Feb. 1, 1955 J. S. KAMBORIAN 2,701,003

MACHINE FOR STRETCHING FLEXIBLE SHEET MATERIAL ABOUT A SUBSTANTIALLY RIGID FORM

Filed April 10, 1948 3 Sheets-Sheet 1

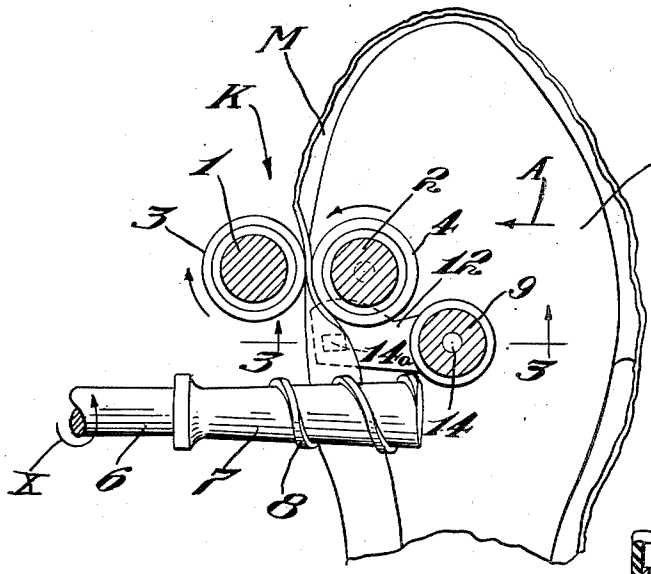
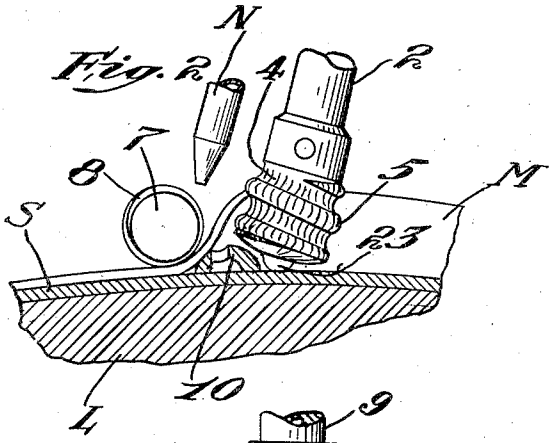


