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2,343,983

METHOD OF OPERATING ON THERMOPLASTIC EYELETS

Original Filed Dec. 8, 1941

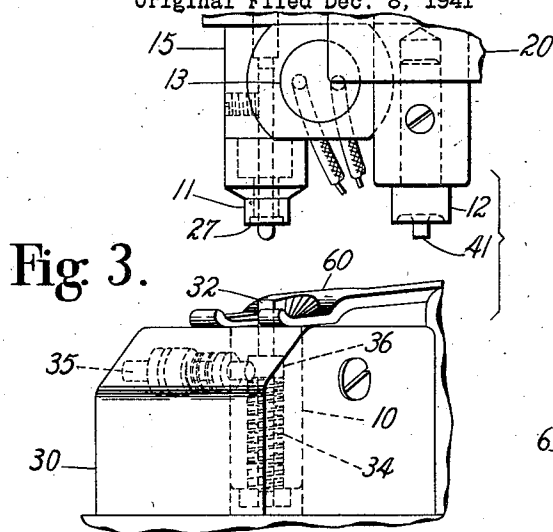


Fig. 3.

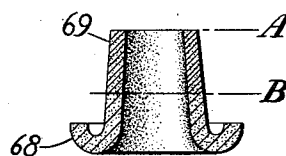


Fig. 2.

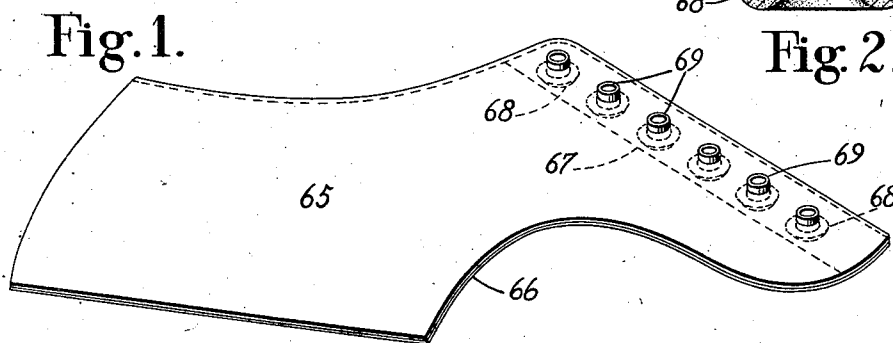


Fig. 1.

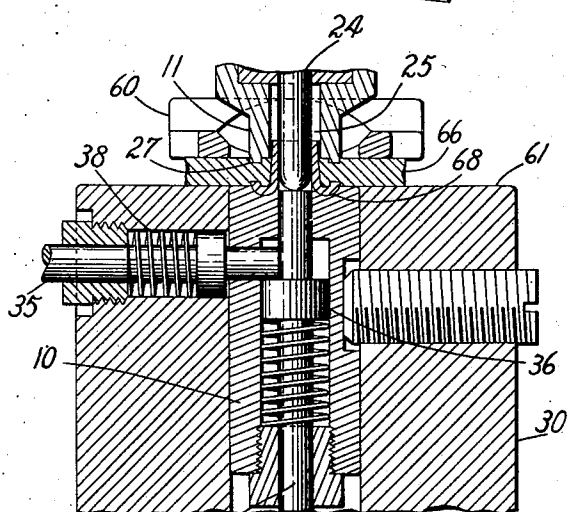


Fig. 4.

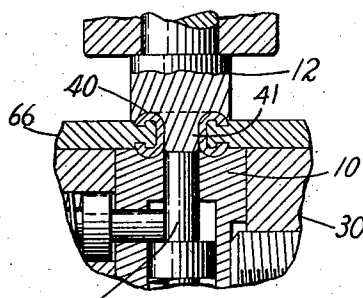


Fig. 5.

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UNITED STATES PATENT OFFICE

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METHOD OF OPERATING ON THERMO-
PLASTIC EYELETS

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Original application December 8, 1941, Serial No.
422,136. Divided and this application April 29,
1943, Serial No. 484,995

7 Claims. (Cl. 218—29)

This invention provides a novel method of operating on thermoplastic eyelets and is herein set forth with reference to setting such eyelets in shoe uppers. This application is a division of my copending application for United States Letters Patent Serial No. 422,136, filed December 8, 1941.

