Sept. 9, 1952 W. S. ROBSON 2,610,287

INDUCTIVELY HEATED SHOEMAKING APPARATUS

Filed Feb. 26, 1949 2 SHEETS—SHEET 1

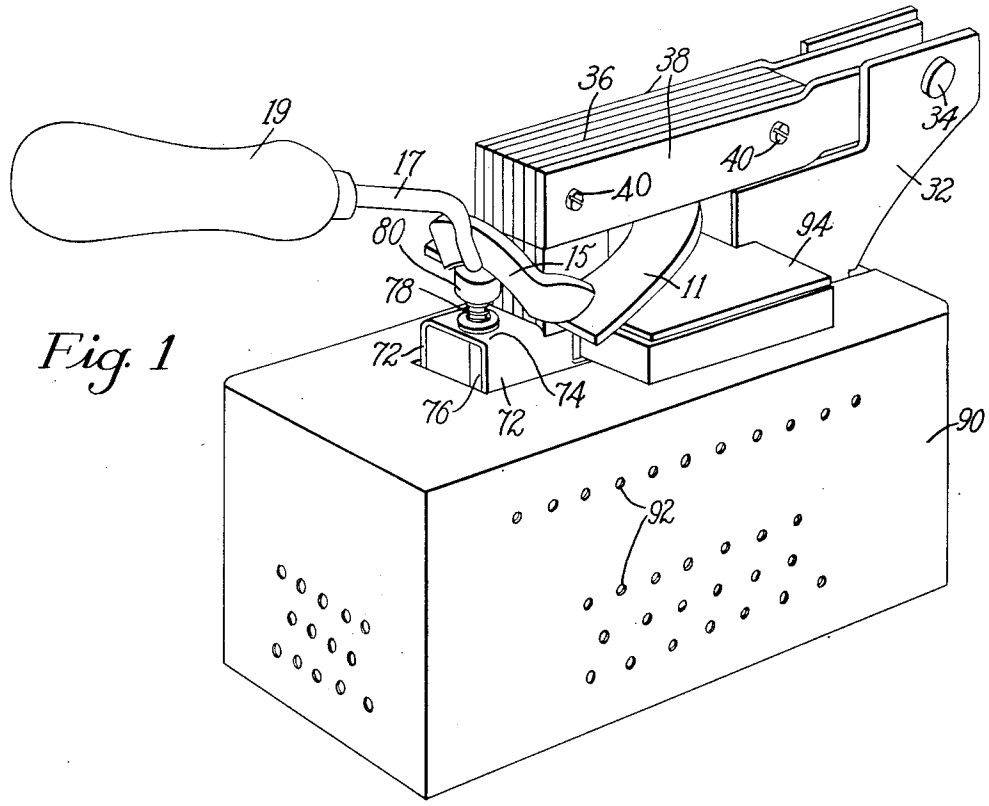



Fig. 1

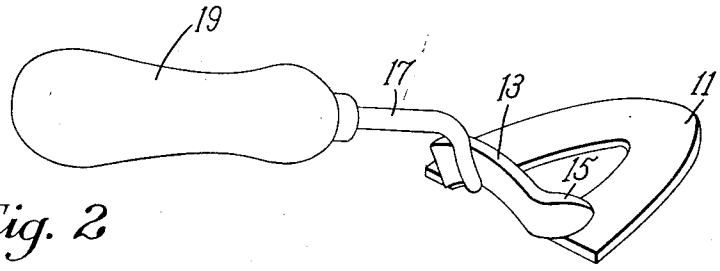



Fig. 2

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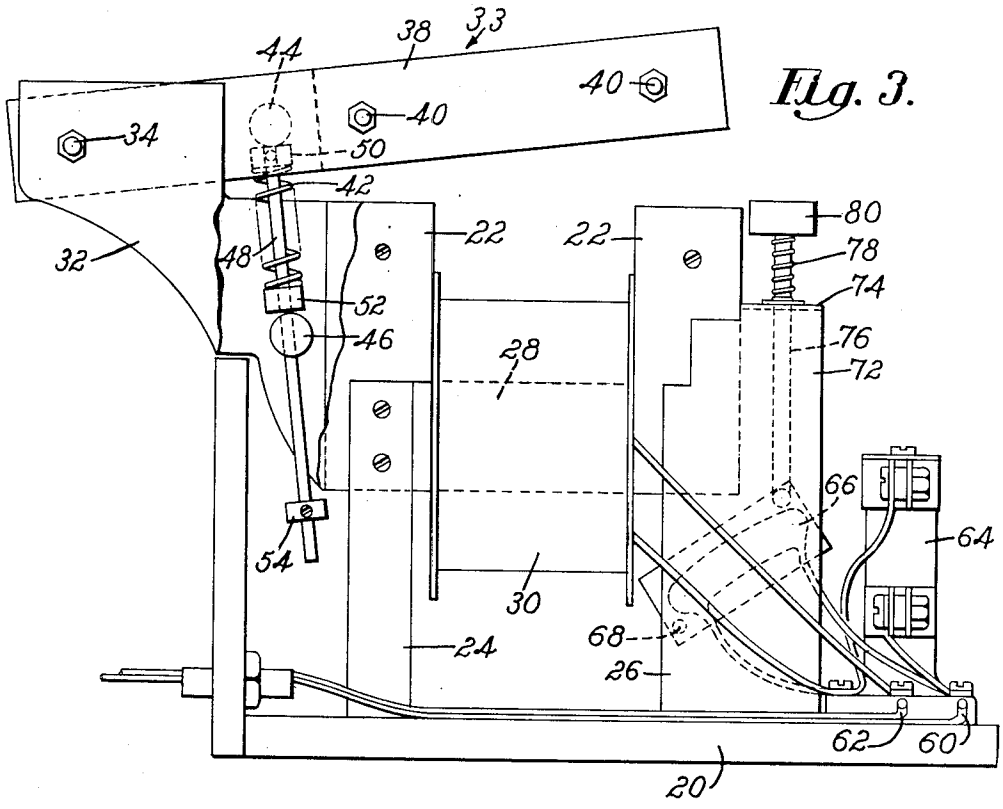
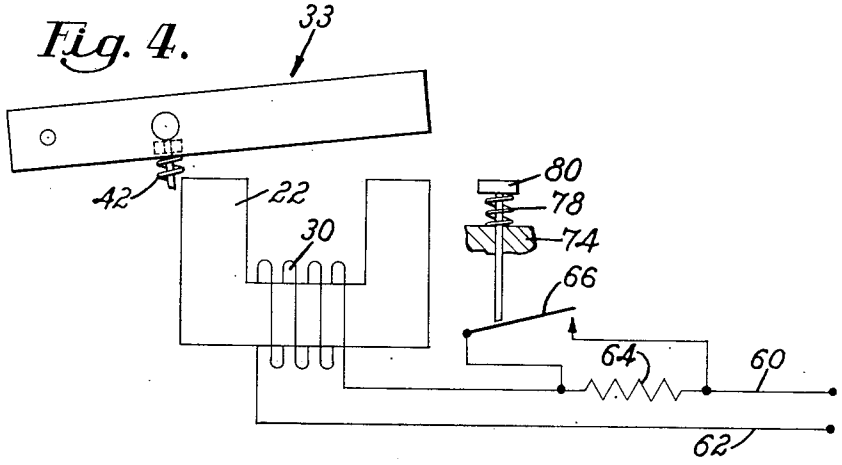



Fig. 3.

Fig. 4.




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# UNITED STATES PATENT OFFICE

2,610,287

## INDUCTIVELY HEATED SHOEMAKING APPARATUS

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6 Claims. (Cl. 219—47)

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This invention relates to improvements in apparatus for the manufacture of shoes and more particularly to apparatus for use in lasting shoes especially where the shoe upper is permanently secured to the insole by means of an adhesive.

In the manufacture of certain shoes in which the marginal portion of an upper, around the toe of a shoe, is to be secured in lasted relation to a shoe bottom member (e. g. an insole) by means of an adhesive, the upper on a last may be conformed to the shape of the last by the employment of a lasting machine of the so-called "bed-lasting machine" type (for example, the type disclosed in United States Letters Patent No. 2,097,567, granted November 2, 1937 upon an application of F. B. Keall) which operates to wipe the marginal portion of the upper around the toe of the shoe over the edge of an insole on the last bottom, inwardly of the edge of the insole. Thereafter this portion is secured in place by means of adhesive previously applied between the portion and the margin of the insole.

In some cases it has been proposed to hold the marginal portion of the upper, at the toe, in lasted relation to the insole, while the adhesive is setting, by means of a toe plate or other temporary holding means which is secured to the shoe bottom and remains on the shoe when the latter is removed from the lasting machine. After the adhesive has set, the temporary upper holding means is removed from the shoe.