Fig. 1



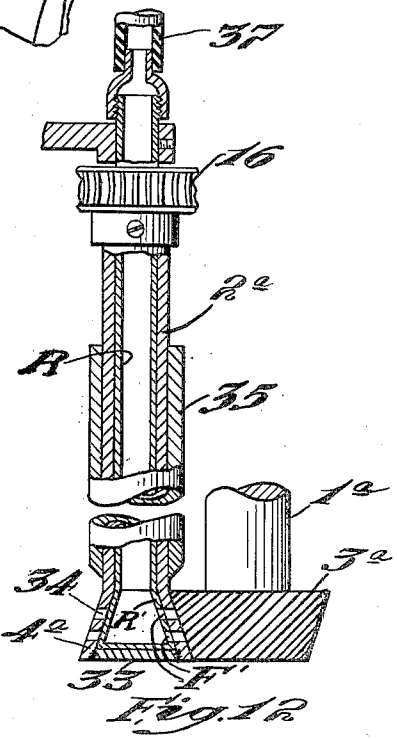


Fig. 12

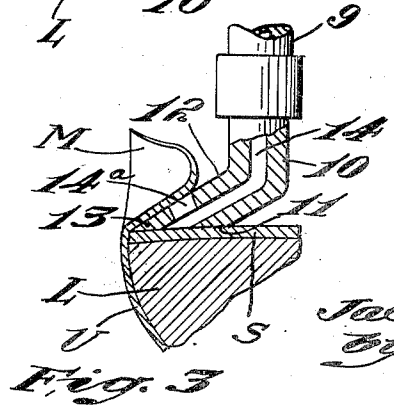


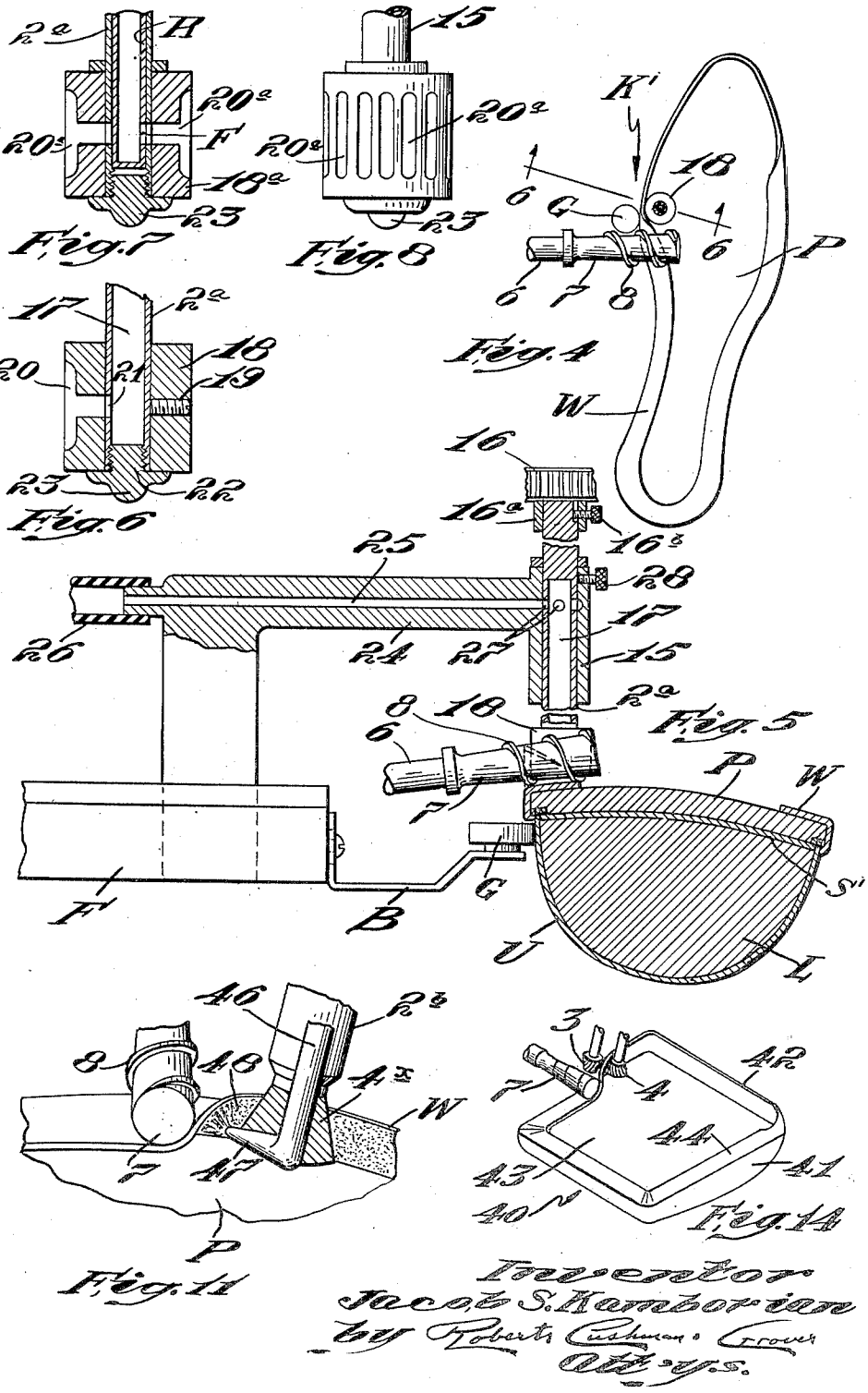
Fig. 3

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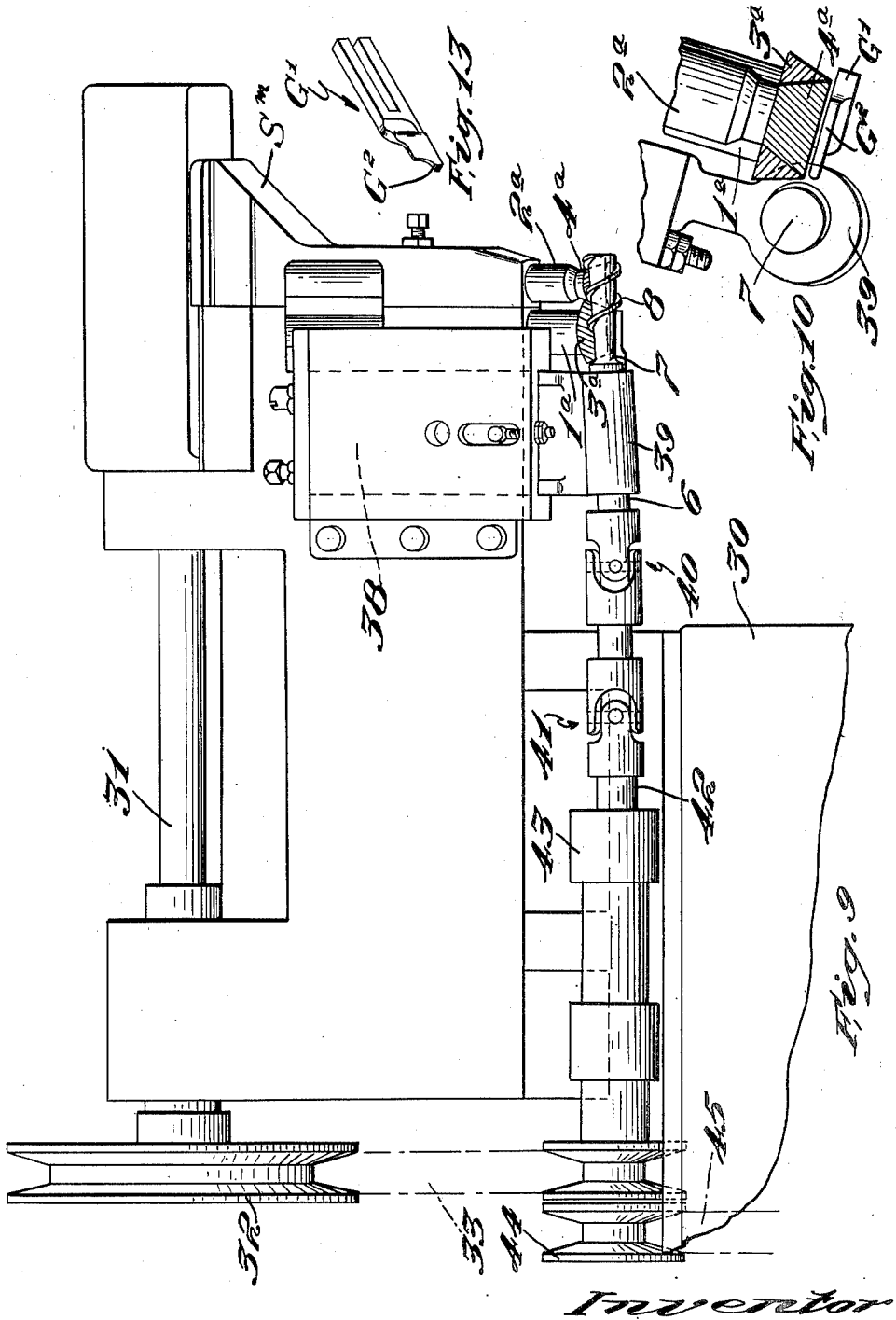


