June 9, 1953 E. E. MEILSTRUP 2,641,212

MAGNETIC HOLDING FIXTURE FOR SOLDERING TERMINALS

Filed July 28, 1949 2 Sheets-Sheet 1

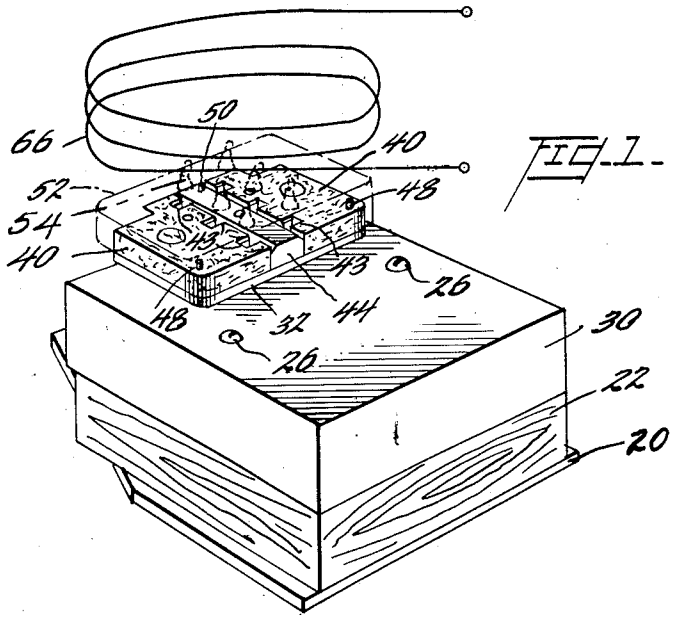


FIG. 1.

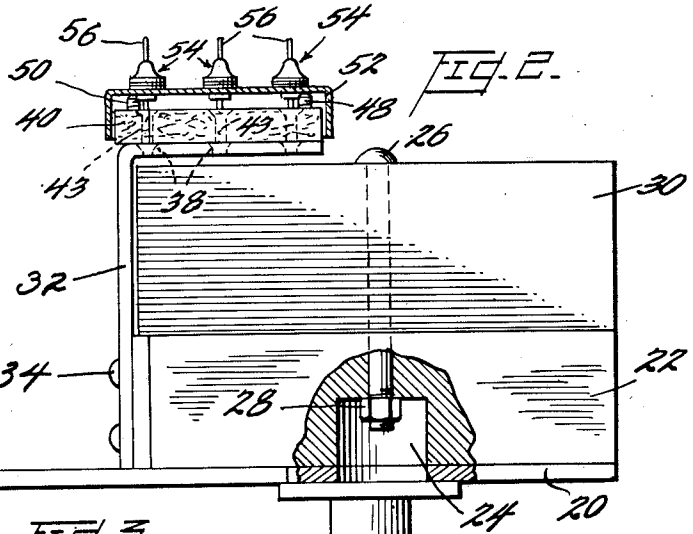


FIG. 2.

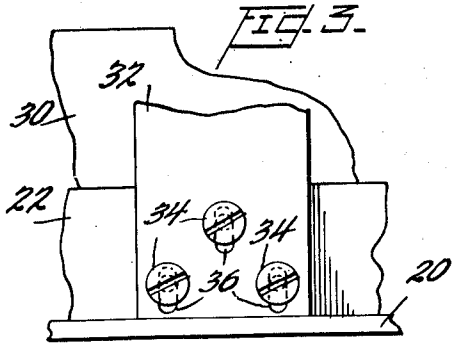
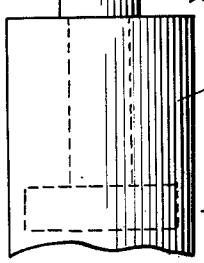


FIG. 3.



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June 9, 1953 E. E. MEILSTRUP 2,641,212

MAGNETIC HOLDING FIXTURE FOR SOLDERING TERMINALS

Filed July 28, 1949 2 Sheets-Sheet 2

FIG. 4.

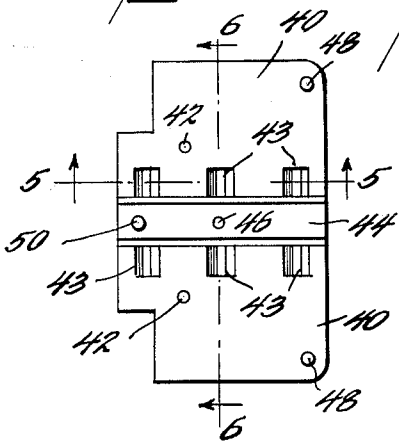


FIG. 5.

