July 27, 1948. C. CHRISTIANSEN 2,446,043

FOLDING AND LASTING MACHINE

Filed Oct. 12, 1946 3 Sheets-Sheet 1

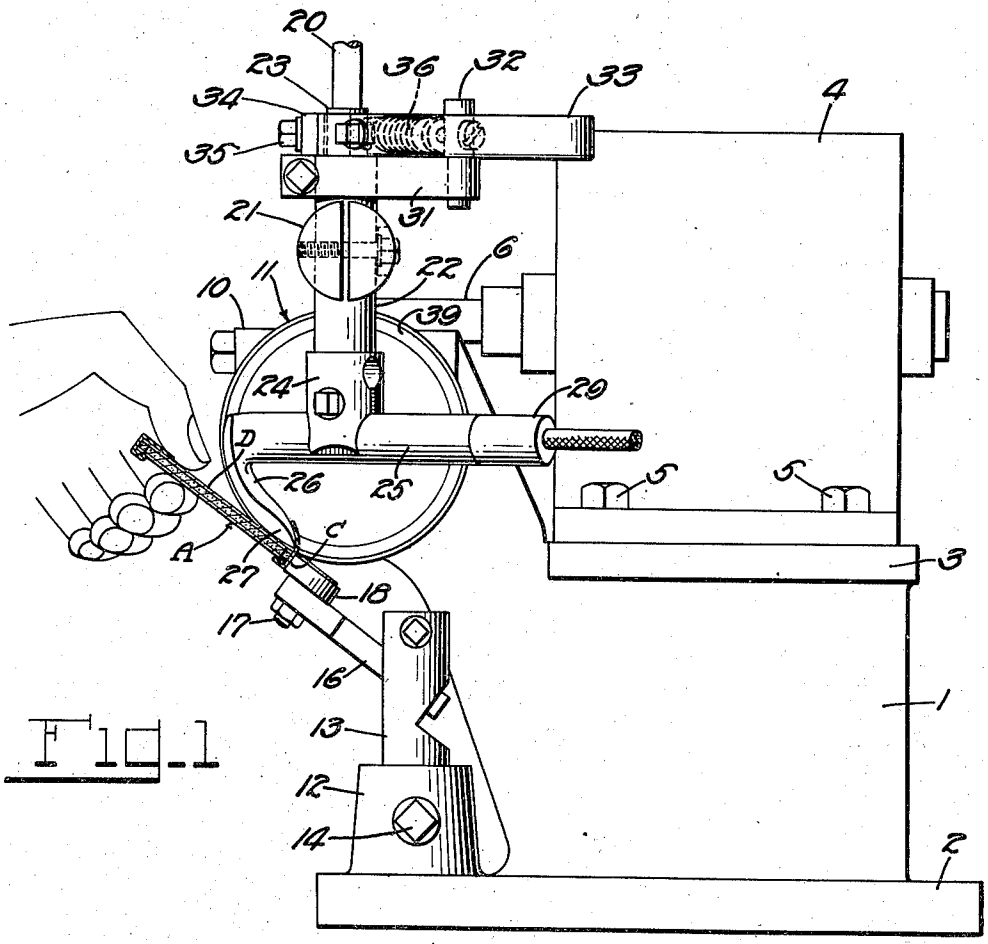



Fig. 1

