March 6, 1928. 1,661,572

C. K. MacDONALD

ART OF FOLDING

Original Filed May 27, 1924

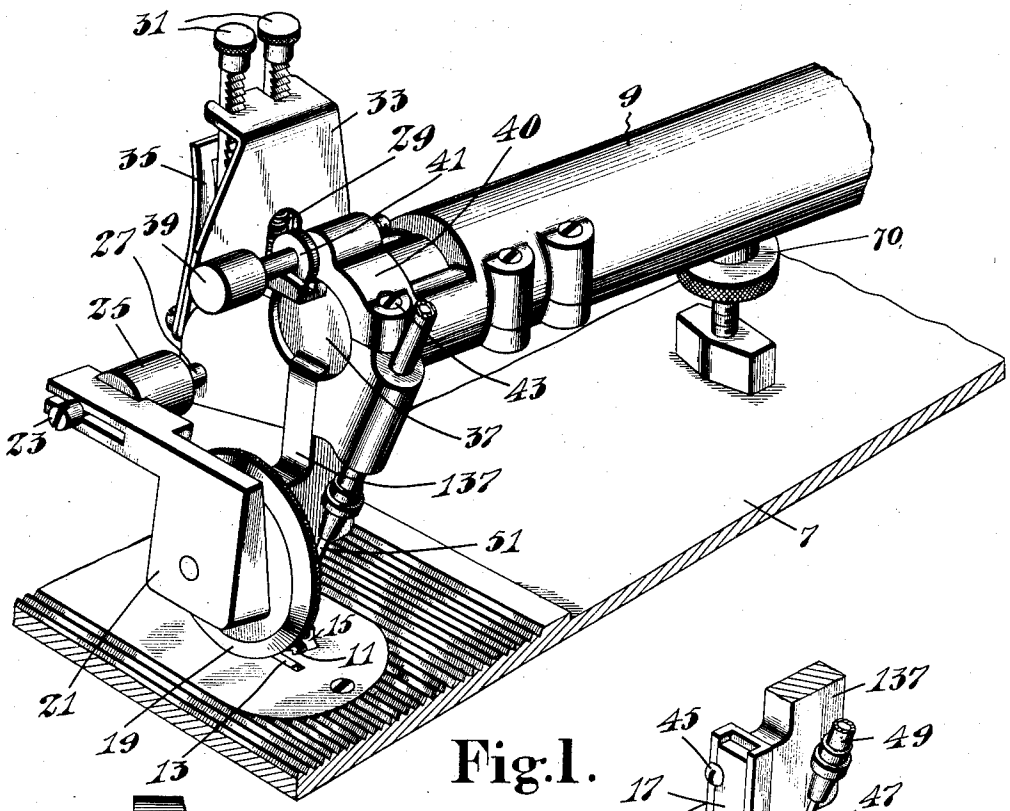


Fig.1.

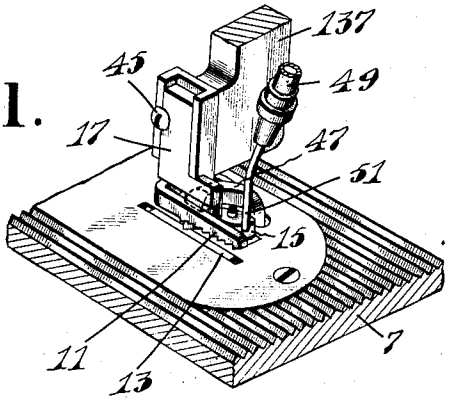


Fig.2.

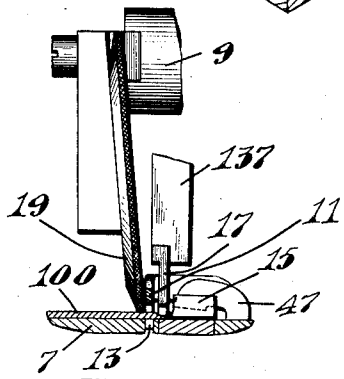


Fig.3.

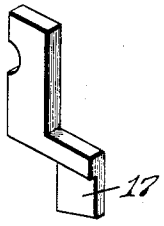


Fig.4.

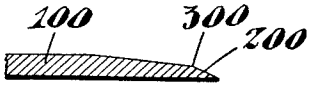


Fig.5.

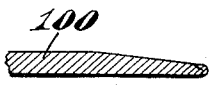


Fig.6.

INVENTOR.

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Patented Mar. 6, 1928. 1,661,572

UNITED STATES PATENT OFFICE.

CLIFFORD K. MacDONALD, OF BROCKTON, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ART OF FOLDING.

Application filed May 27, 1924, Serial No. 716,170. Renewed April 27, 1927.

This invention relates to a method of and a machine for folding the margins of pieces of sheet material such as parts of the uppers of boots and shoes, and more particularly to a method involving the use of a cement which is normally hard and non-sticky but is adapted to be rendered sticky when desired, and to a machine by which certain steps of the method may be carried out.