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Feb. 1, 1955 J. S. KAMBORIAN 2,701,003

MACHINE FOR STRETCHING FLEXIBLE SHEET MATERIAL ABOUT A SUBSTANTIALLY RIGID FORM

Filed April 10, 1948 3 Sheets-Sheet 3



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2,701,003

MACHINE FOR STRETCHING FLEXIBLE SHEET MATERIAL ABOUT A SUBSTANTIALLY RIGID FORM

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Application April 10, 1948, Serial No. 20,297

9 Claims. (Cl. 154—1.8)

This invention pertains to machines of the continuous acting type for stretching material about a substantially rigid form and with provision for supplying adhesive for securing the margin of said material after it has been stretched, the present application being a continuation-in-part of my copending application Ser. No. 568,471, filed December 16, 1944, since issued as Patent No. 2,467,385, dated April 19, 1949.

In the above-mentioned patent, there is disclosed apparatus designed to grip the lasting margin of the upper between power driven rolls while up-drafting stress is applied, the lasting margin being wiped inwardly over the shoe bottom by reciprocating wipers after adhesive has been applied to the inner surface of the lasting margin by means of a stationary hold-down device having a toe portion over which the lasting margin is bent by the action of the wipers and which has a delivery orifice through which adhesive is exuded. As here used, the term "lasting margin" is to be regarded as inclusive of that portion of the upper of a conventional shoe which is lasted in against the insole or its equivalent and also the wrapper or platform cover of a California, platform or force-lasted shoe.

While the alternately acting reciprocating wipers disclosed in said patent produce good results, the present invention has for one object the provision of means whereby even better results are obtainable, specifically by the use, in combination with the aforesaid gripper rolls (for stretching the material about the rigid form) together with adhesive-supplying means, of a rotary wiper which applies uninterrupted inward stress to the marginal portion of the material to which stretching force has been applied.

While highly desirable results, so far as up-draft is concerned, are obtainable by the use of a pair of gripper rolls, as above referred to, it is possible to accomplish desirable results by the use of wiping means alone, in combination with an abutment element, the up-drafting stress resulting from the bending of the lasting margin about the abutment by the operation of the wiper. A further object of the present invention is to provide lasting apparatus for use in cement lasting wherein the up-draft is produced as above suggested by the cooperative action of a wiper and an abutment, and having provision for delivering adhesive to the inner surface of the lasting margin as the operation proceeds. A further object is to provide apparatus for cement lasting wherein an abutment cooperates with wiping means for up-drafting the upper material and in which adhesive is applied to the inner surface of the lasting margin, and wherein the in-wiping operation is continuous and uninterrupted and is accomplished by the operation of a rotating wiper. A further object is to provide a machine for cement lasting wherein an abutment member supplies adhesive to the inner surface of the lasting margin and cooperates with a roll which engages the outer surface of the lasting margin to feed the work along, and which employs a power driven helical wiping element to supply the in-wiping stress. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein

Fig. 1 is a diagrammatic plan view, partly in section and omitting parts, illustrating the operation of lasting apparatus in accordance with the present invention and wherein the lasting margin of a cement-lasted shoe is up-drafted by gripping rolls and the lasting margin is wiped in over an adhesive delivering element by means of a rotary wiper;

Fig. 2 is a fragmentary elevation, looking in the direction of the arrow A of Fig. 1 and also showing a wiper-heating jet-nozzle, illustrating the sequence of steps of the lasting operation and the relation of the lasting elements to the bottom of the shoe, the latter being in vertical section;