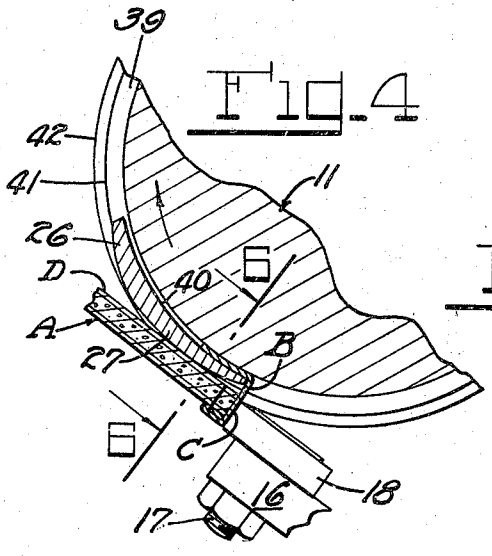



Fig. 4

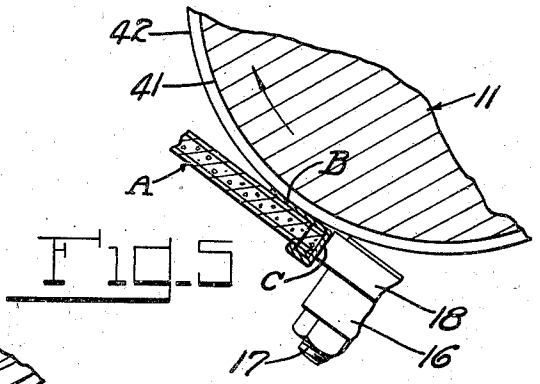



Fig. 5

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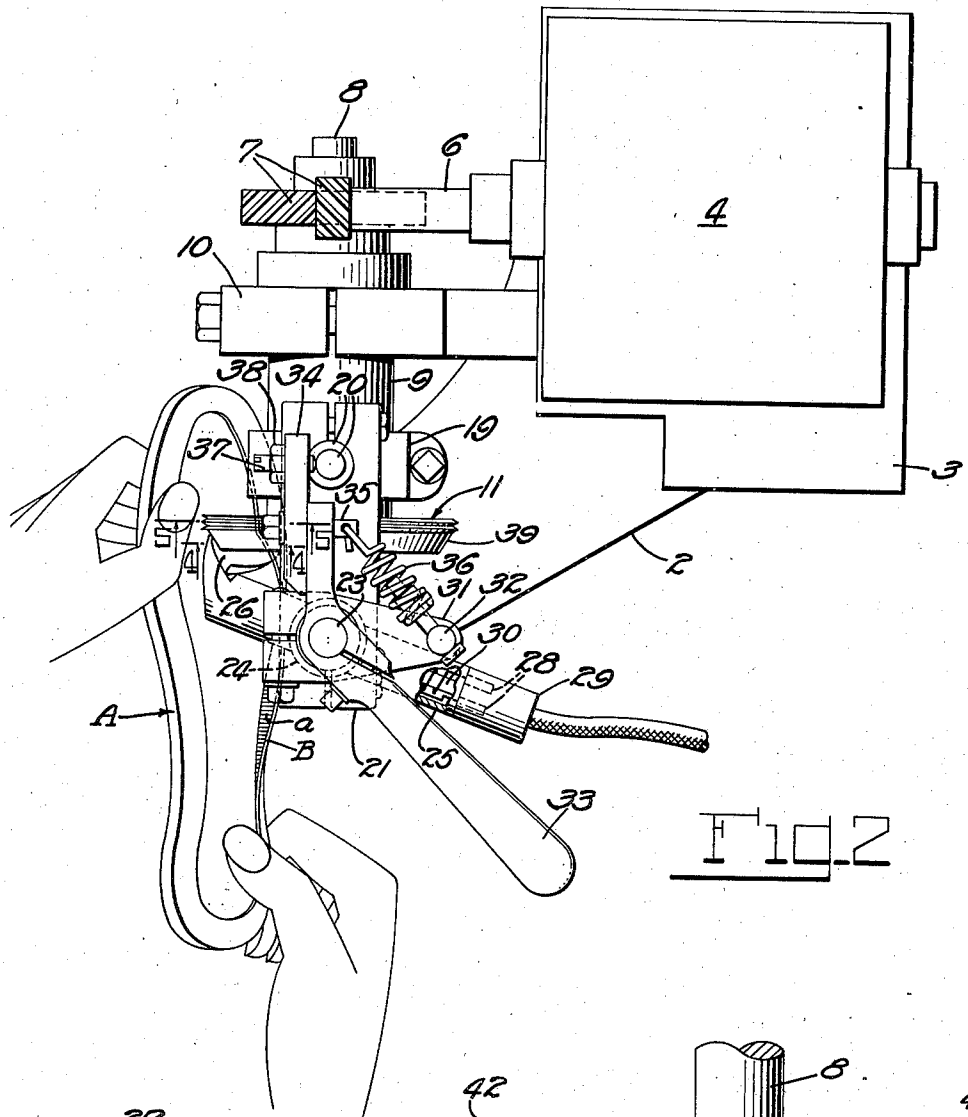



