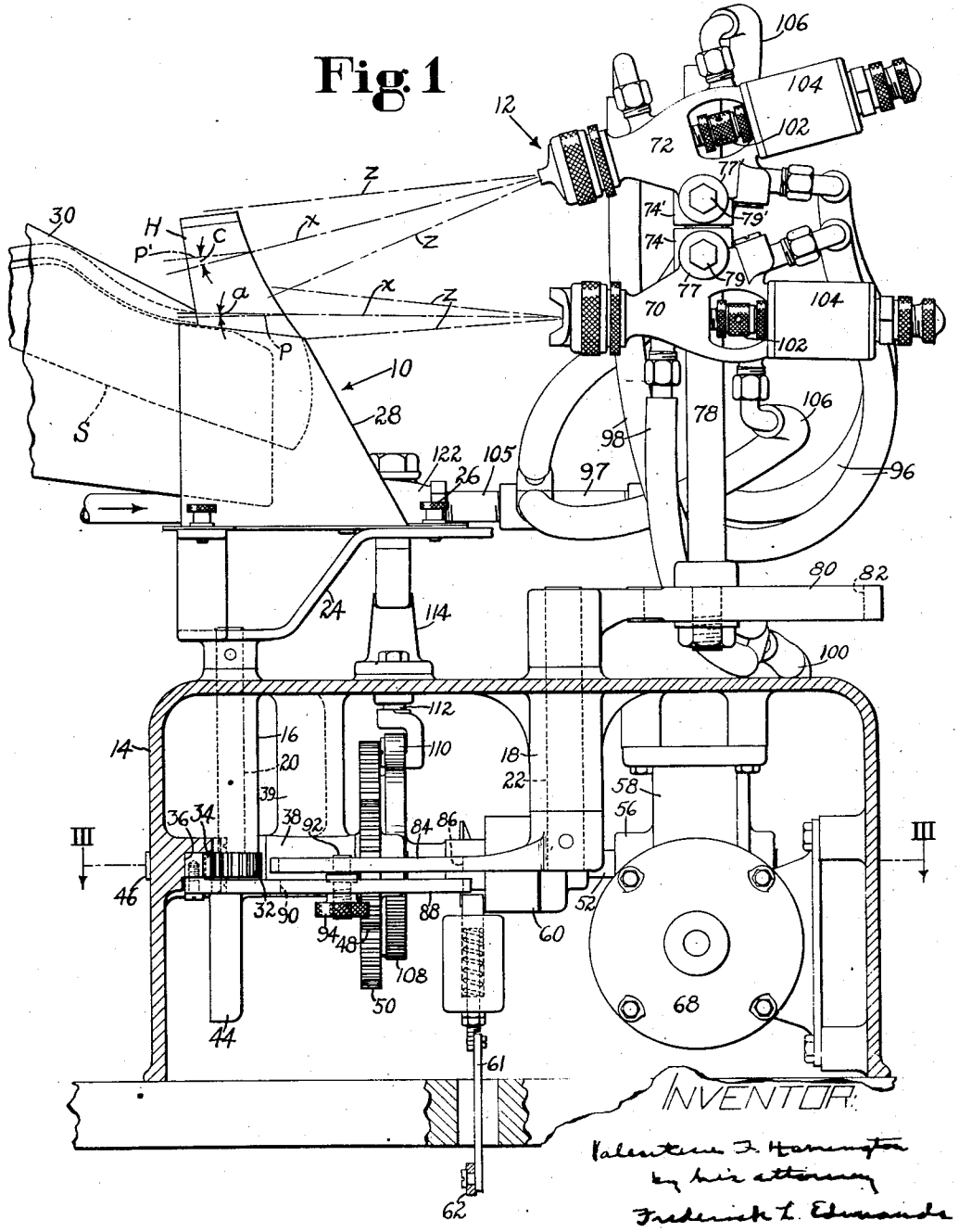
Feb. 6, 1945. V. F. HARRINGTON 2,368,829

METHODS OF AND MACHINE FOR COATING HEELS

Filed Feb. 10, 1942 4 Sheets-Sheet 1

Fig. 1



INVENTOR.

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Feb. 6, 1945. V. F. HARRINGTON 2,368,829