Fig. 3 is a fragmentary elevation, partly in vertical section, substantially on the line 3—3 of Fig. 2, illustrating the operation of the hold-down applicator;

Fig. 4 is a more or less diagrammatic plan view, partly in horizontal section, illustrating a further embodiment of the invention and showing the operation of lasting-in the wrapper of a California type shoe;

Fig. 5 is a side elevation, partly in vertical section and partly broken away, and to somewhat larger scale than Fig. 4, showing the apparatus of Fig. 4 with the parts in the position which they occupy during the in-wiping operation;

Fig. 6 is a vertical section, to larger scale, on the line 6—6 of Fig. 4, showing the abutment roll to larger scale;

Fig. 7 is a view similar to Fig. 6 but illustrating a modification;

Fig. 8 is an elevation of the abutment roll shown in Fig. 7;

Fig. 9 is a fragmentary side elevation of a lasting machine according to a further embodiment of the present invention;

Fig. 10 is a fragmentary front elevation, to larger scale than Fig. 9, showing the relative position of the rolls and wiper of Fig. 9;

Fig. 11 is a fragmentary diagrammatic elevation illustrative of a modified arrangement;

Fig. 12 is a fragmentary vertical section showing a modified arrangement of the upper gripping rolls of the apparatus shown in Fig. 9;

Fig. 13 is a perspective view of a fixed guide shown in Fig. 10; and

Fig. 14 is a perspective view, to small scale, illustrative of the use of apparatus such as here disclosed for stretching a cover about the cushion pad of a chair seat.

Referring to the drawings, and particularly to Figs. 1, 2 and 3, the numerals 1 and 2 designate a pair of parallel, oppositely rotating power driven shafts carrying rolls 3 and 4 at their lower ends respectively, which correspond in function to the gripper rolls disclosed in the patent to Kamborian No. 2,251,285, dated August 5, 1941. However, as here illustrated (Fig. 2) the axes of the shafts 1 and 2 are inclined downwardly and forwardly in the direction of progress of the work. As shown in Fig. 2, the rolls may be provided with helical work-engaging ribs 5, although such ribs are not essential to the operation. For convenience in introducing the work between the rolls 3 and 4, the shaft 2 may be arranged to be moved away from the shaft 1 as more fully described in the above patent to Kamborian. In the drawings a shoe upper U (Fig. 3) is shown on a form comprising a last L and an insole S fixed to the last. The upper U has an extension or lasting margin M. As shown in Figs. 1 and 2, the margin M is gripped between the rolls 3 and 4 and while so gripped is subjected to up-draw tending to pull the upper U snugly about the last. In order to wipe in the margin M over the bottom of the insole S, there is provided a constantly rotating wiper device mounted on a driven shaft 6. The wiper device comprises a body portion 7 preferably but not necessarily tapering as shown in Fig. 1, which is of circular transverse section, having its end secured to the shaft 6 in coaxial relation to the latter. As illustrated, the shaft 6 is united to the smaller end of the wiper. The helical

wiping element, here shown as a rib **8**, is carried by the body portion of the wiper. As the wiper is rotated in the direction of the arrow (Fig. 1) the rib **8**, by engagement with the marginal material of the upper (which is upright or substantially perpendicular to the bottom of the insole S where it is gripped by the rolls) impels or thrusts the margin M inwardly over the edge of the insole and presses it firmly down against the under surface of the insole.

As more particularly illustrated in Figs. 1 and 3 there is provided a hold-down device intermediate the points of engagement of the margin by the rolls and by the wiper device. This hold-down is carried by a normally fixed tubular support **9** which may conveniently be carried by the same parts which support the bearings for the shaft **2**. The support **9** is provided at its lower end with a foot **10** having the substantially horizontal flat under surface **11** (Fig. 3) which engages the under surface of the insole S and which thus limits movement of the shoe upwardly in response to the up-draft of the rolls **3** and **4**. The foot **10** has an inclined top surface **12** over which the lasting margin is bent as shown in Figs. 1 and 3 by the action of the wiper device, the foot **10** preferably tapering to an edge **13** which is substantially flush with the outer edge of the insole S during the operation. The foot **10** has a passage **14** which communicates with the bore in the tubular support **9** and this passage **14** terminates at the under surface **11** of the foot and has a branch **14a** which opens at the inclined surface **12**. Fluid adhesive from a suitable source is supplied, either by gravity or by the employment of a pump (for example as disclosed in the above patent to Kamborian No. 2,467,385) to the bore in the support **9** and flows down through the passage **14** and is delivered to the under or exposed surface of the insole S and also through the orifice **14a** to the inner surface of the margin M. The delivery end of the passage **14** is preferably spaced from the extreme end **13** of the foot and the orifice **14a** is likewise spaced from the end **13** so that the adhesive which is delivered onto the insole and onto the lasting margin does not extend to the outer edge of the insole, being deposited on the insole and on the inner surface of the margin M in the form of spaced ribbons. Since the application of heat helps to speed up the setting of some kinds of cement, a jet nozzle N (Fig. 2) may be provided. This nozzle delivers a jet of hot air, or a jet of burning gas against the wiper **7**, and preferably so that some of the hot fluid impinges directly on the lasting margin just before it is engaged by the wiper.