FIG. 2

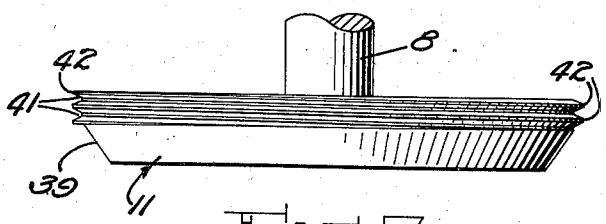



FIG. 7

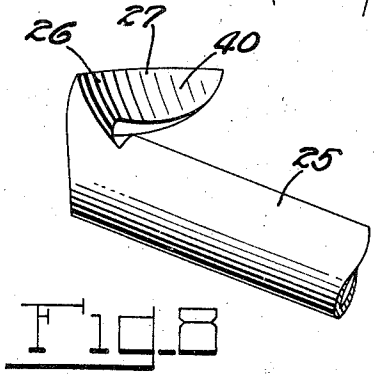



FIG. 8

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FOLDING AND LASTING MACHINE

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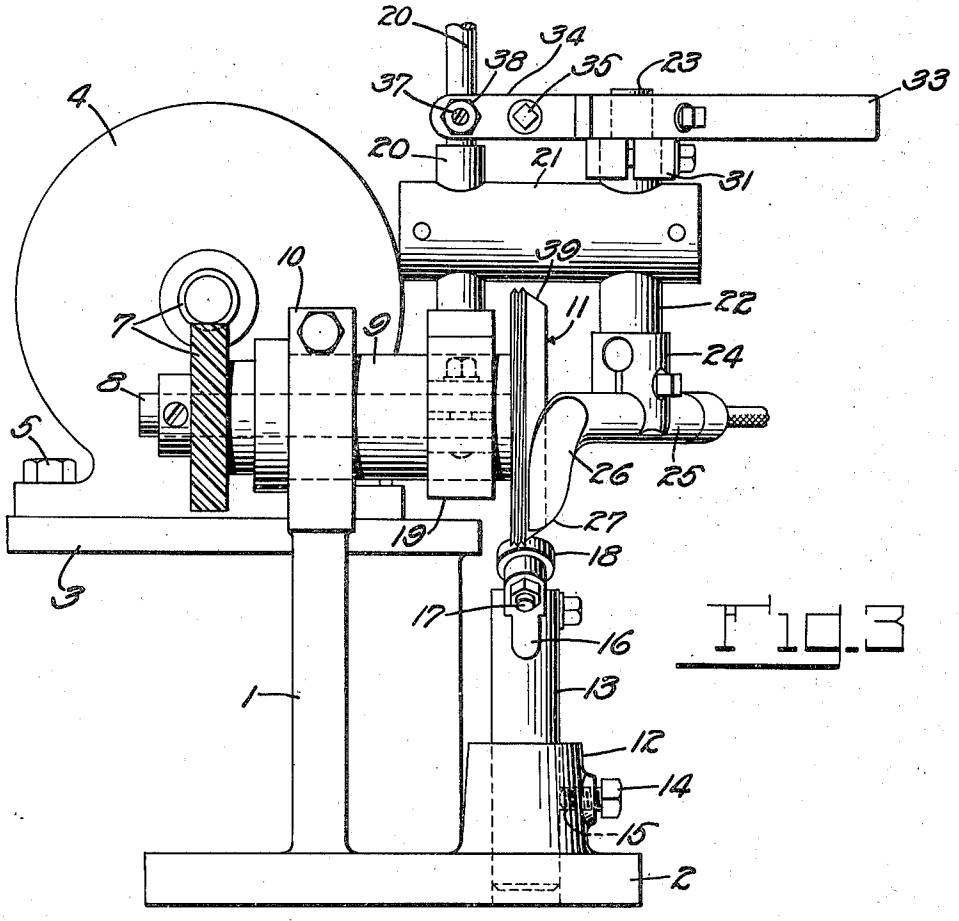