METHODS OF AND MACHINE FOR COATING HEELS

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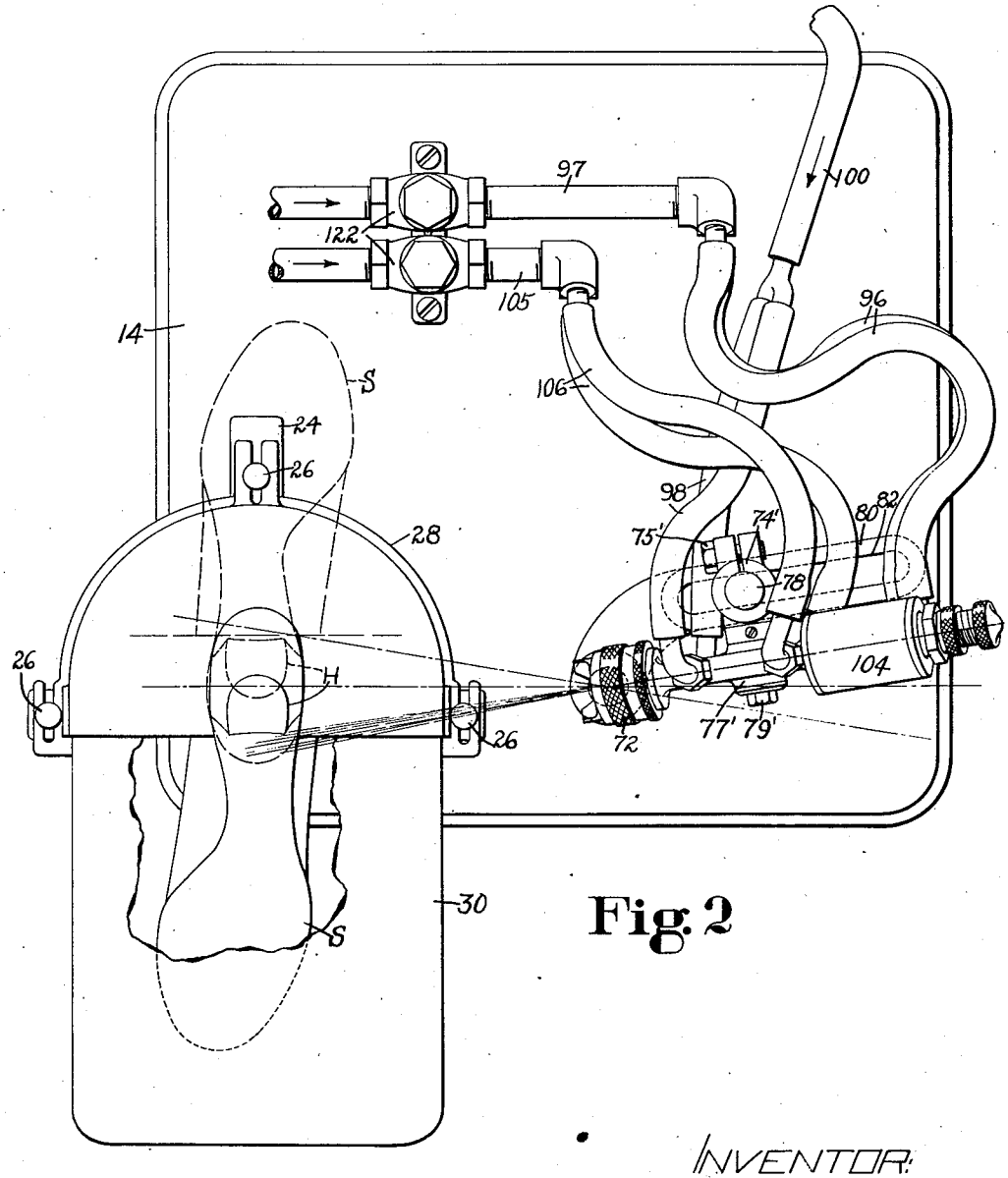


Fig. 2

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Feb. 6, 1945. V. F. HARRINGTON 2,368,829

METHODS OF AND MACHINE FOR COATING HEELS

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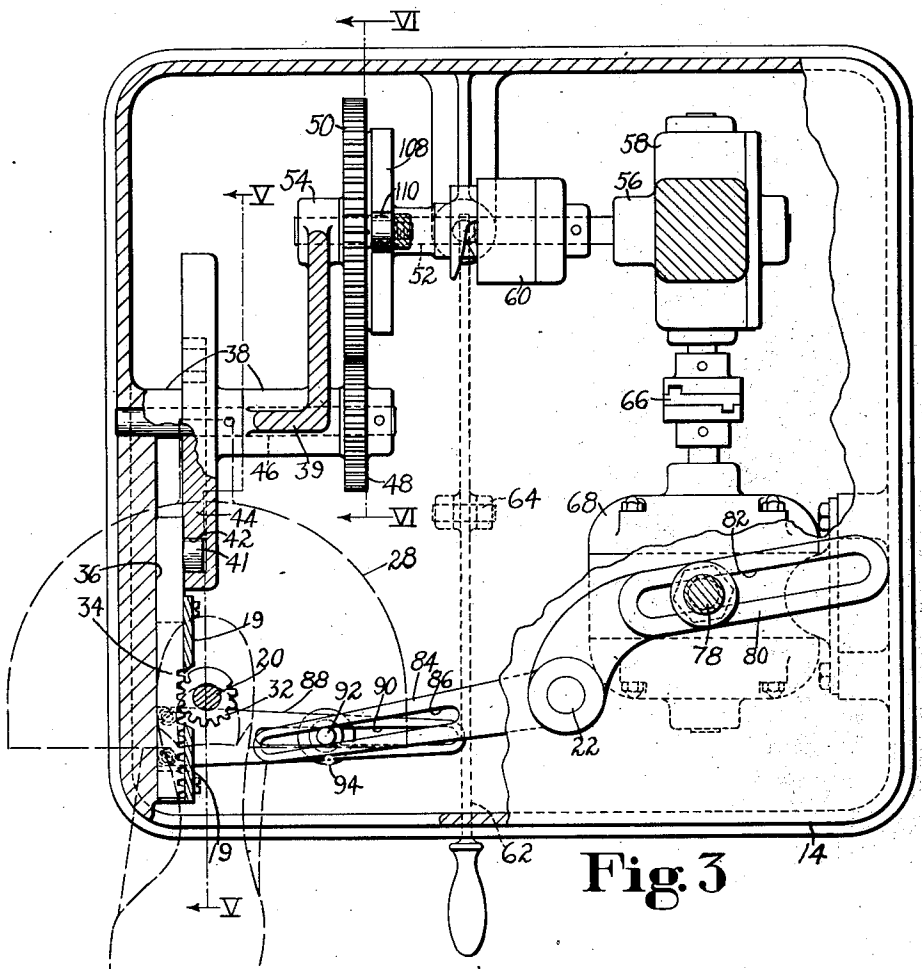