In order to speed up the setting of the adhesive and thereby render the use of such temporary upper holding means unnecessary, it has been proposed that a heated device, corresponding in outline to the toe of a shoe, be placed by the operator on the wiped over margin of the upper (the wipers having been momentarily lifted away from or backed off from that margin to enable the device to be placed in position thereon). Pressure is then applied to the device by means of the wipers, and after a few seconds (the actual length of time depending upon the temperature of the device and the pressure applied) the adhesive will have become sufficiently set to permit the shoe to be removed from the lasting machine and subjected without undue delay to the next manufacturing operation to be performed thereon.

A device which has been used for this purpose takes the form of a small hand tool comprising a U-shaped plate-like member attached to a handle, the member being designed to be heated by placing it in a gas flame between lasting operations on consecutive shoes. The use of gas heated tools has the disadvantage of the production of undesirable fumes, and the naked flame constitutes an appreciable fire risk, especially when adhesive producing inflammable solvent vapors are employed. It has also been proposed to use portable electrically heated tools for

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this purpose, but such use has met little success in practice hitherto due to the fact that the electric elements do not stand up to prolonged use under shoe factory conditions wherein the tools are subjected to severe jolts, tending quickly to disrupt the elements. Another disadvantage of such a tool is the necessity for the use of trailing supply leads which tend to catch on projecting portions of the machine and generally get in the operator's way.

It is an object of the invention to provide an improved organization of apparatus for accelerating the setting of the toe lasting adhesive which does not suffer from the above-mentioned disadvantages.

Another object of the invention is to provide an improved transformer apparatus for inducing heating currents, for example, in portable tools comprising a closed conductive loop adapted to form the secondary of a transformer, whereby such tools may be conveniently and efficiently heated.

Further objects and advantages of the invention will be apparent and the invention itself will be best understood with reference to the following specification and the accompanying drawings in which

Fig. 1 is an angular view of an organization comprising a transformer apparatus and a portable hand tool adapted to be inductively heated for subsequent use in accelerating the setting of toe lasting adhesive in a bed-lasting machine, said tool being shown positioned for heating in said transformer apparatus;

Fig. 2 is an angular view of the portable tool shown in Fig. 1;

Fig. 3 is a side elevation of the transformer apparatus shown in Fig. 1; and

Fig. 4 is a diagram of the electric circuit involved in the transformer apparatus shown in Fig. 1.

The hand tool shown in Fig. 2 is constructed to have its heated portion form part of a closed conductive loop which is adapted to link the core of a transformer and form the secondary winding thereof, whereby said portion is heated by hysteresis and the high current induced in the loop. The tool comprises a U-shaped plate-like member 11 made of steel and conformed to the toe portion of a shoe bottom. Joining the ends of this member and connected thereto in a manner providing a minimum of resistance, as by welding, is a bridge member 13 of a metal of relatively greater conductivity than the plate-like member, for example, being conveniently made of copper. A short metal rod 17 extends upwardly and rearwardly away from the bridge member 13 to which it is attached, and to this rod is secured a wooden handle 19.

The tool shown in Fig. 2 is adapted for use particularly with a machine of the type disclosed

in the Letters Patent referred to above, and accordingly the bridge member 13 is arched upwardly as it extends between the limbs of the U-shaped member 11, in order to provide clearance for the insole-engaging plate, referred to as the plate 401 in said Letters Patent. Additionally, to provide for the inward movement of the wipers, the ends 15 of the bridge member 13 are turned forwardly so that the bridge member is attached to the ends of the plate-like member 11 along their inner margins.

Because of the greater conductivity of the bridge member and the conversely greater resistivity of the plate-like member 11, an induced current flowing through the closed loop comprising the connected members 11 and 13 will produce a greater heating effect in the plate-like member 11 than in the bridge member 13. Accordingly, that portion of the tool which is to be applied to the shoe bottom will be heated to a greater extent than that portion of the tool carrying the handle, resulting in a greater degree of efficiency than if the conductive loop were of uniform conductivity. At the same time this arrangement tends to keep the handle relatively cool.

Apparatus for inducing a heating current in the tool is shown in Figs. 1 and 3. These figures illustrate certain features of the invention, including the means by which the closed loop of the tool may be linked with a flux core to form the secondary of a transformer and yet be readily removable from said core for application to a shoe.