In the operation of the machine, the margin M is gripped between the rolls **3** and **4**, as shown in Fig. 1, and the shoe is progressed in the direction of the arrow K, the rolls gripping the marginal material between them and holding it upright, that is substantially perpendicular to the bottom of the insole S while up-drafting stress tensions the upper and margin. As the shoe is progressed, the marginal material escapes from between the rolls and is urged inwardly by the action of the helical wiping element **8**. The wiping element bends the margin M down over the inclined top surface **12** of the foot **10**, and as adhesive is exuding through the passages **14** and **14a**, ribbons of adhesive are deposited on the inner surface of the margin and the exposed surface of the insole, and as the margin slips from the foot **10** it is pressed down onto the bottom of the insole S by the wiper and firmly adheres to the insole. During this operation the insole is held from rising by its contact with the under surface **11** of the foot **10**. If desired, the roll **4** may have a hold-down button **23** at its lower end for contact with the bottom surface of the insole S. The above operation may be continued all of the way around the shoe or throughout such portion or portions of the periphery of the shoe as may be desired. The operation of the wiper is continuous and uninterrupted and the place at which the wiping stress is applied is always at the same distance from the point at which the marginal material is gripped between the rolls **3** and **4**. This mechanism thus provides for up-drafting the lasting margin, for coating it with adhesive and for wiping it in, all in a single operation, thus eliminating the necessity for applying the adhesive as a preliminary and separate operation. Since the operation of the wiper is continuous and uninterrupted, every point longitudinally of the lasting margin receives the in-wiping stress, and thus the lasting margin is laid down smoothly and firmly onto the bottom of the shoe.

Referring to Figs. 4 to 8 inclusive, a modification of the above arrangement is disclosed. In this arrangement the gripping action of the rolls **3** and **4** above described is dispensed with and a single roll **18**, which engages the inner surface of the lasting margin suffices, in combination with the action of the wiper, to produce the up-drafting stress. As shown in Figs. 4 and 5, the machine is lasting the lasting margin, wrapper, extension or platform cover of a shoe of the California, platform or force-lasted type, having the upper U mounted on the last L, together with plies S' and P of material here illustrated as constituting a sock lining and a platform or cushion sole respectively; the wrapper or lasting margin W being secured to the upper proper by a sewed seam. The single roll **18** is carried by a shaft **2a** (Fig. 5) which is mounted in a vertical bearing **15**. The shaft **2a** may be provided with a worm gear **16** at its upper end or equivalent driving element. It is here shown as having a sleeve or hub portion **16a** which fits over the shaft **2a** and which may be secured to the shaft by a set screw **16b**. The shaft **2a** has an axial passage **17** and the roll **18** is secured to the lower end of the shaft by a set screw **19** (Fig. 6), or its equivalent. As illustrated in Fig. 6, the roll **18** has an orifice **20** in its peripheral surface which communicates by means of a port **21** with the passage **17** in the shaft **2a**. The lower end of the passage in the shaft is closed by a screw threaded boss **22** forming part of a holddown button **23**. The bearing **15** is carried by an arm **24** forming a part of the machine frame F and which has a longitudinal bore **25** which communicates with the interior of a flexible pipe **26**, through which adhesive is supplied. The bore **25** communicates with the passage **17** in the shaft **2a** by means of ports **27**.

A vertically adjustable guide roll G is supported by a bracket B carried by the machine frame F. As here illustrated, the guide roll is so located that its peripheral edge contacts the upper of the shoe just below the seam which unites the upper to the wrapper W. Preferably the axis of the roll G is in or very close to that vertical plane of the axis of the roll **18** which is perpendicular to the edge of the last at the working point. The machine also comprises a rotary wiper device constantly rotated by means of the shaft **6**, the wiper being like that above described and preferably comprising a tapering body portion **7** and the helical rib **8**, the small end of the body portion **7** being secured in axial alignment to the shaft **6**.

As illustrated in Fig. 5, the bearing **15** is provided with a screw threaded opening which receives a set screw **28** having a knurled head. If the shaft **2a** is to be rotated, this set screw **28** is retracted, but if the shaft **2a** is to be held stationary, then the set screw **28** is advanced to hold the shaft in the desired stationary position.

This device may be used in various ways. For example, with the set screw **28** retracted and with the worm gear **16** secured to the shaft by means of the set screw **16b**, power is applied to the worm wheel **16**, thus constantly rotating the shaft **2a**. In operation, the operator places the shoe, mounted upon its last, substantially in the position illustrated in Fig. 4, so that the guide roll G contacts the side of the shoe upper and so that the holddown button **23** engages the upper surface of the platform sole P and with the upstanding lasting margin or wrapper W contacting the periphery of the roll **18**. The operator uninterruptedly moves the shoe in the direction of the arrow K^1 (Fig. 4) assisted by the friction exerted by the rotating roll **18**, thus constantly bringing new portions of the lasting margin or wrapper into contact with the roll **18**. As the shoe is thus progressively moved forward, the constantly rotating wiper device engages the lasting margin and tends to urge the latter inwardly transversely of the edge of the last. Since the roll **18** tends to hold the margin in upright position, that is substantially perpendicular to the bottom of the shoe and thus opposes free inward bending of the margin, the inward thrust of the helix **8** against the margin at a point closely adjacent to but at one side of the roll **18**, bends the lasting margin sharply about the periphery of the roll and thus exerts a susbtantial up-drafting stress on the margin so as to draw it tightly about the outer edge of the platform P. The lasting margin is thus forced inwardly and over the bottom of the platform, the wiper device pressing the margin down against the bottom of the platform. As the roll **18** revolves, adhesive is exuded through the orifice **20** and is deposited in spaced spots