Fig. 3

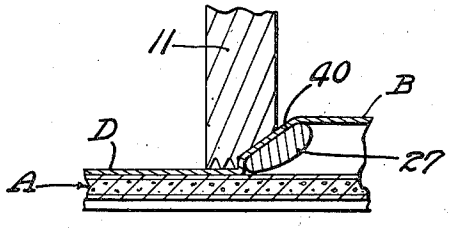



Fig. 6

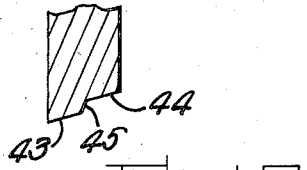



Fig. 9

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# UNITED STATES PATENT OFFICE

2,446,043

## FOLDING AND LASTING MACHINE

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Application October 12, 1946, Serial No. 702,925

11 Claims. (Cl. 12—7)

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My present invention relates to a machine for folding and securing the binding on an insole or for lasting an upper to an insole. Although the machine is shown herein operating on a simple plain insole, it operates equally well on the California type insole and performs the function of lasting an upper to an insole where the upper is to be cemented in place.

The ordinary insole is provided with a binding strip or galloon which is stitched to one side and carries an adhesive on the unsecured edge. The free edge has to be folded about the edge of the insole, stretched into position on the opposite flat surface, and cemented in place. The folding and pressing operation may be performed by machines of the type described in my Patent No. 2,700,074, issued May 14, 1946. The machine of the present invention can, in addition, perform lasting of the character described above.

The difficulty with folding machines generally has been that, in order to stretch the material tightly and fold it accurately, they employ complicated feeding and pressing mechanisms which prevent their use for lasting and also obscure the work to such an extent that errors either cannot be discovered or, if discovered, cannot be corrected before the end of a folding operation or cycle. Such machines do not permit frequent stopping and positioning. If something goes wrong, the machines continue to finish the operation, and the defective product must be ripped up and done over, or else discarded. Lasting machines, on the other hand, are not adapted for folding because they lack the ability to hold and stretch the material properly, as folding machines do.

A principal object of the invention is to make it possible to fold and secure bindings and last uppers of the character described on a single machine. Further objects are to last cemented uppers without loss of control over the work; to ensure uniform stretching and folding of the portions to be secured to the insole; to provide ready access to the work so that mistakes, if any, can easily be observed and immediately corrected, and to render the machine less complicated and expensive.

In attaining these objects, I have devised a new and greatly simplified type of folding-lasting machine in which the progress of the operation can easily be viewed, and which permits mistakes to be corrected immediately because the operation may be stopped at any time. An improved form of stretching and folding mechanism practically ensures accuracy of fold and evenness in stretching and pressing. I have also made it possible to feed the work by hand, eliminating all feeding devices without loss of accuracy. To do this I employ a heated holding and guiding finger with a somewhat spatula-shaped hook that cooperates with a folding and pressing roll having a peripheral portion which cooperates with the finger in guiding, stretching, and folding the material. These elements constitute the sole operative means acting on the work. The finger is in yielding engagement with the work, providing a constant pressure directed against work supported by the roll throughout the operation.

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The nature and objects of the invention will best be understood by reference to the following description together with the accompanying drawings, in which:

Fig. 1 is a view in front elevation of a machine embodying the invention shown in operation.

Fig. 2 is a plan view of said machine also illustrating the operation.

Fig. 3 is a side elevation as viewed from the left of Fig. 1.

Figs. 4 and 5 are sections taken respectively on the lines 4—4 and 5—5 of Fig. 2, and illustrating steps in the operation.

Fig. 6 is a section taken on the line 6—6 of Fig. 4.

Fig. 7 is a detail view showing the folding wheel.

Fig. 8 is a detail view showing the end of the folding and holding finger.

Fig. 9 is a detail view showing a modification of a part of the invention.

In the drawings, a machine frame 1 on a base plate 2 has a support 3 on which a motor 4 is secured as by bolts 5. The drive shaft 6 of the motor supplies power to a system of gears 7 (Fig. 2) which turn a shaft 8 passing through and journalled in a sleeve 9 held in the bracket 10 on the frame. The forward end of the shaft 8 carries a folding wheel 11, which is described more fully later.