The technique evolved to practice this method comprises the step of heating the entering end of an eyelet without upsetting it and without heating the opposite end, and thereafter upsetting, and at the same time cooling the heated end. The portion of an eyelet barrel that extends beyond the eyelet-receiving material to be transformed into a revoluted clenching flange is the only portion that requires softening to satisfy the needs of this method. Consequently, a non-heated tool or anvil in contact with the head of the eyelet will prevent softening that end while the entering end is being softened by heat from a heated element. No upsetting pressure is applied during the heating stage, but, once the entering end has been softened, the eyelet and the heated element are separated and endwise upsetting pressure is applied as promptly as possible to the eyelet by two cooperative non-heated elements one of which may be the anvil used in the heating stage.

While the softened end of the eyelet is being transformed by the non-heated upsetting tool it becomes cooled thereby and its normal hardness nearly, if not entirely, restored before the upsetting pressure is removed. Moreover, since the heat applied to the eyelet is localized at the entering end, the intermediate portion of the barrel will remain capable of withstanding the upsetting pressure without being collapsed.

Referring to the drawing,

Fig. 1 is a perspective view of a "quarter" of a shoe upper into which thermoplastic eyelets have been inserted in readiness for softening and clenching;

Fig. 2 represents a longitudinal section of a thermoplastic eyelet in which the heated and non-heated portions are indicated by dissimilar shading;

Fig. 3 is an elevation of portions of a machine for operating on eyelets according to the method herein set forth;

Fig. 4 is a sectional view of the elements used in the heating stage of the method; and

Fig. 5 is a sectional view of the elements used in the upsetting and cooling stage.

The left quarter of a shoe upper is represented

in Fig. 1, the leather lining 65 being above the outer leather 66, an eyelet stay 67 being located between them, and a row of thermoplastic eyelets being inserted into closely fitting holes previously punched through the three layers above named. The heads 68 of the eyelets lie against the layer 66, while the entering ends 69 of the barrels project above the lining.

In Figs. 4 and 5 the eyelet-receiving material is represented as one thick layer 66 instead of three thin layers to avoid confusing lines that would obscure surface indentations. The holes punched for the reception of the eyelets are preferably a little smaller than the barrels to insure retention of the eyelets by friction. When the head 68 of an eyelet is pressed home against one surface of the work the entering end 69 will project from the opposite surface. The head 68 may be placed on a non-heated anvil 10 provided with a centering pin 32 adapted to fill the barrel of the eyelet. This pin is normally raised as in Fig. 3 by a compression spring 34. A presser foot 60 may be used to press the eyelet-receiving material against a supporting surface 61 of the base 30 in which the anvil is fixed.

Once the work is located and secured on the anvil, the next step is to soften the entering end of the eyelet with heat. This may be done without damaging the eyelet-receiving material by depressing an electrically heated tool 11 to the position represented in Fig. 4. The lower end of this tool is a narrow circular bead 27 intended to impress a groove in the upper surface of the eyelet-receiving material. The bore of the tool 11 is but little greater than the outside diameter of the entering end of an eyelet. Moreover, a pin 24 in the center of this tool projects a short distance below the bead 27 and is rounded to enter an eyelet without upsetting it, but is of a size to engage the internal surface of the barrel. These details render the pin 24 effective to center the entering end of an eyelet and guide it into the annular heating chamber 25 where an interval of about one second is enough to soften it.

As the pin 24 descends inside the eyelet it depresses the pin 32 and the thrust collar 36 carried thereby. A locking pin 35 is then projected over the collar 36 by a spring 38 to restrain the pin 32 in its lower position. At the same time the bead 27 of the heated tool is depressed into the upper surface of the eyelet-receiving material to form an annular groove encircling the softened portion of the eyelet. In Fig. 2 the softened portion is represented by dark shading between the lines

