

Oct. 27, 1936.

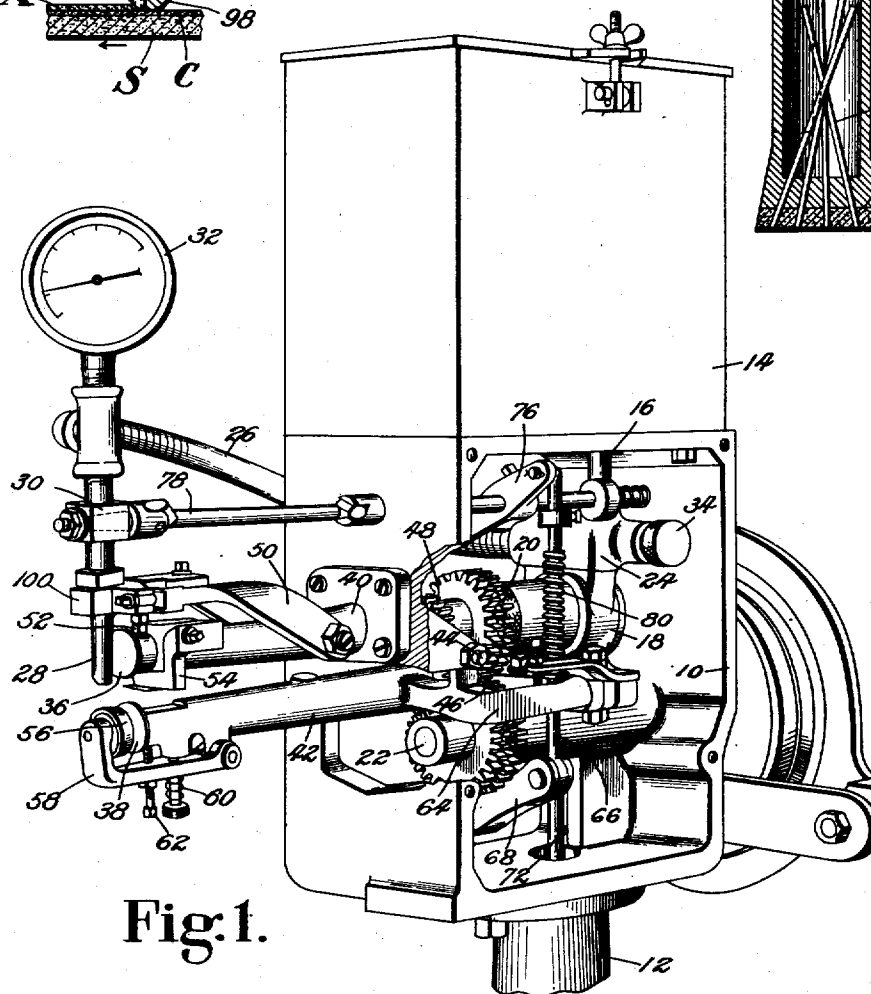
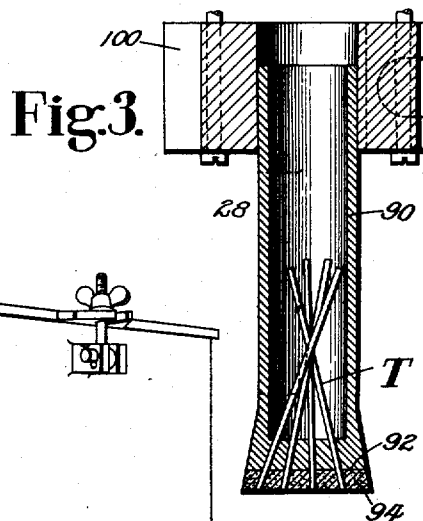
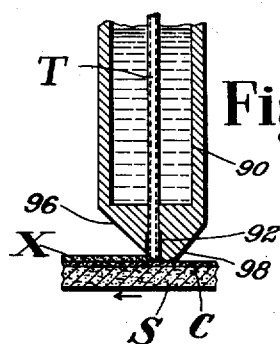
J. W. JOHNSON.

2,058,461

NOZZLE FOR MACHINES FOR PREPARING SOLES FOR CEMENT SHOES

Original Filed Oct. 3, 1933

2 Sheets-Sheet 1



Inventor

Joseph W. Tolson
By his Attorney
Harlow M. Davis

Oct. 27, 1936.