Fig. 3

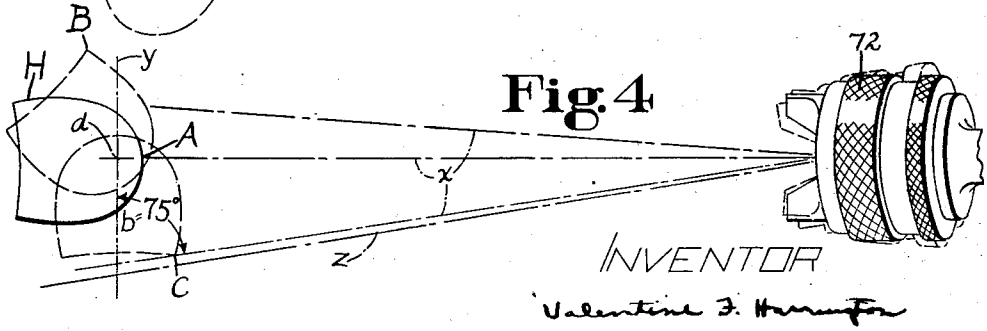


Fig. 4

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METHODS OF AND MACHINE FOR COATING HEELS

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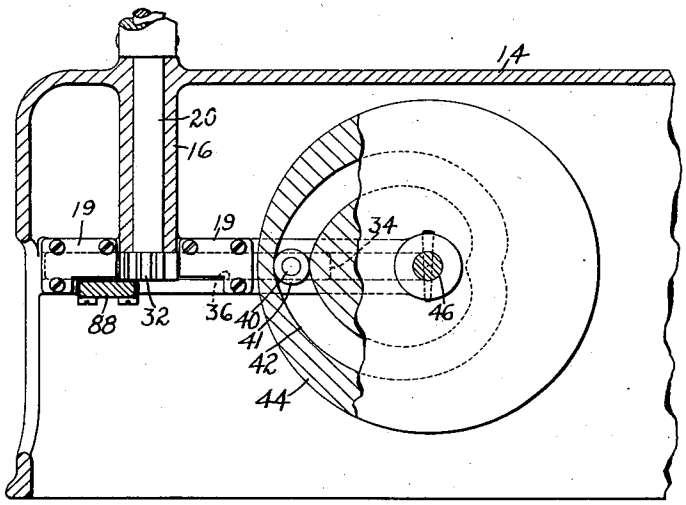


Fig 5

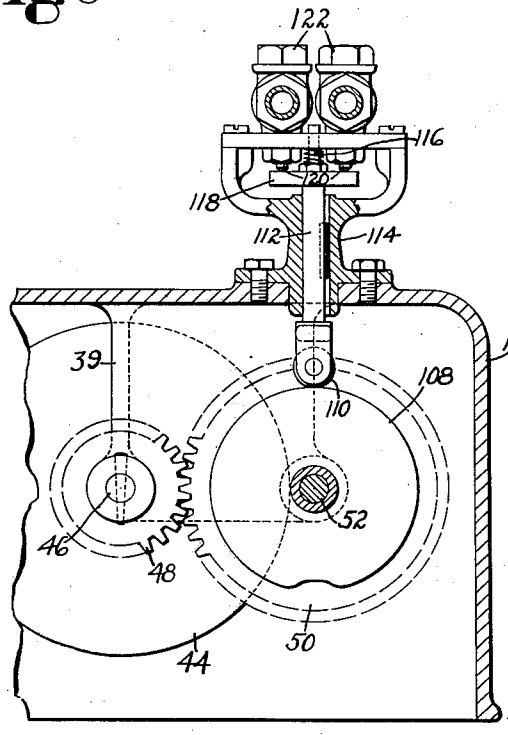


Fig 6

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Patented Feb. 6, 1945

2,368,829

UNITED STATES PATENT OFFICE

2,368,829

METHOD OF AND MACHINE FOR COATING HEELS

Valentine F. Harrington, Newton, Mass., assignor to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Application February 10, 1942, Serial No. 430,259

19 Claims. (Cl. 117—104)

The present invention relates to a method of and a machine for applying a coating to a shoe part, and more particularly to applying a spray coating to shoe heels.