A boss 12 on the bed plate 2 carries a post 13 which is prevented from turning by a bolt 14 extending through a bore 15 in the boss. Post 13 carries an arm 16 held at an angle as shown in Fig. 1. Arm 16 is provided with a bolt 17 which holds a roller or rotatable disc 18. A split ring 19 (Fig. 3) is clamped to sleeve 9 and carries a post 20 to which a horizontal arm 21 is fastened. The outer end of arm 21 is clamped to a vertical sleeve or tube 22 through which passes a rod 23. The lower end of rod 23 is provided with a clamping head 24 which holds the shank portion 25 of a finger 26. The forward end of

this finger has a generally spatulate hooked end 27; the rearward end is provided with a connection 28 (Fig. 2) adapted to pass electric current from an extension cord plug 29 to a heating element 30 within the shank of the finger. On the upper end of sleeve 22 is clamped an arm 31 carrying a pin 32 (Fig. 2). A handle 33 clamped to the upper end of rod 23 has a projection 34 secured thereto by a bolt 35. An expansion type spring 36 has one end secured to bolt 35 and the other end held under adjustable tension to pin 32. Projection 34 has a set screw 37 held in adjusted position by a lock nut 38. The set screw, under the urge of spring 36, normally bears on post 20.

Finger 26 is held so that its hook shaped spatulate end is normally positioned adjacent the rim of folding wheel 11 at a point just above roll 18. The spacing between the finger and the rim of the wheel is determined by the setting of set screw 37 according to the thickness of material that is to be passed between the end of the finger and the folding wheel. The spring 36, which urges the end of the set screw toward the post 20 also causes the end of the finger to press the material of the work toward and against the rim of the wheel.

The periphery of wheel 11 has a beveled portion 39 adapted to cooperate with the flattened and curved inner surface 40 (Figs. 4 and 6) of the hook shaped finger 26 in holding and folding the material. Behind this beveled portion, the wheel is provided with means for stretching the material and continuing the folding operation. The preferred construction is shown in detail in Fig. 7, where the periphery of the wheel is shown with grooves 41 and ridges 42 formed like screw threads (Fig. 7), having sufficient angularity to the face of the wheel to draw the material and stretch it as it is folded over the tip of the finger. As shown in Fig. 7, these threads have a left-hand pitch, i. e. proceed from the front to the back of the wheel with a leftward progression. An angle of 3½° has been used satisfactorily. The beveled part 39 will give good results if formed at an angle 35° to 40°. An operable but somewhat less desirable modified form of folding wheel is shown in Fig. 9, in which the rear part 43 of the periphery is smooth but beveled in much the same manner as the face portion 44, and an intermediate surface 45 with a sharp rise or greater bevel connects the front and rear portions. This rise will serve in the folding operation and also tend to draw on the material and stretch it, but will not do so as efficiently as will the preferred form.

In operation, the motor 4 is started and turns the folding wheel 11 clockwise as viewed in Fig 1. Electric current is supplied to resistance unit 30 which heats the finger. An insole A is held with the surface to be cemented uppermost. The insole A has a tape B stitched to one surface of the insole, and this tape has cement along the surface *a* (Fig 2) that is to be cemented to the insole. The operator turns the handle 33 counter-clockwise as viewed in Fig. 2 to move the finger away from the folding wheel and holds the insole A so that the tape-covered edge C (Fig. 1) of the insole rests against the roll 18. The upper surface D of the insole rests against the heel of the hooked finger, and the free margin or flap of the tape is passed about the tip of the finger. The finger then extends as far as possible between the elements to be cemented. The inner cement-covered surface of the flap is heated by the hot finger until the cement is softened enough to act as a lubricant and render the tape slippery. The handle is released, causing the free edge of the tape to be pressed between the finger and the beveled part of the wheel by the pressure applied by the spring. Unless the operator releases the work, the flap is thus held under constant pressure throughout the operation.

When the machine has been used a few times the beveled edge 39 is covered with a dry film of excess cement that has been deposited on it in previous operations. This dried cement provides friction which facilitates gripping and pulling on the material. The fact that the tape is slippery on the side to be cemented while friction is increased on the side that is being pulled and folded by the wheel makes it very easy for the operator to push the insole forward throughout the sealing operation.

The beveled edge of the wheel starts the tape turning about the tip of the finger (see Fig. 4). The ridged portion of the rotating wheel grasps the material and stretches it (Fig. 6), the slanting threads exerting a continuous pull until the tape is folded past the end of the finger and pressed or "ironed" against the surface of the insole. If the modified form of wheel shown in Fig. 9 is used, the folding takes place in much the same way, though requiring more care and attention by the operator.