In one aspect the present invention provides a method which comprises providing the margin of a piece of work with a coating of cement in a hard, non-sticky condition, softening the cement to render it sticky and thereafter folding the margin. Preferably a cement which softens under heat is used and the fold after having been formed is subjected to the action of a cool member to press the fold and to set or harden the cement.

In another aspect the invention provides a machine for folding pieces of work such as those referred to above, the margins of which are coated with a cement which is hard and non-sticky, said machine having means for softening the cement and means for thereafter folding the margin. The illustrated machine is adapted to be used with work having upon its margin a coating of cement which may be softened by heat; and to that end is provided with a pipe through which a blast of hot air is directed upon the coating of cement to soften it before the work reaches the folding means of the machine.

Referring now to the accompanying drawings,

Figure 1 is a perspective of a portion of a machine by which certain steps of the method may be carried out.

Figure 2 is a fragmentary perspective showing more particularly the work-engaging parts, the presser wheel having been omitted.

Figure 3 is a view principally in elevation of the same parts and the presser wheel.

Figure 4 is a perspective of the fold guide.

Figure 5 is a section, on an enlarged scale, of a piece of leather before being folded, and

Figure 6 is a section of the same piece after having been folded.

The particular kind of work chosen for illustration (see Figures 5 and 6) is a piece of leather 100 having at its margin a narrow scarf 200 and along the base of the scarf a portion 300 which has been reduced to a uniform thickness. Conveniently the leather may be prepared by forming a scarf of gradual inclination spaced from the edge of the material, and an abrupt scarf 200 extending from the outer edge of the scarf of gradual inclination to the extreme edge of the material. When the work has been thus prepared, the subsequently formed folded margin is of uniform thickness. In folding work of this kind, as is explained in prior application Serial No. 683,682 filed in my name Dec. 31, 1923, a cement which is normally hard but may be rendered soft by heat has been found to be particularly effective. It should be understood, however, that the invention is not limited in its broader aspects to the particular kind of work which has been shown and described.

The machine comprises a work support in the form of a table 7 and an overhanging arm 9. The work is fed over the table by means of a feed foot 11 and a cooperating lower feed member 13. The lower feed member moves back and forth in the line of feed. The feed foot 11 moves in a generally rectangular path, the two members together forming what is commonly called a "four-motion feed". Extending up from the table is a plow 15, and located between the plow and the feed foot is a fold guide 17. An idle presser wheel 19 engages the work outside the feed foot 11. This presser wheel is rotatable in a bracket 21 which is adjustably held by a screw 23 in a slot in a head 25, said head being formed on the outer end of a rod 27 which is angularly movable in bearings in the overhanging arm 9. Two short arms, not shown, extend rearwardly from this rod, and to each arm is attached the lower end of a tension spring 29, the upper ends of the springs being attached respectively to the lower ends of pull rods 31, said rods extending up through rectangular grooves in an angle plate 33 which is carried by the overhanging arm 9. The rods have rack teeth, as shown, and are pressed toward the angle plate by a leaf spring 35. By manipulating the rods 31, the tension of

the springs 29 may be increased or decreased to vary the pressure exerted by the presser wheel 19 upon the work. The fold guide 17 is carried by a cylindrical member 37 which is slidably mounted in the overhanging arm 9 and may be adjusted in and out by turning a thumb screw 39, said screw being threaded into a saddle piece 40 and having a collar 41 which runs in a groove formed in a bracket which is part of the cylindrical carrier 37. The saddle piece 40 acts as a clamp to hold the carrier in adjusted position, being adapted to be tightened by screws, one of which is shown at 43. The carrier 37 has extending downward from it a bracket 137 provided, as best shown in Figure 2, with a vertical guideway in which the stem of the fold guide 17 is fastened by a screw 45. Located behind the plow 15, as viewed in Figure 3, is a hammer 47 which is oscillated about a horizontal axis located beneath the table. The machine, as thus far described, is or may be substantially the same as that of Patent No. 1,464,504, granted Aug. 14, 1923, upon an application filed in the name of Fossa except that the presser wheel 19 is mounted yieldingly on the arm 9 and that for the heated searing tool of the patented machine there has been substituted the fold guide 17 which is not heated. Referring more particularly to Figure 3, it will be noted that the work is fed over the table with its margin (preferably skived) against the plow, the extremity of the margin being bent upward into the space between the fold guide and the plow, and that this bent-up portion of the margin is bent over upon and pressed down upon the body portion of the work by the hammer.

In practising the present invention, a cement is used which is normally hard but is capable of being softened. The specific cement chosen for the purpose of explaining the invention is one made by treating gutta-percha with a suitable solvent such as carbon tetrachloride. The treatment results in a viscous fluid which is very sticky and may readily be used to coat the margin of the work. The solvent quickly evaporates, leaving the gutta-percha in a hard, non-sticky state but capable of being rendered sticky by the application of heat. The coating of cement is thus normally hard. In order to render it plastic and sticky before the fold-forming and fold-pressing operations are performed, means is provided for heating it.