The apparatus comprises a base plate 20 upon which a U-shaped transformer core 22 is supported on brackets 24 and 26 with the limbs of the core vertically disposed, one limb near the front and one rearwardly thereof. The cross-member 28 of the core, corresponding to the base of the U, carries a winding 30 which forms the primary coil of the transformer apparatus. Attached to the two sides of the rear limb of the core and extending rearwardly and upwardly therefrom are plates 32 between which an armature assembly 33 is pivoted on a pivot pin 34. The armature assembly comprises an armature 36 (effectively comprising a section of transformer core) supported between two parallel metal strips 38 by bolts 40 (Fig. 1), the strips 38 extending rearwardly beyond the armature where they are journaled on the pivot pin 34. Accordingly the armature is movable into bridging relation with the ends of core 22 to provide a magnetic circuit of low reluctance. In another aspect, the core and armature together may be regarded as a substantially rectangular transformer core having a portion movable into spaced relation with the remaining portion.

Normally, that is, while the apparatus is in use, except during the heating cycle, the armature is maintained in spaced relation with the remainder of the core by being urged upward and out of engagement with the upper faces of the limbs of core 22 by a spring 42 extending between a transverse pin 44 in the armature assembly 33 and a transverse pin 46 between the plates 32. The spring 42 surrounds a rod 48 which extends radially from the pin 44, passing through a bore extending diametrically through the pin 46. The upper end of the spring engages a collar 50 secured to the rod while the lower end of the spring engages a collar 52 slidable on rod 48. A stop collar 54 is secured to the rod 48 at its lower end.



The primary coil 30 is adapted for connection by leads 60 and 62 to a source of alternating current having a potential sufficient to attract the armature 36 into closing relation with the core 22. When a tool is not being heated, a resistance 64 is interposed between lead 60 and the coil. This resistance is sufficient to reduce the potential of the alternating current supplied to the coil to a value at which the attraction between the ends of core 22 and the armature 36 is insufficient to overcome the force of the spring 42.

During the heating cycle, the resistance 64 is shunted by a mercury switch 66 extending forwardly and rearwardly of the apparatus and pivotally mounted adjacent to its rear end on a transverse pin 68 carried by side plate 72 forming the bracket which supports the front end of the core 22. A cross-piece 74 extends transversely between upper end portions of the side plates 72, and through a hole in this cross-piece a rod 76 extends downwardly to support the forward end of the mercury switch, the rod in turn being suported by a spring 78 extending between a collar 80 and the cross-piece 74. The mercury switch is normally held in the tilted position shown in Fig. 3 so that it does not shunt out the resistance 64, but when a toll such as that illustrated in Fig. 2 is positioned in linking relation on the forward limb of core 22 through the space provided by the open armature, the weight of the tool resting on collar 80 depresses rod 76 to pivot the mercury switch to a more horizontal position in which it shunts out the resistance 64. In this position, the energy supplied to the primary coil is sufficient to cause the armature 36 to move into engagement with the upper faces of the limbs of core 22. The armature remains in this closing relation with the core until the tool is lifted, whereupon spring 78 returns the mercury switch 66 to a tilted position, effectively inserting the resistance 64 in series relation with the supply circuit. Thereupon the current in coil 30 becomes insufficient to hold the armature in such closing relation. The small current which flows through the coil under these circumstances advantageously overcomes any remanent magnetism in the core which might tend to keep the armature attracted thereto. This small current insures that at some instant in the current cycle this magnetism is reduced to zero, any subsequent increase in the magnetic field during the flow of this small current being insufficient to cause the armature to be held in its closed position.

In the illustrative apparatus (Fig. 1) the lower portion of the core, the lower part of the primary coil, the resistance and the switch are conveniently enclosed in a metal case 90 having ventilating holes 92 in its walls, while the upper part of the coil is protected by means of an asbestos bridge piece 94 extending between the limbs of the core, which bridge piece protects the windings of the coil from contact with the heating tool and from heat radiated therefrom.

In operation the operator finds the heating apparatus with its armature spaced from the core. Through the gap thereby provided, the tool, shown in Fig. 2, is positioned in linking relation with the forward limb of the transformer core. In this position, the tool rests as shown in Fig 1, with its weight primarily supported upon the collar 80, causing the mercury switch to be closed and the armature to be attracted to a position in closing relation with the core, in which

position a path for the magnetic flux is provided which is substantially free from air gaps. Accordingly the tool is physically linked with the core and is inductively coupled to a maximum flux, the leakage flux being reduced to a minimum by the closing of the core.

When the tool is heated, the operator may then grasp it by its handle, lifting it away from the collar 30 and allowing the mercury switch to be tilted to the off-position, whereupon the armature is released to be moved to a spaced relation with the core under the urging of the spring 42 so that the tool may be conveniently removed.

Although the invention has been described in connection with the illustrated apparatus, numerous variations within the scope of the invention will occur to those skilled in the art and accordingly the claims are to be given a broad interpretation consistent therewith.