J. W. JOHNSON

2,058,461

NOZZLE FOR MACHINES FOR PREPARING SOLES FOR CEMENT SHOES

Original Filed Oct. 3, 1933

2 Sheets-Sheet 2

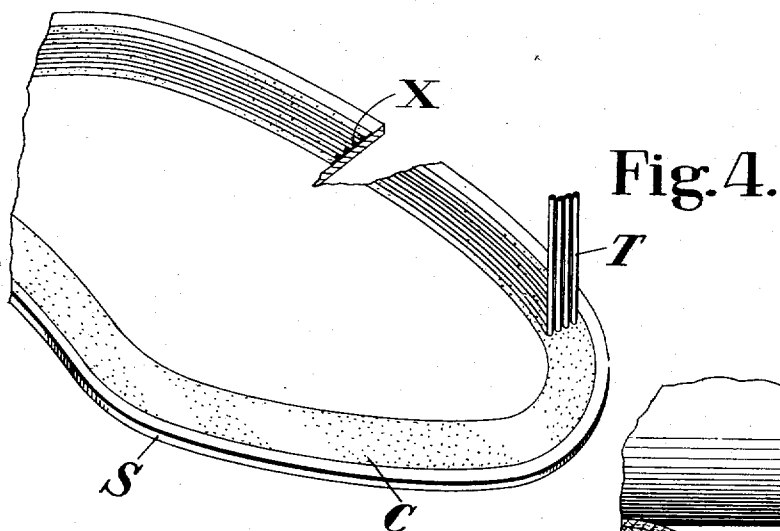
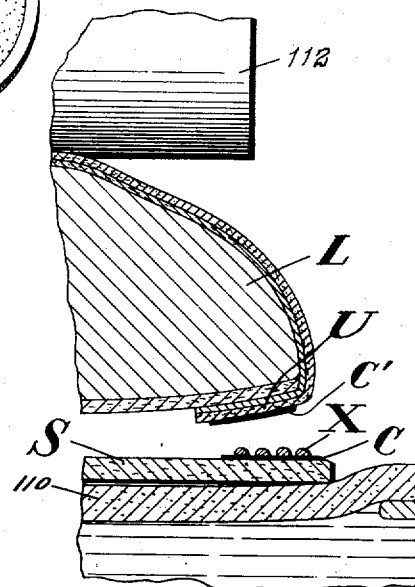
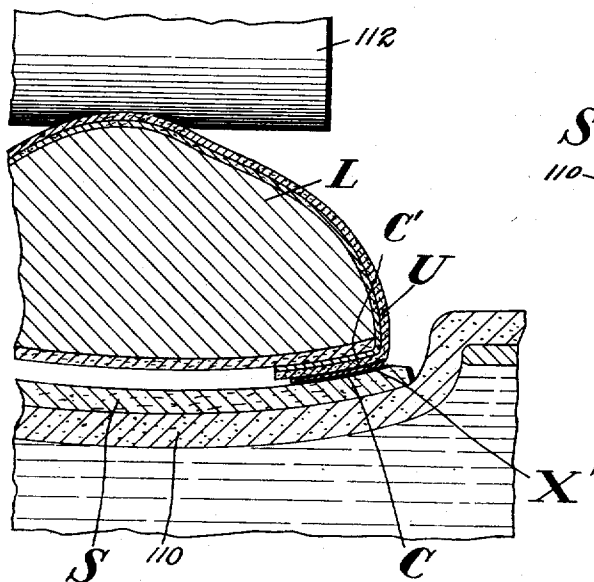


Fig. 6.



Inventor

Joseph W. Johnson
By his Attorney
Harlow M. Davis

UNITED STATES PATENT OFFICE

2,058,461

NOZZLE FOR MACHINES FOR PREPARING
SOLES FOR CEMENT SHOESJoseph W. Johnson, Salem, Mass., assignor to
United Shoe Machinery Corporation, Paterson,
N. J., a corporation of New JerseyOriginal application October 3, 1933, Serial No.
692,043. Divided and this application Decem-
ber 31, 1934, Serial No. 759,915. In Great
Britain October 10, 1932

1 Claim. (Cl. 91-43)

This invention relates to machines for prepar-
ing soles for incorporation in shoes. The inven-
tion is herein illustratively described in connec-
tion with the application of a solvent to acti-
vate a dry coating of cement upon a sole which
is to be permanently attached to a shoe by means
of cement and as embodied in a nozzle for a ma-
chine for applying a fluid, such as solvent, pro-
gressively to the margin of a piece of work, al-
though in various respects the invention is not
so limited.