on the inside surface of the lasting margin, and when the margin is laid down onto the bottom surface of the platform P, the adhesive firmly unites the margin to the platform. In order to place the spots of adhesive more closely together, a roll such as shown in Figs. 7 and 8 may be substituted for the roll **18**. This roll **18**[a] has a plurality of peripherally spaced orifices **20**[a]. With this arrangement it is preferable to mount the rotary roll shaft **2**[a] on a fixed hollow, coaxial shaft R (Fig. 7) closed at its lower end and having a single orifice F with which the inner ends of the orifices **20**[a] register successively as the roll turns. As the roll rotates, spots of adhesive are applied to the lasting margin at very frequent intervals so that the spots substantially merge and provide a continuous coating. Preferably, an automatic valve (not shown) similar, for example, to that disclosed in the patent to Kamborian No. 2,467,384 dated April 19, 1949, is provided to cut off the flow of adhesive except when a shoe is being operated on.

Instead of rotating the roll **18**, the latter may be made stationary, thus constituting a fixed abutment for cooperation with the wiping device in producing up-drafting stress. With this in view, the set screw **16**[b] (Fig. 5) may be loosened and the roll **18** turned by hand until the orifice **20** is disposed in position to deliver adhesive to the inner surface of the lasting margin at the place where the latter is bent around the roll. The set screw **28** is now tightened so as to hold the roll **18** in this position. With this arrangement the adhesive flows from the roll **20** and forms a continuous band on the inner surface of the lasting margin as the shoe is progressed. If both set screws **16**[b] and **28** be loosened, the roll **18** will rotate solely by the friction of the stock as the shoe is fed forward by the operator.

In Figs. 9 to 12 a further modification is illustrated. The machine frame **30** and the general construction of the apparatus may be quite similar to that shown in the above patent to Kamborian 2,251,285. Thus the frame supports a horizontal shaft **31** having a pulley **32** at its rear end which is driven by a belt **33**. The parallel shafts **1**[a] and **2**[a] with their work-gripping rolls **3**[a] and **4**[a] correspond generally in arrangement and function to the work-gripping and advancing rolls of the above patent, and to the shafts **1** and **2** and rolls **3** and **4** above described. The shaft **2**[a] is carried by a slide S^m, as in the above patent and is capable of moving from front to rear so that the roll **4**[a] may be separated from the roll **3**[a] to facilitate admission of the work between them. The shaft **2**[a] carries the worm wheel **16** (Fig. 12) at its upper end which meshes with a worm (not shown) carried by the shaft **31**. As illustrated in Figs. 9 to 12 inclusive, the work-gripping rolls are of frusto-conical form, the forward roll tapering upwardly and being of smaller diameter than the rear roll. The shafts **1**[a] and **2**[a] are inclined forwardly and downwardly in the direction of work advance, like the shafts **1** and **2** above described. Preferably the peripheral surfaces of the work-gripping rolls are provided with flutes, ribs or knurling in order to obtain a better grip on the lasting margin. Adhesive may be delivered into the lasting zone through an orifice in a fixed hold-down toe as illustrated in the aforesaid patent or, as here shown in Fig. 12, the shaft **2**[a] may be tubular and the roll **4**[a] is hollow and provided with a plurality of rows of peripheral orifices **34**. The shaft **2**[a] is mounted on a hollow coaxial shaft R (as in the arrangement of Fig. 7). In this case the shaft R has an enlargement R' at its lower end which fits snugly in the hollow roll **4**[a]. The enlargement R' has orifices F', at points opposite to the roll **3**[a], with which the orifices **34** in roll **4**[a] register successively as the roll rotates. The lower part of shaft **2**[a] turns in an external bearing **35** carried by the slide S^m. At its upper end shaft R is connected to a flexible supply conduit **37** through which adhesive is supplied to the interior of the hollow shaft R.

At the left-hand side of the machine frame there is arranged a vertical adjustable slide **38** (Fig. 9), preferably spring pressed downwardly and which carries at its lower end an elongate bearing **39** for the shaft **6** which at its forward end carries the rotary wiper device, this wiper device comprising the tapering body portion **7** and the peripheral helical rib **8** as above described. The shaft **6** is continuously driven, receiving its power through a pair of universal joints **40** and **41** from a shaft **42** turning in bearings **43**, carried by the machine frame and having a pulley **44** at its rear end which is driven by a belt **45**.