In United States Letters Patent No. 2,259,450, granted October 21, 1941, on an application filed in the name of Lewis J. Bazzoni, it is pointed out for the various reasons set forth therein that it is desirable to apply the coating to the heel by a spray gun, and a shield is shown therein for protecting the upper of a shoe during the application of the coating to the heel. While the coating may be applied to the heel by mounting the shoe on the aforesaid shield and moving the spray gun by hand about the heel, or by holding the spray gun steady and turning the shield in front of the spray gun, this is a tiring procedure and an operator cannot hold the spray gun steady enough over prolonged periods to maintain as smooth and uniform a coating as is desirable. Spray machines have been developed in which the heel is oscillated in front of a fixed spray gun. In these machines, however, the coating piles up at the breast edges of the heel during the reversal of the direction of movement of the heel, forming a heavy coating along the breast edges which is of a deeper color than the remaining surface and producing a noticeable ridge. Furthermore, because of the shape of the heel, that is, the variation in the extent of the surface and radius of curvature of various parts of the heel, machines which have simply oscillated or turned the heel upon a vertical axis adjacent to a spray gun without regard to the aforesaid variations in the curvature of the heel have not produced satisfactory results.

It is an object of the invention to eliminate these objectionable features and to coat the heel in such a manner that the coating material applied will be distributed substantially uniformly over the entire surface.

Accordingly, invention resides in applying a coating by causing a quantity of the coating material to be projected in spray form, exposing the convex surface of the heel to the spray by turning the heel about an axis running heightwise thereof, and by moving the line of projection of the sprayed coating material from one side of the axis of the heel to the other in such a manner that the direction of movement of the convex surface of the heel is always opposite to the direction of movement of the line of projection of the sprayed coating material.

It has been determined that the uniformity of the coating may be improved by applying the coating while maintaining the direction of application within certain predetermined limits with respect to the heel. That is, if the line of projection is kept as near normal as possible to the surface of the heel at all times, there will be a minimum loss of material by recocheting.

It is another object of the invention to provide a machine for carrying out this method which will automatically coat the heel of the shoe rapidly and efficiently, thereby relieving the operator of the duty of holding the spray gun, and at the same time maintain the aforesaid angular relations between the axis of the spray gun and the heel.

The machine, as illustrated herein, includes a shield of the kind shown in Patent No. 2,259,450 and the invention resides in embodying this shield, which serves as a support for the heel, in means for oscillating the support in front of a spray gun to expose every part of the convex surface of the heel thereto, and in means for moving the spray gun relative to the support to cause the gun to coat the entire convex surface of the heel, the movement of the spray gun and heel support occurring simultaneously and in the same direction of rotation.

The details of the aforesaid machine will now be described with reference to the accompanying drawings, in which

Fig. 1 is a side elevation of the entire machine, partly in section;

Fig. 2 is a plan view showing the position of the shoe at the opposite extremities of its oscillation;

Fig. 3 is a section on the line III—III of Fig. 1;

Fig. 4 is a diagrammatic showing of the rotation of the heel and the direction of the projected coating material at intermediate and extreme positions;

Fig. 5 is a section on the line V—V in Fig. 3 showing the cam for reciprocating the shoe support; and

Fig. 6 is a section on the line VI—VI in Fig. 3 showing the valve operating means for the spray guns.

Referring to Fig. 1, the machine is shown as comprising, in general, a shield and support 10 for holding a shoe S in an inverted position with the heel H extending upwardly in front of a spray unit 12 consisting of a pair of spray guns, the aforesaid shield and spray unit being mounted on a hollow base 14. The base 14 is provided on the underside of its top portion with a pair of depending bearing sleeves 16 and 18 in which are journaled vertically disposed shafts 20 and