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

1. In apparatus of the class described, a portable heating tool comprising a closed conductive loop and a handle, a transformer core having a fixed portion and a portion movable with respect to said fixed portion to provide space for admitting said tool into linking relation with said core, a coil on the fixed portion of said core, a spring for urging said movable portion into spaced relation with said fixed portion, and a switch operated by the positioning of the tool in a predetermined position in linked relation with said core for connecting said coil to a supply of alternating current sufficient to close said movable portion by magnetic attraction.

2. Apparatus for inducing heating current in a closed loop heating tool comprising a core forming an incomplete loop having spaced ends, a primary coil on said core, an armature pivoted for movement into and out of engagement with the ends of said core to bridge the gap therebetween, a spring for yieldingly urging said armature out of contact with the core, means for connecting said coil to a source of alternating current through a resistance sufficient to limit the current to an amount insufficient to cause said armature to be attracted to said core against the force of the spring, and a switch arranged to be operated by the weight of such a tool for shunting out said resistance when the tool is resting in linked relation with said apparatus.

3. In apparatus of the class described, a portable hand tool in the form of a closed conductive loop having a handle attached thereto, a transformer core forming an incomplete loop having spaced ends and carrying a primary coil, an armature comprising a transformer core section movable into and out of bridging relation with said ends, a spring for yieldingly urging said armature out of said bridging relation, and means for connecting the coil to a source of alternating current comprising a switch adjacent to said core and adapted to be held closed by the weight of said tool while the tool is disposed in linked relation with the core during the heating cycle to supply alternating current to said coil sufficient to attract said armature into said bridging relation, said switch being actuated by resilient means, upon the lifting of said tool, to effectively insert in circuit a series resistance sufficient to reduce the supply of current to the coil to an amount sufficient to overcome any remanent magnetism but insufficient to hold said armature in closing relation with said core.

4. Inductive heating apparatus comprising a transformer core, a portion of said core being movable into spaced relation from the remaining portion of said core to provide a gap by which a closed loop tool may be linked with said core, means for maintaining said movable portion normally in spaced relation with said remaining portion, a primary coil on a portion of said core, and means responsive to the movement of said tool into a predetermined heating position for connecting said coil to a source of alternating current sufficient to attract said movable portion into a position in closing relation with said remaining portion, said connecting means being also responsive to movement of said tool away from said linked, heating position, preliminary to unlinking it with said loop, for reducing the supply of current to the coil before the movable portion of the core is moved into spaced relation with the remaining portion.

5. Inductive heating apparatus comprising a transformer core having an opening therein, an armature movable to close said opening, means for maintaining said armature normally in an open position, a primary coil on said core, means for supplying said coil with alternating current comprising a resistance in series relation with said coil and sufficient to reduce the potential of the alternating current supplied to said coil to an amount insufficient to hold said armature in its closing position, and a switch actuated by the positioning of a tool in linked relation with the magnetic circuit of said heating apparatus for shunting out said resistance.

6. Inductive heating apparatus comprising a transformer core, a portion of said core being movable into spaced relation from the remaining portion of said core to provide a gap by which a closed loop may be linked with said core, a primary coil on a portion of said core, means adapted to be actuated by the weight of a closed-loop-tool, disposed in a predetermined position in linked relation with said core, for controlling the supply of alternating current to said coil, said supply of power being sufficient to close said core when applied, and means yielding upon such application for maintaining said core portion normally in said spaced relation.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,128,731 | Spencer | Feb. 16, 1915 |
| 1,413,053 | Onstad | Apr. 18, 1922 |
| 1,609,132 | Sederholm | Nov. 30, 1926 |
| 1,610,041 | Cope | Dec. 7, 1926 |
| 1,615,018 | Langdon-Davies et al. | Jan. 18, 1927 |
| 1,645,029 | Sunderland | Oct. 11, 1927 |
| 1,919,660 | Kamborian | July 25, 1933 |
| 1,975,459 | Holslag | Oct 2, 1934 |
| 2,097,567 | Keall | Nov. 2, 1937 |
| 2,108,670 | Kamborian | Feb. 15, 1938 |
| 2,315,159 | Moore | Mar. 30, 1943 |
| 2,321,704 | Robson | June 15, 1943 |
| 2,374,662 | Black | May 1, 1945 |
| 2,387,028 | Kamborian | Oct. 16, 1945 |
| 2,418,056 | Strickland, Jr. | Mar. 25, 1947 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 670,369 | France | Nov. 28, 1929 |