In the manufacture of compo shoes in which
the outsole is secured to the shoe bottom by ce-
ment, a common practice is to apply a coating
of cement containing pyroxylin or other cellulose
derivative to the flesh surface or attaching face
of an outsole. Frequently this is applied in the
form of a marginal stripe which may not extend
fully to the edge of the sole and this coating is
usually allowed to dry as the soles are accumu-
lated prior to the time when they are needed for
incorporation in shoes. Usually, the shoe bottom
is also provided with a stripe of cement which
is allowed to dry. Just before the outsole is to
be applied to the shoe bottom, the cement coat-
ing on the outsole is activated by applying there-
to a solvent for the cement, whereupon the shoe
and outsole are brought into close contact in a
press, such, for example, as that described in Let-
ters Patent of the United States No. 2,047,185,
granted July 14, 1936, on the application of Mil-
ton H. Ballard, et al., until the cement has dried
sufficiently to secure the outsole properly in place
on the shoe.

It has been a common practice hitherto to
apply a liquid solvent to the cement coating on
the sole and to put it on manually by means of a
brush. This practice is, however, disadvantage-
ous from many points of view since, for example,
the application may be uneven and the cement
may be displaced by the dragging action of the
brush, and the solvent, unless great care is taken,
may spread over the mid-portion of the sole
where it is not needed or get on the edge and
tread surface of the sole with a consequent dan-
ger of staining. More recently there has been
used with great satisfaction an activator in the
form of a highly viscous solvent. One form of
such a softener is described in United States Let-
ters Patent No. 1,959,321, granted May 15, 1934
upon an application filed in the name of Walter
H. Wedger, wherein there are set forth certain
desirable results which accrue from the use of
such a solvent, such as the ability to apply the
solvent in a predetermined position from which

it is not readily displaced, the greater ease with
which the sole thus coated may be handled and
the reduction in the length of time during which
the shoe must remain in the press. A lessened
danger of squeeze-out, when pressure is applied, is
another important advantage.

Quite clearly, too much solvent means a waste
of material as well as an increase in the time
required for the volatile constituents of the sol-
vent to evaporate and, hence, an increase in the
time during which the shoe must be kept in the
press. On the other hand, too little solvent may
readily result in "starved" joints and, hence, im-
perfect adhesion of the sole to the shoe. A meth-
od providing for the application of a predeter-
mined amount of viscous solvent in a plurality
of separated threads is not claimed herein since
it forms the subject matter of an application for
Letters Patent of the United States Serial No.
692,043, filed October 3, 1933, in my name, for
improvements in Method of preparing soles for
cement shoes, of which this application is a di-
vision.

As illustratively described, the threads of vis-
cous solvent are applied in ridges of sufficient
height to enable the solvent to be spread laterally
under pressure. It is possible, however, by con-
trolling the dimensions of these ridges to make
the spreading extend over just the required dis-
tance, thus eliminating squeeze-out. Solvent thus
applied attacks immediately the cement directly
beneath the threads, and as the liquid component
of the solvent is absorbed in the cement the
threads tend to stiffen or to form a thin surface
skin. After the sole has been positioned upon
the shoe and pressure has been applied, the ridges
of solvent are spread laterally and, being capable
of control as to their cross-sectional dimensions,
can spread only so far as is desired to make them
effective in activating the whole surface of the
stripe of cement with a minimum of wetness in
the joint. This makes it possible to absorb the
wetness in a short time dwell and to keep the
spread of solvent toward the edge fully under
control so as thereby to eliminate squeeze-out.

If the dry cement is to be thoroughly activated,
the solvent must be applied thereto in exactly
the desired overlying relation. The determined
position will vary slightly in accordance with the
wishes of the particular manufacturer but usual-
ly he will wish to keep the margin clean between
the cement and the edge of the sole. This can be
very readily accomplished when the solvent is ap-
plied in ridges or threads.