22. The shaft 20 extends through the top side of the base 14 and has fastened thereto a frame 24 to which the shield 10 is fastened by screws 26. The shield 10, which is shown in Patent No. 2,259,450 and will not be described in detail herein, consists of a frusto-conical member 28 having a resilient U-shaped opening at its upper end for the reception of the back part of the shoe S, as illustrated. An additional shield 30 is associated with the member 28 to protect the forepart of the shoe. The support 10 is reciprocated in front of the spray unit 12 to expose the entire convex surface of the heel from breast edge to breast edge to the projected spray of coating material from the spray guns, that is, the heel is oscillated about an axis *d* running heightwise thereof, so that a plane passing through the axis and bisecting the breast will swing substantially 90° about the axis in one direction and then 90° about the axis in the other direction, starting the coating operation at a point A at the back of the heel, as illustrated in Fig. 4. Referring to Fig. 4, it will be observed that the heel oscillates from side to side about the axis *d*, the plane passing through the axis *d* and bisecting the breast being represented by the line *y*. It is within the scope of the invention, however, to start the rotation at the breast edge B and to turn the heel through 180° and back again. To provide for this oscillation, a gear 32 is fastened to the lower end of the shaft 20, the gear meshing with a rack 34 which is slidably mounted in a horizontally disposed way 36 (Figs. 1 and 3) which is formed integral with a wall of the base 14 adjacent to the lower end of the sleeve 16. The rack is held in the way 36 by plates 19 which are screwed to the open side thereof at each side of the gear 32, as illustrated in Fig. 3. The way extends rearwardly of the sleeve 16, as seen in Fig. 3, to bearings 38, so that the center line of the rack passes through the center line of a shaft 46 journaled therein. At the inner end of the rack 34 there is provided a pin 40 (Fig. 5) having a roller 41 thereon which occupies a cam slot 42 formed in a cam 44, the latter being fastened to the shaft 46. One of the bearings 38 is supported from the side of the base and the other from the top of the base, as illustrated in Fig. 3, by a depending web 39. A gear 48 is also fastened to the shaft 46 and meshes with a gear 50 which is mounted to rotate freely on a shaft 52, the latter being journaled at one end in a bearing 54 and at the other end in a bearing box 56 formed at one side of a differential gear box 58. A shaft extending from the differential gear box 58 is connected by means of an Oldham coupling 66 with a motor 68, so that the shaft 52 is constantly turning. A one-revolution clutch of the customary type, indicated generally at 60, is mounted upon the shaft 52 and is operable to connect the gear 50 to the shaft 52 for rotation. For this purpose, a rod 61 is provided, one end thereof being attached to the clutch throw. The opposite end of the rod 61 extends downwardly through the table upon which the machine rests and is attached to an arm 62 pivoted at 64 to some convenient part of the table. By throwing the clutch into operation, the rack 34 may be caused to reciprocate, thereby oscillating the shaft 20 and turning the shoe back and forth in front of the spray unit.

If a heel is oscillated in front of a fixed spray gun, the coating material will pile up at the breast edges B at opposite sides of the heel because of the fact that during the reversal of the direction of oscillation the heel is momentarily stationary. To avoid this accumulation, the spray gun, as herein described, is arranged to oscillate with respect to the heel through an angle of such extent that during the reversal of the heel the spray gun is directed to one side of the heel, that is, so that the cone of projected spray, an element *z* of which is shown in Fig. 4, does not fall on the surface of the heel while its direction of rotation is changing. In other words, the spray gun is oscillated relative to the heel and in a direction which at any given time is opposite to the movement of the convex surface of the heel and overruns or moves beyond the breast edge of the heel at each end of its travel so that the coating is applied to the surface of the heel only while the surface is in motion. The coating of the heel, in accordance with this imposed condition, is provided by a spray gun 70 which is attached to a vertical post 78. To permit adjustment, the spray gun is tiltably mounted upon a bolt 79 which is passed through a boss 77 formed on the spray gun, the bolt being threaded into a split collar 74 clamped to the post by a bolt 75. The post 78 is fixed to one end of an arm 80. The opposite end of the arm 80 is fixed to the upper end of the shaft 22 by which the arm, and consequently the post, is oscillated. The oscillation of the shaft 22 is accomplished by an arm 84, having a slot 86 therein, which is fastened to the lower end of the shaft 22. The arm 84 is connected by a pin 92 to an arm 88, also having a slot 90 therein, the pin 92 being fastened to the arm 88 in the slot by a knurled nut 94. The arm 88 is formed integral with the rack 34 (Fig. 3) and moves therewith in a horizontal plane. During the reciprocation of the rack 34, the arm 88 will be moved horizontally and the pin 92 will cause the arm 84 to oscillate the shaft 22, and consequently the post 78 to which the spray guns are attached, through a given angle. This angle through which the spray guns turn may be increased or decreased by adjusting the position of the pin 92 in the slot 90 of the arm 88 and should be of such magnitude that the spray gun at the extremity of its movement will not project the coating material on the surface of the heel. Additional adjustment is also provided by movement of the post 78 in the slot 82 of the arm 80.

In order to coat the entire convex surface of the heel with a fixed spray gun, the heel must be turned relative to the spray gun through an angle of more than 180° and if this is done as the breast edge comes opposite the spray gun, the breast will be exposed to the coating material. By oscillating the spray gun relaive to the heel, as previously explained, the coating may be applied to the sides of the heel adjacent to the breast edges without having to turn the heel through more than 180° and consequently without danger of coating the breast of the heel.