Throughout the operation the roll 18 serves as a guide and support for the edge of the insole. Provided the operator pushes the insole through its proper course, the device of the invention pulls the tape tightly about the edge of the insole, heats the cemented tape, stretches it back over the surface of the insole and irons it in place without wrinkles in the tape or gaps in the seal. The advantages of proper folding and cementing are gained without the disadvantage found in the controlled feed type of machine, that a cycle of operation, once begun, cannot be discontinued. When the device of the invention is used, it is always possible for the operator to see exactly what is happening, to inspect the work at will, and to stop or start when he wishes. And when lasting is done, the invention makes it possible to have constant control, eliminating the disadvantages of intermittent holding and releasing of the work by the mechanical elements. The work is constantly under controlled pressure, without the interference of feed mechanism which obscures the work and makes supervision difficult.

I claim:

1. A folding and lasting machine having, in combination, a rotatable folding wheel, means for rotating the wheel, and heated means adapted to bear with constant pressure against work held between it and the folding wheel during an operating cycle.

2. A folding and lasting machine having, in combination, a rotatable folding wheel, means for rotating the wheel, heated means adapted to bear with resilient pressure against work held between it and the folding wheel, and manually operated means for releasing the pressure at any time during the operation.

3. A folding and lasting machine having, in combination, a rotatable folding wheel having a beveled peripheral surface, means for rotating the wheel, and heated means for bearing with resilient pressure against work held between it and the beveled periphery of the folding wheel.

4. A folding and lasting machine having, in

combination, a rotatable folding wheel, means for rotating the wheel, and heated means adapted to bear with resilient pressure against work held between it and the folding wheel, said heated means having a curved spatulate finger adapted to pass between two layers of materials being secured and press one of them tightly with constant pressure throughout a cycle of operation against the folding wheel.

5. A folding and lasting mechanism having, in combination, a rotatable folding and pressing wheel, means for rotating the wheel, and a heated finger adapted to bear with constant resilient pressure throughout a complete cycle of operation against work held between it and said wheel, said wheel having a beveled peripheral portion adapted to cooperate with the heated finger in holding the work and a raised stretching and folding portion provided with gripping means adapted to bend the work around the end of the finger.

6. A folding and lasting machine having, in combination, a rotatable folding wheel having a beveled peripheral portion, means for rotating the wheel, a heated finger having a flattened surface adapted to bear with constant resilient pressure during a lasting operation against work held between it and the beveled part of the wheel, and a peripheral surface on said wheel having ridges disposed at an angle to the direction of movement of the wheel adapted to bend one pressed layer of the work around the end of the finger with a stretching action as the work is moved and to secure said layer to a second layer of the work as it is passed beyond the finger.

7. In a folding and lasting machine, in combination, a curved spatulate finger adapted to penetrate between two surfaces of material to be cemented, a folding wheel having on its periphery a series of ridges disposed at an angle to the direction of rotation of said wheel, and means for holding said finger with constant pressure against said wheel.

8. In a folding and lasting machine, in combination, a heated finger adapted to pass between



two layers of material to be cemented, and a folding wheel adapted to cooperate with said finger in folding one of said layers and securing it to the other, said wheel having two beveled surfaces on its periphery, one of which has a greater degree of angularity than the other.

9. A folding and lasting machine having, in combination, a rotatable folding wheel, means for rotating the wheel, a heated finger adapted to bear with constant pressure against the tape of an insole or the like held between it and the folding wheel during a cycle of operation, a flattened curved surface on said finger adapted to bend said tape over the periphery of said wheel, and means on said wheel for grasping and stretching said tape and folding it on a surface of said insole.

10. A folding and lasting machine having, in combination, a rotatable folding wheel, means for rotating the wheel, heated means adapted to bear with constant pressure against work held between it and the folding wheel during an operating cycle, and a supporting wheel adapted to receive the edge of the work and to guide the same during said operating cycle.

11. A folding and lasting machine having, in combination, a rotatable folding wheel, means for rotating the wheel, heated means adapted to bear with constant pressure against work held between it and the folding wheel during an operating cycle, and a freely rotatable wheel adapted to support and guide the edge of the work during said cycle.

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