Inasmuch as the time interval between the ap-

plication of solvent and the bringing together of a sole and shoe depends upon the particular operator, it is important that there shall be as little loss as possible of the volatile constituents of the solvent during this time interval. Another advantage of the application of solvent in a plurality of separated threads or ridges lies in the fact that the escape of the volatile constituents is less for any particular mass of solvent per running inch of margin to be activated when applied in separated threads than it is when applied in a ribbon or band. The reason for this is twofold: first, the area of contact between the threads of solvent and the band of cement is less than the area between a ribbon of solvent and the cement and, therefore, there is less opportunity for the escape of the volatile or active constituents of the solvent into the cement, and, second, the surface area of the threads of solvent is less, for that predetermined mass per unit length of margin which is needed to activate the cement, when it is applied in threads than when it is applied in a broad ribbon. Therefore, the opportunity for surface evaporation is less.

To get a perfect bond between the sole and the shoe by means of cement it is necessary that the whole band of cement shall be activated. On the other hand, if too much solvent is applied there is immediate danger of squeeze-out and there has been deposited upon the shoe an excess of solvent which must be volatilized and dried out before the shoe may be released from the press. The minimizing of the time dwell during which the shoe remains in the press is dependent upon the promptness with which the solvent is dried or absorbed and solvent fumes driven out of the cement joint. It will be understood that, if a given production is to be obtained, any increase in this time dwell causes an increase in the number of presses required. On the other hand, a reduction in time dwell means that the same machinery will produce more shoes in a given period. It is not always necessary that the joint shall have become completely dry at the time when the shoe is removed from the press but it must have at least attained that condition in which there shall be no subsequent separation of the sole from the shoe and, if the arrangement is such that the extreme edge of the sole is held adhesively when the shoe is removed from the press, then the margin will dry out safely as the interior portion of the joint proceeds to harden.

Many difficulties are attendant upon the application of solvent by machine in such a way that a small quantity which is just enough but not too much will be deposited upon the cement uniformly. The continued application of a uniform quantity of material containing a cellulose derivative, such as pyroxylin, with its quick drying properties, depends not only upon the provision of a work feeding mechanism by means of which the pieces, such as unattached soles, are moved progressively at a substantially constant speed but also upon the use of an applying device in which the exposure of the material to the air at the delivery opening does not affect the uniformity of application. By using a machine of the extrusion type in which the substance is forced under pressure through a nozzle, the difficulty of applying a uniform quantity is minimized as compared with a machine employing a rotary brush or roll for the application of the coating material. It is found, however, that such material cannot be extruded with precision and with-

out interruption of operation through the usual nozzle having a slit-like opening. The pressure cannot be very large without extruding more than the desired quantity and, if the pressure is small and the opening narrow, it is almost impossible to keep the whole of the nozzle opening clear for any length of time. The clogging of even a small part of a slit, which happens frequently, leaves a bare portion and prevents the application of a uniform band. Furthermore, the difficulties of manufacturing a nozzle with such a slit-like opening of the desired restricted size, with sufficient mechanical precision to enable it to operate uniformly, are very severe.

An object of the invention is to provide a solution of these problems and this is accomplished in the present instance by the provision of an improved nozzle for this type of machine by means of which a predetermined and controllable amount of solvent may be applied to a sole and in just the required position.

In accordance with a feature of the invention, the illustrated nozzle comprises a plurality of capillary tubes through which the solvent is forced and by which it is applied in threads or ridges occupying approximately parallel separated positions around the margin of a sole.

In common with most machines of this class, the illustrated machine, in which this nozzle is embodied, provides a valve for interrupting the flow of solvent when there is no work in the machine, and it is essential that any material left in the nozzle between the valve and the nozzle outlet shall not run out or drop upon the machine or the pieces of work. Another feature of the invention resides in the provision of an improved nozzle comprising capillary tubes the internal diameter of each of which bears such a relation to the viscosity of the solvent that the capillary action of the tube on the solvent will retain the solvent in the tube upon removal of the feeding pressure, thus eliminating dripping from the outlet ends of the tubes in the intervals between the presentation of successive pieces of work to the machine. In the illustrated machine, pressure to extrude the solvent through the tubes is provided by means of a gear pump which, while commercially satisfactory, is liable to relatively large momentary variations in pressure. Accordingly, the length of the capillary tubes of the nozzle is made many times the diameter of each tube. As a result, the frictional resistance provided by the inner walls of the tubes, which increases approximately as the square of the velocity of the stream passing through the tubes, is sufficient to offset the effect of the relatively large momentary variations in pressure and to reduce to a minimum variations in the quantity of solvent extruded per unit of time. Since the viscosity of the fluid varies with the temperature of the room and for other reasons, it has been found desirable in the illustrated machine to provide a spring controlled by-pass valve connected across the pump and to include means for varying the spring pressure thereby to control the pressure applied to the solvent. The construction, therefore, enables the threads of solvent to be extruded at a speed equal to or slightly greater than the speed of movement of the work, thus providing for unbroken and substantially uniform threads of solvent.