The convex surface of a heel, particularly the heel of a woman's shoe, is not uniform in contour. The radius of curvature heightwise varies from a minimum at the attaching face to a maximum at the top lift and, around the periphery, the curvature varies from the back to the breast edges B at opposite sides of the heel. When a coating is to be applied to a uniform surface such as a cylinder with a maximum of efficiency, the direction of projection of the spray of coating material is kept normal to the surface. If

the angle between the line of projection of the spray of coating material and the surface being coated becomes markedly less than 90°, there is a tendency for the particles to bounce or ricochet from the surface, and this tendency becomes more pronounced as the angle decreases. Accordingly, when coating a heel it is desirable to keep this angle as near 90° as is feasible without complicating the mechanism for turning the heel and spray gun. It was found by experience that a satisfactory angular relation between the axis of the spray gun and the surface of the heel could be approximated by oscillating the spray gun with respect to the heel during the oscillation of the heel in the manner prescribed if certain angular relations were preserved between the axis of the spray gun and the plane of the attaching surface and a plane passing through the axis of the heel and bisecting the breast thereof. In order to minimize ricochet, it has been found that the direction of application, that is, the axis of the spray gun (represented at *x* Fig. 1) should be substantially parallel to the plane of the attaching face of the heel. Practically, this condition can not be attained for each size and style of heel without unduly complicating the machine. However, if the angle *a* (Fig. 1) between the axis *x* of the spray gun and a plane *p* passing through the locus of the points of intersection of the line of projection and the convex surface of the heel is not greater than 10°, that is, if the angle between the axis of the spray gun and the aforesaid plane *p* is between 0° and 10°, substantially the desired conditions will be obtained from any shoe that it may be necessary to coat. The aforesaid angular relation between the axis of the spray gun and the plane *p* may be obtained by releasing the split collar **74** and moving the spray gun up or down on the post and by tilting the spray gun about the bolt **79**. It has also been found that if the angle *b* (Fig. 4) between the axis *x* of the spray gun and the plane *y* passing through the axis running heightwise of the heel and bisecting the breast is 75° or greater at the point C, the angle at which the spray strikes the surface of the heel at any given time during the relative movement between the heel and spray gun will not be such as to produce an undue amount of loss by ricocheting. To obtain this relation it is merely necessary, when adjusting the spray gun for oscillation through an arc sufficient to carry its cone of projection beyond the breast edge of the heel at each end of its oscillation, to see that the angle between the axis *x* of the spray gun and the plane *y* passing through the axis of the heel and bisecting the breast is at least 75°. Adjustments provided by the movement of the pin **92** in the slot **90** and the movement of the post **78** are sufficient. It is to be observed that the oscillation of the spray gun and the heel in such a manner that the direction of movement of the line of projected spray and the surface of the heel at any given time is opposite counteracts the tendency for the particles of sprayed material to ricochet.

While the coating may be accomplished by employing a single spray gun by turning the head thereof to produce a vertical fan of projected material which will coat the entire surface of the heel, it is found to be advantageous to use two spray guns because of the great difference in the area of the surface to be coated at the base and top of the heel, respectively. Accordingly, a second spray gun **72** is mounted above the spray gun **70**. When two spray guns are employed, the spray gun **70** is directed at the base of the heel and is adjusted to give an elliptical or fan-like projection, the long axis of the ellipse being disposed horizontally, while the spray gun **72**, which is directed at the top of the heel, is adjusted to give an elliptical projection the long axis of which is disposed vertically. The second spray gun **72**, which, as stated, applies the coating material to the upper end of the heel, is provided with a split collar **74'** and is mounted on the post **78** above the spray gun **70**, as illustrated in Fig. 1. The split collar **74'**, like the collar **74**, is clamped to the post by a bolt **75'** and has threaded into one side thereof a bolt **79'** which is passed through a boss **77'** formed on the spray gun. It is to be observed that the spray gun **72** is tilted so that its axis is substantially parallel to the plane of the top lift of the heel to minimize ricochet. The angle *c* (Fig. 1) between the axis of the spray gun **72** and a plane *p'* passing through the locus of the points of intersection of the line of projection of the spray gun **72** and the convex surface of the heel adjacent to the top lift may vary between 0° and 10°. Thus the conditions maintained at the lower part of the heel are substantially duplicated at the top portion of the heel since the spray gun **72** turns with the spray gun **70**, thereby having the same angular movement relative to the heel as the spray gun **70**.

The spray guns **70** and **72** are furnished with compressed air, for atomizing the coating material, through a pair of conduits **96** (Figs. 1 and 2) connected to a common conduit **97** and with a source of coating material through conduits **98** which are connected to a common conduit **100**. The spray gun valves **102** are operated by means of air cylinders **104** which are furnished with air from conduits **106**, the latter being connected to a common duct **105**.