A and B, while the portion below the line B and contrasted by light shading is maintained in a hard condition by the non-heated anvil 10. Having held the heated tool 11 about one second in the position represented in Fig. 4 the operator will raise it to clear the eyelet, move it laterally, shift the non-heated upsetting tool 12 into alignment with the anvil, and depress the tool 12 to the position represented in Fig. 5. The central pilot 41 of this tool will enter the eyelet, but the annular upsetting surface 40 of concave section will transform the entering end of the eyelet while it is still soft. The soft portion of the eyelet will be transformed into a revoluted clenching flange by the tool 12 and its rim will be embedded in the annular groove previously impressed into the eyelet-receiving material by the bead 27. The tool 12 will also reduce the temperature of the clenched portion and restore it to a hard condition. While the clenching pressure is being applied by the tools 10 and 12 the pilot 41 will brace the barrel of the eyelet against its tendency to be collapsed and will preserve its true shape and diameter. An interval of about one second of contact of the tool 12 with the eyelet is sufficient to perform the transforming operation and restore the transformed portion to a hard or rigid state. Finally, the operator may retract the tool 12, raise the presser foot 60, remove the work, pull the locking pin 35 to release the centering pin 32, and place another eyelet on the anvil.

Referring to Fig. 3, the heated tool 11 is affixed to a block 15 of copper or bronze in which an electric heating unit 13 is embedded. This block is carried by a movable head 20 but is thermally insulated therefrom. The non-heated tool 12 is also carried by the head but is insulated from the block 15 to remain at or near room temperature while the tool 11 is maintained at a temperature about 300° F.

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

1. The method of setting a thermoplastic eyelet which consists in thrusting the barrel thereof through and beyond a hole in a work-piece while the eyelet is unheated, softening the projecting entering end of the barrel with heat without softening the opposite end thereof, separating the eyelet and the source of heat, and thereafter upsetting the softened end against the work-piece and simultaneously cooling it.

2. That improvement in methods of operating on thermoplastic eyelets which consists in inserting one end of the barrel of an eyelet through and beyond a closely fitting hole in a work-piece, softening that end of the barrel with heat but without softening the opposite end of the barrel, separating the eyelet and the source of heat, and thereafter simultaneously upsetting and cooling the heated end of the barrel.

3. That improvement in methods of operating

on thermoplastic eyelets which consists in inserting one end of the barrel of an eyelet through and beyond a closely fitting hole in a work-piece, softening that end of the barrel with heat, forming a depression in the adjacent surface of the work-piece, separating the eyelet and the source of heat, and thereafter transforming that end of the barrel into a revoluted flange with pressure by which a portion of such flange is embedded in said depression.

4. That improvement in methods of operating on thermoplastic eyelets which consists in inserting one end of the barrel of an eyelet through and beyond a tightly fitting hole in a work-piece, simultaneously softening that end of the barrel with heat and impressing an encircling groove in the adjacent surface of the work-piece, maintaining the opposite end of the barrel in a hard condition while the end first mentioned is being softened with heat, separating the eyelet and the source of heat, and transforming the softened end into a revoluted flange with pressure by which the rim of such flange is embedded in said groove.

5. That improvement in methods of operating on thermoplastic eyelets which consists in inserting one end of the barrel of an eyelet through and beyond a closely fitting hole in a work-piece, softening that end of the barrel with heat transferred to it both internally and externally, separating the eyelet and the source of heat, and transforming that end of the barrel into a flange with pressure of a cooling instrumentality.

6. That improvement in methods of operating on thermoplastic eyelets each having a barrel to be transformed at one end and a head at the opposite end, which consists in inserting the end first mentioned through and beyond a closely fitting hole in a work-piece, softening that end with heat while maintaining said head in a hard condition, separating the eyelet and the source of heat, and simultaneously transforming the softened end into a flange and cooling it by contact with a transforming instrumentality at or near room temperature.

7. That improvement in methods of providing a work-piece with a thermoplastic eyelet which consists in punching a hole in the work-piece, thrusting the entering end of a tightly fitting single-flange eyelet through and beyond the punched hole in the work-piece, softening the entering end of the eyelet by contact thereof with a heated element and at the same time maintaining the flange of the eyelet in contact with a non-heated metallic element, separating the entering end of the eyelet and the heated element to arrest the softening effect of the latter, and upsetting the entering end of the eyelet while yet soft with heat derived from said heated element by subjecting the eyelet to endwise pressure by two non-heated eyelet-engaging elements.

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