For a better understanding of the various features of the invention as described in the following specification, reference may be had to the accompanying drawings, in which

Fig. 1 is a perspective view of a machine provided with a nozzle embodying the invention;

Figs. 2 and 3 are vertical sections, taken in planes at right angles to one another, through a nozzle for use in the machine;

Fig. 4 shows a sole having a band of dried cement and to the upper portion of which threads of solvent have been applied;

Fig. 5 shows a treated sole positioned in a sole-attaching machine with a shoe held above the sole with the elements somewhat exaggerated, and

Fig. 6 indicates the condition which obtains after the shoe has been brought into contact with the sole and pressure applied, thereby flattening the threads of solvent.

The operating parts of a machine embodying my invention are supported in a hollow frame 10 which may be carried on the head of a column 12. A receptacle 14 secured on the frame 10 delivers viscous solvent through an outlet pipe 16 to a gear pump 18. This pump is driven through gears 20 by means of power supplied to a drive shaft 22. The pump 18 is effective to force the solvent through a passage in a block 24 and to a flexible pipe 26 which is connected to a nozzle 28. A valve 30 is interposed between the nozzle 28 and the pipe 26, and a gage 32 is provided to indicate the pressure. In the block 24 is a by-pass controlled by a spring pressed valve and the pressure at which the solvent is delivered to the nozzle may be controlled by regulating the pressure of the spring against this by-pass valve by turning a knurled head 34 of a screw.

In order that the sole may be fed at a uniform speed past the nozzle 28, the machine is provided with an upper feed roll 36 and a coating lower feed roll 38. The upper feed roll is mounted on a shaft journaled in an arm 40 which is rigidly mounted upon the frame and extends outwardly therefrom and the lower feed roll is mounted on a shaft journaled in an arm 42 which is supported by pivot screws 44 so that the arm may tilt and the lower feed roll 38 may be dropped (as shown in Fig. 1) to provide for the presentation of a piece of work, or be raised to grip the work rested against the arm 40. The shafts carrying these feed rolls 36 and 38 are driven from the drive shaft 22 by means of gears 46 and are interconnected by gears 48. It is to be observed that the nozzle 28 is carried in a forked arm 50 pivotally mounted upon the arm 40, thus permitting the nozzle to float on the surface of the work. The limit of downward movement of the forked arm carrying the nozzle is determined by a stop screw 52. An edge gage 54 is also mounted on the arm 40 and determines the relation of the sole to the outlet openings of the nozzle. Carried upon the arm 42 is a supporting roll 56 which is journaled in a carrier 58 pivotally mounted upon the arm 42 and held upward resiliently by a spring 60 to a position determined by a stop screw 62. This provides a proper support for portions of non-uniform thickness transversely of the margin, such as shank portions of the sole. The arm 42 has an inward extension 64 through which passes a rod 66 connected, through an intermediate lever 68 and a rod 72 with a treadle (not shown). The upper end of the rod 66 is joined to a lever 76 upon a valve rod 78. It is to be observed that the valve rod 78, detachably connected to the valve 30, is provided with universal joints so that this connection does not interfere with the floating action of the nozzle. A spring 80 is interposed between a collar on

the rod 66 and a washer resting upon the arm extension 64. When the operator presents a piece of work to the machine and operates the treadle, he will simultaneously raise the lower rolls 38 and 56 into engagement with the sole and will open the valve 30 permitting a flow of solvent through the nozzle to the work.

In order that the solvent may be applied to the work in ridge-like threads X (Fig. 4) which will be located in just the desired position upon a stripe of dried cement C upon a sole S, I have provided the nozzle with a series of laterally separated capillary tubes T positioned beside one another. These tubes are manufactured inexpensively and with considerable exactness and I have found that tubes having an internal diameter of 20 to 25 thousandths of an inch, for example, are suitable for the use of the particular solvents having a cellulose derivative which are now employed by the trade. It is essential for cleanliness in the machine and in order that succeeding pieces of work may not be soiled that there shall be no dripping from the nozzle. This result will be attained with the capillary tubes already described. I have found that by choosing tubes of the proper diameter for use with a solvent of a particular viscosity there will be no dripping from the nozzle when the valve is closed. The capillary action of the tubes is responsible for this valuable effect.