While it is possible to use a guide roll such as the roll G of Fig. 5, it is preferred, as shown in Fig. 10, to employ an adjustable, normally stationary guide G' (Figs. 10 and 13) disposed just below the plane of the lower end of the roll **4**[a] and having a vertically narrow work-engaging surface G^2 located below the plane of the lower ends of the rolls.

In the operation of this arrangement, the shoe is presented, as above described, so that the lasting margin is gripped between the rolls **3**[a] and **4**[a] and by the action of the latter is up-drafted, while at the same time the shoe is fed forwardly. As the roll **4**[a] rotates, adhesive supplied through the conduit **37** exudes through the ports **34** and thus spots or coats the inner surface of the margin. The shoe is guided by engagement with the edge G^2 of the guide member G' and as the lasting margin escapes from between the rolls **3**[a] and **4**[a] it is engaged by the wiper device and wiped in over the bottom of the shoe.

It may be noted that in the arrangements of Figs. 1 and 9, since the lasting margin is supported in upright position by the inner roll **4** or **4**[a] respectively, and since the wiper acts upon the margin at a point very close to the rolls, the wiper exerts some up-drafting action on the upper in the same way as in the arrangement of Figs. 4 and 5, although when two gripping rolls are employed, the up-drafting stress is primarily resultant from the action of these rolls.

Instead of supplying the adhesive to the inside surface of the lasting margin by the arrangement specifically shown in Fig. 12, the adhesive may be delivered, as illustrated in Fig. 11, which shows a tubular support **46** carrying a nozzle **47** at its lower end which is arranged to deliver adhesive against the inner surface **48** of the margin W just before the latter is wiped in by the wiper device. This tubular support **46** may be carried by the slide S^m which supports the shaft **2**[b] carrying the roll 4^x, the shaft 2^b corresponding to the shafts **2** or **2**[a], above described, and being supported and driven in the same way.

It may be noted that in each of the above arrangements, wherein provision is made for subjecting the wrapper, lasting margin or extension of the upper to a continuous uninterrupted up-drafting stress and to a continuous uninterrupted inwiping stress, there is also provided means for supplying adhesive to the inner surface of the margin in the interval between the application of the up-drafting and inwiping stresses. Thus, in each of the several modifications illustrated, provision is made for continuous lasting and for the continuous supply of adhesive, thus eliminating the necessity for the application of cement to the wrapper, lasting margin or upper extension as a separate operation preliminary to the lasting operation.

Instead of positively driving the roll **18**, or in fact any of the other rolls **3**, **4**, **3**[a], **4**[a], etc., the rolls may be mounted for free rotation by frictional engagement with the shoe, and in that event, the feed of the work is dependent solely upon the operator and the in-lasting results from the action of the wiper in conjunction with the abutment function of the roll.

In Fig. 14 the apparatus of Fig. 9 is shown in use for stretching the cover over the cushioning pad of a chair bottom. The chair bottom **40**, usually of rigid material such as wood, has a pad of cushioning material at one side (the under side as illustrated) and the cover **41** of leather or cloth is drawn about the cushioning pad and has its margin **42** up-turned to extend beyond the side **43** of the bottom. This margin is gripped between the rollers **3** and **4** and is stressed upwardly so as to draw it snugly about the cushioning pad and is then wiped in by the rotary wiper **7**, adhesive being first applied to the inner surface of the margin so that when it is wiped down against the surface **43** of the bottom it firmly adheres to the latter as shown at **44**. The application of the cover to chair bottoms in this manner is accomplished much more cheaply and expeditiously than by previous hand methods of applying the cover.

While various modifications have been illustrated, it is to be understood that the invention is broadly inclusive of any and all such other arrangements and modifications as fall within the scope of the appended claims. It is further to be understood that when such words as "up,"

"down," "below," "above," etc., have been employed herein they are used in a relative sense and with respect to the drawings and for convenience only and are not to be regarded as limitations with respect to the mode of operating the apparatus.

As herein disclosed the stretching of a shoe upper over a last is instanced as one specific utility of the invention while the stretching of the cover over the cushioning pad of a chair seat is given as another illustrative instance of its utility, it being understood that the last and the chair bottom, respectively, are examples of rigid or substantially rigid "forms," and that the shoe upper and the cover for the chair seat cushion are cited as examples of "coverings" of stretchable material which, in accordance with the present invention, are drawn snugly about such form.

I claim:

1. In a machine for drawing sheet material about a substantially rigid form and wherein updrafting stress is applied to the margin of the sheet material by means, including a constantly rotating, upwardly tapering roll which holds said margin in upright position at the region where updrafting stress is being applied, in combination, a rotary wiper which constantly turns in the same direction, said wiper being designed to lay the marginal portion of the sheet material down over the bottom of the form, said wiper being arranged to extend inwardly over the bottom of the form and comprising an elongate body portion and a helical work-impelling element embracing the body portion, said work-impelling element being operative uninterruptedly to urge that portion of the margin with which it is engaged in a direction substantially parallel to the axis of the helical element, the body portion of the wiper tapering in diameter and having its smaller end at the rear, a rotary supporting shaft fixed to the smaller end of the wiper and coaxial with the latter, and means for supplying adhesive to the inner surface of the marginal portion of the sheet material just before it is laid down over the bottom of the form by the wiper.