It has been found that in order to cover the heel properly at least three coats of material should usually be applied, although the number of coats may be varied without affecting the scope of applicant's invention. In the present instance three coats are applied and means is provided for turning the heel three times through 180° of rotation. This is taken care of by the ratio of the gears **48** and **50** and it is evident that, by changing the size of the gears, the number of rotations may be varied. The valves admitting the coating material to the nozzles of the spray guns are automatically opened and closed at the beginning and at the end of the rotation of the heel. The admission of compressed air to the conduit **97** is also automatically controlled. To this end, a cam **108** (Fig. 6) is fastened to the gear **50**. A cam follower **110** rides on the surface of the cam **108**, the cam follower being fastened to a plunger **112** arranged to slide vertically in a sleeve **114** fastened to the base **14**. The plunger **112** is urged downwardly by a spring **116** to hold the follower **110** against the cam surface. A plate **118** is fastened to the upper end of the plunger and abuts a pair of valve pins **120** which extend from a pair of valves **122** placed in the supply ducts **97** and **105**. The surface of the cam **108** is so formed that the valve pins **120** will be held open to admit compressed air to the nozzle of the guns and compressed air to the pistons **104** which open the coating material valves during the oscillation of the heel through three times 180° and will then permit the valve pins to close.

In the operation of the machine, a shoe S is

slipped into the frusto-conical member 28 of the shield 10, the member 30 being placed over the forepart of the shoe. The spray guns 70 and 72 are then tilted until the angles between the axes of the guns and the planes passing through the locus of the points of intersection of the lines of projection of the respective spray guns and the convex surface of the heel are between 0° and 10°. The angular movement of the spray guns is then determined by adjustments of the post in the slot 80 and the pin 92 in the slot 84 to obtain a maximum angle of at least 75° between the axes of the spray guns and a plane passing through the axis of the heel and bisecting the breast at one extremity of the movement. The clutch 60 is then closed and the shoe is oscillated in front of the spray guns from breast edge to breast edge, that is, through 180° of rotation, three times, thereby applying three coats of material to the surface of the heel. The spray guns turn simultaneously with the oscillation of the heel and the valves supplying compressed air to the spray guns are held open during this time. After the heel has been oscillated three times, the machine automatically stops and the shoe is removed.

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

1. A method for applying a coating to a heel including as steps creating a projection of sprayed coating material, presenting the convex surface of a heel to the projected spray, oscillating the heel about an axis running heightwise thereof to expose the entire convex surface thereof to the spray, and moving the line of projection of the spray from side to side of said axis and always in a direction opposite to the movement of the convex surface of the heel.

2. A method for applying a coating to a heel including as steps creating a projection of sprayed coating material, presenting the convex surface of a heel to the projected spray, oscillating the heel about an axis running heightwise thereof to expose the entire convex surface thereof to the spray, and oscillating the line of projection of the spray from side to side of the axis of the heel, the oscillation of the heel and the line of projection of the spray being simultaneous and so related that the directions of movement of the line of projection and of the surface of the heel at any point are opposite.

3. A method for applying a coating to a heel including as steps creating a projection of sprayed coating material, progressively changing the direction of projection laterally through a given angle, holding a heel within the limits of the angular change in the direction of the projected spray, and oscillating the heel laterally in directions opposing the lateral change of direction of the projected spray.

4. A method for applying a coating to a heel including as steps creating a projection of sprayed coating material, holding a heel within the range of the projected spray, oscillating the heel and oscillating the spray gun progressively to change the direction of projection through a given angle sufficiently great to cause the line of projection of the spray to move beyond the heel surface at each side thereof, the oscillations of the spray gun and heel being such that the tip of the spray gun and the surface of the heel always move in opposite directions.

5. A method for applying a coating to a heel including as steps creating a projection of sprayed coating material, holding a heel within the range of the projected spray, oscillating the heel and oscillating the spray gun progressively to change the direction of projection through a given angle sufficiently great to cause the cone of projected spray to move beyond the surface of the heel at each side thereof, the oscillations of the spray gun and heel being such that the tip of the spray gun and the surface of the heel are always moving in opposite directions.

6. A machine for applying a coating to the convex surface of a heel, comprising a heel support oscillatable about an axis running heightwise thereof, a spray gun mounted for oscillation about an axis adjacent to the heel support and parallel to the axis thereof, means for effecting oscillation of the heel support in clockwise and counterclockwise directions about its axis, and means for simultaneously effecting movement of the spray gun in similar clockwise and counterclockwise directions of rotation about its axis.

7. A machine for applying a coating to the convex surface of a heel, comprising a spray gun for projecting a spray of coating material, means for supporting said spray gun for oscillation, a support for a heel adjacent to the spray gun, said heel support being oscillatable, means for effecting oscillation of the heel support, and means connecting the last-named means to the spray gun support for effecting oscillation thereof to cause the tip of the spray gun to move from side to side of the heel support and always in a direction opposite to the direction of movement of the surface of the heel, the amplitude of the oscillations being such that the tip of the spray gun moves beyond the surface of the heel during each oscillating movement.