The tubes T may be secured in any desired fashion to the pipe 26 leading from the pump, as by mounting the upper ends of the tubes in a block of metal, not shown, but the tubes will be better protected from mechanical displacement if they are mounted in a casing 90 (Figs. 2 and 3), the lower end of which is provided with a groove 92 from which holes are drilled to the interior of the casing. The tubes T are inserted in these holes with their upper ends within the hollow casing 90 and are secured in liquid-tight relation by means of solder 94 filling the groove 92 around the tubes. The lower ends of these tubes are beveled flush with an inclined surface 96 upon the forward side of the nozzle casing while the trailing side is provided with a toe 98 which rests upon the work. The upper end of the casing 90 is secured in a block 100 detachably secured to the forked arm 50 and attached by means of screws (Fig. 3) to a portion of the casing of the valve 30.

As the sole is fed through the machine at a substantially uniform rate, being guided with respect to the nozzle in such a way that the lower end of the nozzle maintains a uniform relation to the edge of the sole, solvent will be distributed upon the sole in parallel threads X (Fig. 4) of ridge-like formation and deposited in exactly the desired position upon the stripe of dried cement C. This construction provides a nozzle by means of which a uniform quantity is extruded per unit of time and, by reason of the uniform feeding of the sole, per unit of area of the cement coated margin. The arrangement greatly simplifies the construction and reduces the cost of manufacture. There is no difficulty in keeping the tubes free and, perhaps partly because of the reduced area of the solvent which is exposed to the air at the outlets of the tubes during the intervals between presentation to pieces of work, there is no difficulty about the continued application, day in and day out, of exactly the desired quantity of material to the work.

The gear pump provides a satisfactory means of applying pressure to the solvent to force it

through the nozzle. It is found, however, that either by reason of the nature of the pump or possibly because of the lack of perfect homogeneity in the solvent itself, there are momentary variations in applied pressure which, were they not otherwise counteracted, would be a serious drawback in the application of uniform quantities of material. I have found, however, that by using tubes the length of which is many times the diameter of a single tube, and is of the order of an inch and one-half, then the fluctuations in pressure are almost entirely offset, presumably by the frictional resistance provided between the stream of solvent and the inner walls of the tubes. This resistance increases approximately as the square of the velocity of the stream of solvent passing through the tubes and reduces to a minimum variations in the quantity of solvent extruded per unit of time. By regulating the pressure of the spring acting on the by-pass valve, as by turning the screw head 34, it is possible to control the pressure applied and to enable the threads of solvent to be extruded at a speed equal to or slightly greater than the speed of movement of the work, thus insuring unbroken and substantially uniform threads of solvent.

Certain features of the machine illustrated in the drawings are not claimed herein since they are claimed in Letters Patent of the United States No. 2,042,479, granted June 2, 1936, on the application of Carl A. Newhall.

After the solvent has been applied around the band of cement, the sole is immediately positioned upon a pad 110 forming a unit of the sole attaching press of the application of Ballard et al. mentioned above. The condition is somewhat as illustrated in exaggerated dimensions in Fig. 5. The solvent will immediately attack a portion of the cement directly under the threads of solvent and a slight skin will form upon the top of these ridge-like threads X. To the overlaid upper U of a shoe upon the last L there has been applied a band of cement C' which is allowed to dry. As soon, however, as the shoe is brought down against the sole and pressure has been applied through a

member 112, the threads of solvent will be spread laterally to meet one another and to form a continuous band as indicated at X' in Fig. 6, which will completely cover the bands of cement C and C'. Being carefully controlled as to quantity and as to position, the solvent will not spread laterally beyond the confines of the bands C and C' thereby to cause a disadvantageous squeeze-out which is all too common when a liquid solvent is employed.

In using the machine, the operator will present a sole to the nozzle with its edge against the gage 54 and, depressing the treadle, will cause the sole to be gripped between the feed rolls 36 and 38. This same depression of the treadle will open the valve 30 and allow a flow of solvent through the nozzle. The sole will be guided past the gage substantially automatically by the mechanism more fully illustrated in the Newhall application to which reference has been made above, and a series of stripes X of the solvent will be applied upon the band of dried cement C around such portion of the margin of the sole as is desired by the manufacturer. Usually, this will include all except part of the heel seat of the sole. The treadle is then released and the sole removed from the machine. Release of the treadle shuts the valve 30 and the action of the capillary tubes prevents any dripping from the nozzle.