In the machine shown, the heating is accomplished by a blast of hot air supplied through a pipe 49 having a slender nozzle 51 which terminates just in front of the plow 15 in position to heat the cement just prior to the formation of the fold by the action of the fold guide and the plow. The softening of the cement at this stage—namely just prior to the formation of the fold—is particularly advantageous first because the cement is thus rendered thoroughly sticky before the fold is formed, and second because subsequent cooling and setting of the cement, more particularly by the action of the cold hammer or fold-presser, is permitted. As soon as the fold is pressed, it is desirable that the temperature of the cement be lowered in order to set it, since otherwise the bond may not be of the desired firmness, and by separating the heating means from the fold-forming and fold-pressing means, this result is attained. This cooling and setting effect may be increased by directing a blast of cold air upon the hammer, but with the mechanism shown it has been found that such additional cooling device is ordinarily not necessary since the hot air blast through the nozzle 51 may be so controlled as to impart practically no heat to the work-engaging parts of the machine.

The machine herein shown has been stated to be in certain respects substantially like that shown in Patent No. 1,464,504. It may be noted that specifically the overhanging arm 9 is not spring balanced, as in the patented machine, but is free to swing downward by its own weight as far as an adjustable stop 70 will permit.

The method of rendering a coating of cement on the margin of a piece of sheet material plastic by means of heat and of forming a fold in said margin and pressing the fold is not claimed herein but forms the subject-matter of the prior application which has been referred to above.

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

1. A method of finishing the edge of a piece of sheet material which comprises coating the margin thereof with a cement which is normally not sticky, softening the cement to render it sticky, and thereafter folding the margin and pressing the fold.

2. A method of finishing the edge of a piece of sheet material which comprises coating the margin thereof with a cement which is not sticky at ordinary temperatures but becomes sticky upon application of heat, heating the cement to render it sticky and thereafter folding the margin and pressing the fold.

3. A method of finishing the edge of a piece of sheet material which comprises coating the margin thereof with a cement which is not sticky at ordinary temperatures but becomes sticky upon application of heat, heating the cement to render it sticky and thereafter folding the margin and applying a cool member to press the fold and to set the cement.

4. A method of finishing the edge of a piece of sheet material which comprises pro-

viding the piece with a skived margin and with a locality of uniform thickness at the base of the scarf, coating the margin with a cement which is not sticky at ordinary temperatures but becomes sticky upon application of heat, heating the cement to render it sticky, folding the margin and pressing the fold.

5. A method of finishing the edge of a piece of sheet material which comprises providing the piece with a skived margin and with a locality of uniform thickness at the base of the scarf, coating the margin with a cement which is not sticky at ordinary temperatures but becomes sticky upon application of heat, heating the cement to render it sticky, folding the margin and applying a cool member to press the fold and to set the cement.

6. A machine of the class described having, in combination, a support over which a piece of sheet material having its margin coated with hard cement is fed, means for softening the cement, and means for thereafter forming a fold in the margin and for pressing the fold.

7. A machine of the class described having, in combination, a support for a piece of sheet material having its margin coated with hard cement, means for intermittently feeding the piece over the support, fold-forming mechanism and fold-pressing mechanism past which the piece is successively fed, and cement-softening mechanism adapted to act upon the cemented margin in advance of the other two mechanisms.

8. A machine of the class described having, in combination, a support for a piece of sheet material having its margin coated with hard cement, means for heating the cement to soften it, means for thereafter forming a fold in the margin, and means for feeding the piece past the softening and the fold forming means and for pressing the fold.

9. A machine of the class described having, in combination, a support for a piece of sheet material having its margin coated with hard cement, means for heating the cement to soften it, means for thereafter forming a fold in the margin, and means for feeding the piece intermittently past the softening and the fold forming means and for pressing the fold.

10. A machine of the class described having, in combination, a support for a piece of sheet material having its margin coated with hard cement, means for feeding the piece over the support, a cooperating plow and fold guide for forming the fold, a hammer for pressing the fold, and means located in front of the plow considered in the direction of feed movement for softening the coating of cement.

11. A machine of the class described having, in combination, a support for a piece of sheet material having its margin coated with hard cement, means for feeding the piece over the support, a cooperating plow and fold guide for forming the fold, a hammer for pressing the fold, and means for conducting a heated gas to the coated margin of the piece to soften the cement.

12. A method of finishing the edge of sheet material which comprises coating the margin thereof with a cement which is normally not sticky, progressively softening the cement to render it sticky, and thereafter progressively folding the margin.

13. A machine for folding a piece of work having along its margin a coating of hard cement having, in combination, a support for the work, means for feeding the work over the support, means for progressively heating the cement and for forming the fold, and an unheated hammer for pressing the fold.

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

CLIFFORD K. MacDONALD.