8. A machine for applying a coating to the convex surface of a heel, comprising a heel support for holding a heel in a position to be turned from breast edge to breast edge about an axis running heightwise thereof, a spray gun, a support for said spray gun adjacent to the heel support, said support being movable about a center between the axis of the heel support and the spray gun, means for turning the heel about its axis, and means for simultaneously turning the spray gun support to move the spray gun bodily in an arc of such magnitude that the tip of the spray gun moves beyond the breast edge of the heel at each end of its movement.

9. In a machine for spraying a heel, a support for the heel, means for oscillating said support, a spray gun, a support for said spray gun, said spray gun support being oscillatable about a center located between the center of rotation of the heel support and the spray gun, means on said spray gun support for adjusting the spray gun about a horizontal axis so that the angle between the axis of the spray gun and a plane passing through the locus of the points of intersection of the line of projection and the convex surface of the heel is not greater than 10°, and means for oscillating the spray gun support to move the spray gun bodily in an arc relative to the heel support during the oscillation of the heel support.

10. In a machine for spraying a heel, a support for the heel, means for oscillating said heel support to turn the heel about an axis running heightwise thereof, a spray gun, a support for said spray gun mounted for rotation about a center between the axis of rotation of the heel support and the spray gun, and means for oscillating the spray gun support relative to the heel

support to move the spray gun in an arc about the heel during the oscillation of the heel support, the bodily movement of the spray gun being such that the angle between the line of projection of the spray gun and a plane passing through the axis of the heel and bisecting the breast of the heel is at least as great as 75°.

11. In a machine for spraying a heel, a support for the heel, means for oscillating said support to turn the heel about an axis running heightwise thereof, a spray gun, a support for said spray gun mounted for rotation about a center located between the axis of rotation of the heel support and the spray gun, means on said spray gun support for adjusting the spray gun about a horizontal axis so that the angle between the axis of the spray gun and a plane passing through the locus of the points of intersection of the line of projection and the convex surface of the heel is not greater than 10°, and means for oscillating the spray gun support relative to the heel support during the oscillation of the heel to move the spray gun bodily in an arc about the heel, the length of the arcuate movement of the spray gun being such that the angle between the line of projection of the spray gun and a plane passing through the axis of the heel and bisecting the breast of the heel is at least 75° at either extremity of the oscillation of the heel.

12. In a machine for spraying a heel, a support for the heel, means for oscillating the heel support to turn the heel about an axis running heightwise thereof, a spray gun, a support for the spray gun, means for oscillating the spray gun support relative to the heel support, and means for increasing or decreasing the degree of oscillation of said spray gun support relative to the heel support.

13. In a machine for spraying a heel, a movable support for the heel, a spray gun, means for oscillating said heel support to turn about the heel from breast edge to breast edge in front of the spray gun, a movable support for said spray gun, means for oscillating the spray gun support relative to the heel support as it oscillates, means for adjusting said spray gun on the support to and from the heel support, and means for tilting said spray gun on said spray gun support.

14. In a machine for spraying a heel, an oscillatable support for the heel, a spray gun, means for oscillating said heel support to turn the heel from breast edge to breast edge in front of the spray gun, and an oscillatable support for said spray gun, said means for oscillating said heel support oscillating said spray gun support.

15. In a machine for spraying a heel, an oscillatable support for the heel, a spray gun, means for oscillating said heel support to turn a heel from breast edge to breast edge before said spray gun, an oscillatable support for said spray gun, and adjustable means connecting said spray gun support to said heel support for oscillation.

16. In a machine for spraying a heel, an oscillatable support for the heel, a pair of spray guns, oscillatable means for supporting said spray guns adjacent to the heel support, one of said guns being opposite the large end of the heel and the other opposite the small end of the heel, and means for simultaneously oscillating the heel support and spray guns relative to each other and in the same direction of rotation.

17. In a machine for spraying a heel, a shaft, means for supporting the heel for rotation with said shaft, a spindle parallel to the shaft, means for supporting the spray gun on said spindle, a second shaft between the first shaft and spindle, means for supporting the spindle on the second shaft for movement in an arc about the first shaft, and means for adjusting the spindle radially of the shaft.

18. In a machine for spraying a heel, a pair of parallel shafts, means for supporting the heel for oscillation with one of the shafts, means for supporting a spray gun for oscillation with the other of said shafts, means for oscillating said shafts, and means for varying the degree of oscillation of one of said shafts with respect to the other.

19. In a machine for spraying a heel, a pair of parallel shafts, means for supporting the heel for oscillation with one of said shafts, means for supporting a spray gun for oscillation with the other of said shafts, reciprocable means, means on said one shaft cooperable with the reciprocable means to produce oscillation of said shaft, an arm on said other shaft, and means connecting said arm to the reciprocable means for oscillation thereby, said last-named means being adjustable to vary the degree of oscillation of said other shaft.

VALENTINE F. HARRINGTON.