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

In a solvent extruding machine of the type in which solvent is forced through a nozzle under fluid pressure which is subject to fluctuation, said nozzle being so positioned as to tend to drip upon cessation of supply pressure, a shut-off valve interposed between the pressure-producing means and the nozzle, the discharge means of said nozzle comprising a plurality of capillary tubes relatively positioned laterally of one another and having their flow passages so proportioned to the viscosity of the solvent to be extruded that there will be no dripping of solvent from the tubes when said shut-off valve is closed.

JOSEPH W. JOHNSON.

CERTIFICATE OF CORRECTION.

Patent No. 2,058,461.

October 27, 1936.

JOSEPH W. JOHNSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 47, strike out the words "rested against the arm 40"; line 56, after the numeral "52" and before the period insert resting against the arm 40; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of February, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.

through the nozzle. It is found, however, that either by reason of the nature of the pump or possibly because of the lack of perfect homogeneity in the solvent itself, there are momentary variations in applied pressure which, were they not otherwise counteracted, would be a serious drawback in the application of uniform quantities of material. I have found, however, that by using tubes the length of which is many times the diameter of a single tube, and is of the order of an inch and one-half, then the fluctuations in pressure are almost entirely offset, presumably by the frictional resistance provided between the stream of solvent and the inner walls of the tubes. This resistance increases approximately as the square of the velocity of the stream of solvent passing through the tubes and reduces to a minimum variations in the quantity of solvent extruded per unit of time. By regulating the pressure of the spring acting on the by-pass valve, as by turning the screw head 34, it is possible to control the pressure applied and to enable the threads of solvent to be extruded at a speed equal to or slightly greater than the speed of movement of the work, thus insuring unbroken and substantially uniform threads of solvent.

Certain features of the machine illustrated in the drawings are not claimed herein since they are claimed in Letters Patent of the United States No. 2,042,479, granted June 2, 1936, on the application of Carl A. Newhall.

After the solvent has been applied around the band of cement, the sole is immediately positioned upon a pad 110 forming a unit of the sole attaching press of the application of Ballard et al. mentioned above. The condition is somewhat as illustrated in exaggerated dimensions in Fig. 5. The solvent will immediately attack a portion of the cement directly under the threads of solvent and a slight skin will form upon the top of these ridge-like threads X. To the overlaid upper U of a shoe upon the last L there has been applied a band of cement C' which is allowed to dry. As soon, however, as the shoe is brought down against the sole and pressure has been applied through a

member 112, the threads of solvent will be spread laterally to meet one another and to form a continuous band as indicated at X' in Fig. 6, which will completely cover the bands of cement C and C'. Being carefully controlled as to quantity and as to position, the solvent will not spread laterally beyond the confines of the bands C and C' thereby to cause a disadvantageous squeeze-out which is all too common when a liquid solvent is employed.

In using the machine, the operator will present a sole to the nozzle with its edge against the gage 54 and, depressing the treadle, will cause the sole to be gripped between the feed rolls 36 and 38. This same depression of the treadle will open the valve 30 and allow a flow of solvent through the nozzle. The sole will be guided past the gage substantially automatically by the mechanism more fully illustrated in the Newhall application to which reference has been made above, and a series of stripes X of the solvent will be applied upon the band of dried cement C around such portion of the margin of the sole as is desired by the manufacturer. Usually, this will include all except part of the heel seat of the sole. The treadle is then released and the sole removed from the machine. Release of the treadle shuts the valve 30 and the action of the capillary tubes prevents any dripping from the nozzle.

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

In a solvent extruding machine of the type in which solvent is forced through a nozzle under fluid pressure which is subject to fluctuation, said nozzle being so positioned as to tend to drip upon cessation of supply pressure, a shut-off valve interposed between the pressure-producing means and the nozzle, the discharge means of said nozzle comprising a plurality of capillary tubes relatively positioned laterally of one another and having their flow passages so proportioned to the viscosity of the solvent to be extruded that there will be no dripping of solvent from the tubes when said shut-off valve is closed.

JOSEPH W. JOHNSON.

CERTIFICATE OF CORRECTION.

Patent No. 2,058,461.

October 27, 1936.

JOSEPH W. JOHNSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 47, strike out the words "rested against the arm 40"; line 56, after the numeral "52" and before the period insert resting against the arm 40; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of February, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.