2. A machine for stretching flexible covering material over a substantially rigid form and comprising means for gripping the margin of the covering material while up-drafting stress is being applied to said margin, a rotary helical wiping element engageable with the margin and operative to exert in-wiping stress upon the margin, and means for supplying adhesive to the inner surface of the margin prior to the action of the wiper, said adhesive supplying means including a roll with which the margin contacts and which has an outlet through which adhesive is delivered to the margin.

3. A machine for stretching flexible covering material about a substantially rigid form, said machine being of the kind which includes a pair of oppositely turning, frusto-conical, oppositely tapering feed rolls whose axes are parallel and inclined downwardly in the direction of advance of the work, said rolls being operative to grip the margin of the covering material and, while stretching the covering material snugly about the form, concomitantly to advance the form uninterruptedly, and having a rotary wiper which engages said margin after the latter leaves the gripping means and which wipes said margin inwardly and downwardly over the exposed surface of a ply of material attached to the bottom of the form, and means for supplying adhesive to the inner surface of the margin just before it is wiped in.

4. In a machine for stretching flexible covering material about a substantially rigid form, in combination a rotatable wiper having a helical wiping element operative uninterruptedly to engage the margin of the covering material, thereby to urge the margin inwardly over the bottom of the form, means for rotating the wiper, a frusto-conical, upwardly tapering roll which contacts the inner surface of the marginal portion of the covering material just before the covering material is engaged by the wiper, and a nozzle arranged to deliver adhesive to the inner surface of the margin of the covering material intermediate the roll and wiper.

5. A machine for stretching flexible covering material about a substantially rigid form in accordance with claim 4, having a second frusto-conical roll but which tapers downwardly and which engages the outer surface of the margin of the covering material and which cooperates with the first-named frusto-conical roll to grip the marginal material, and means for positively turning one, at least, of said frusto-conical rolls in a direction to feed the work along.

6. In combination in a machine for drawing flexible sheet material about a rigid form and for adhesively uniting the margin of said material to the upper face of the form and wherein updrafting stress is applied to the margin of the sheet material by means including a constantly rotating roll which contacts that surface of the margin which is to be adhered to the form, and wherein the point of application of updrafting stress is progressed uninterruptedly relatively to the form along the periphery of the upper surface of the latter, a rotary wiper having a tapering body of circular transverse section fixed at its smaller end in coaxial relation to a supporting shaft, the wiper including a helical work-stressing rib, the wiper being arranged so that its helical rib engages the margin of the sheet material after the margin has moved out of operative engagement with the roll, means turning the shaft in such a direction that the helical rib uninterruptedly impels the margin inwardly transversely of the edge of the top face of the form while pressing said margin down onto the top face of the form, the shaft constituting the sole support for the wiper, the forward end of the wiper being free, a part having a delivery orifice located so closely to the inner surface of the margin that liquid adhesive, exuding from the orifice, deposits on said inner surface, and means defining a conduit through which a stream of liquid adhesive flows to the orifice.

7. A machine for stretching flexible covering material about a substantially rigid form having a ply of material attached to its bottom, said machine being of the kind which includes a pair of oppositely turning feed rolls whose axes are parallel and inclined downwardly in the direction of advance of the work, said rolls being operative to grip the margin of the covering material and, while stretching the covering material snugly about the form, concomitantly to advance the form uninterruptedly, and having a rotary wiper operative to engage said margin after the latter leaves the gripping rolls to wipe said margin inwardly and down against the exposed surface of the ply of material attached to the bottom of the form, that one of said rolls which engages the inner surface of the margin having an orifice in its peripheral surface, and means for supplying adhesive for delivery through said orifice to the inner surface of the margin.

8. In a machine of the class described having, in combination, a pair of oppositely tapering, frusto-conical rolls for gripping the margin of sheet material and for drawing the latter snugly about a substantially rigid form, an elongate, rotatable wiper having a helical work-impelling element operative, uninterruptedly, to engage said margin after it leaves said gripping rolls and uninterruptedly to impel the margin inwardly transversely of the edge of the form and to wipe the margin down upon the bottom of the form, a rotary drive shaft for turning the wiper, said shaft being coaxial with and rigidly connected to the rear end of the wiper, the shaft constituting the sole support for the wiper, the forward end of the wiper being free, and adhesive delivery means operative to deliver adhesive into the angle between the bottom of the form and the margin of the sheet material just before the latter is engaged by the wiper.

9. In a machine of the class described having, in combination, front and rear, oppositely turning, frusto-conical rolls whose axes are parallel and inclined downwardly in the direction of advance of the work, said rolls being operative to grip the margin of sheet material and while stretching the sheet material snugly about a substantially rigid form concomitantly to advance the work uninterruptedly, constantly rotating means for wiping the margin of the sheet material inwardly over the bottom of the form, and adhesive delivery means operative to deliver adhesive into the angle between the bottom of the form and the marginal portion of the sheet material just before the latter is engaged by the wiping means.

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