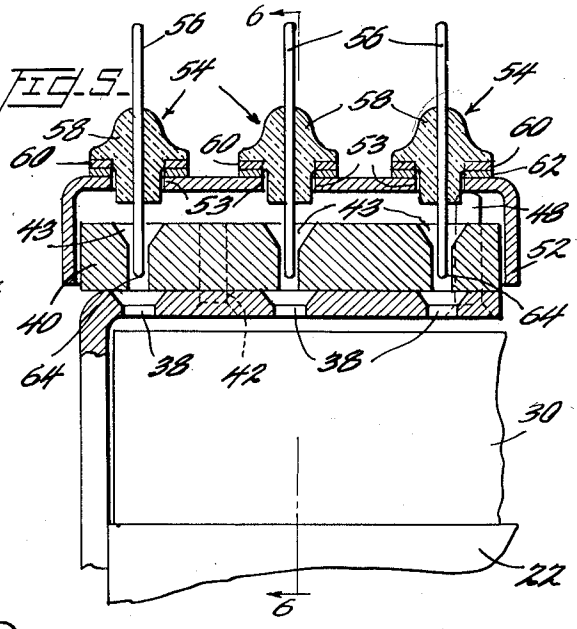


FIG. 6.

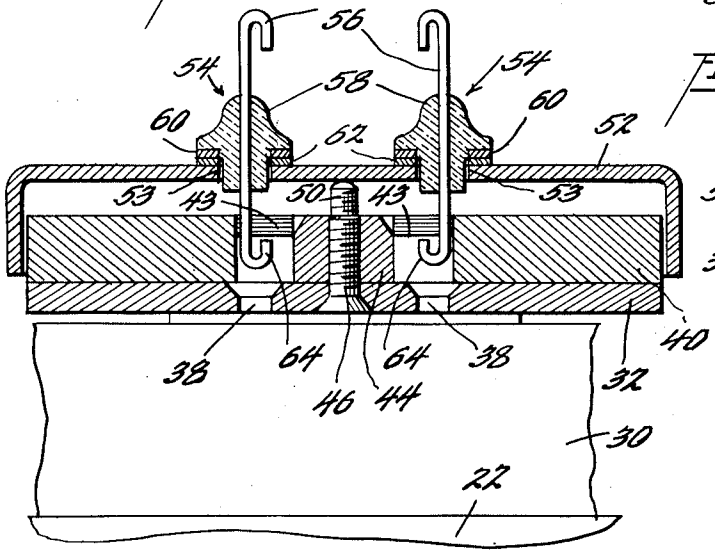


FIG. 7.

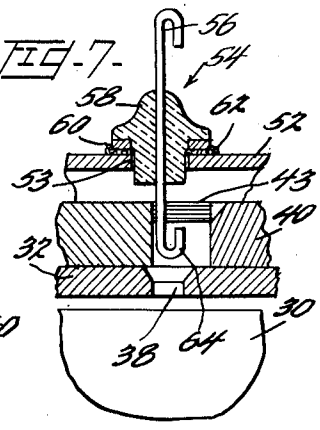
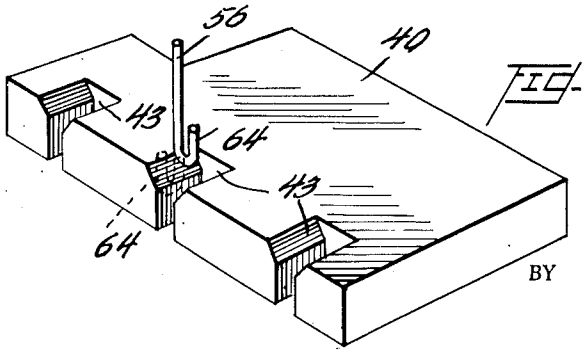


FIG. 8.



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MAGNETIC HOLDING FIXTURE FOR SOLDERING TERMINALS

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Application July 28, 1949, Serial No. 107,303

4 Claims. (Cl. 113—59)

1

This invention relates to magnetic apparatus for assembling articles and more particularly to such apparatus for soldering terminal leads to transformer covers.

In the manufacture of transformer covers having a plurality of openings through which extend a plurality of insulated terminals for providing leads from the enclosed transformer coils to external apparatus, it has long been the practice to solder the terminals to the cover by hand tools with the unsatisfactory result that the terminals are often moved out of proper alignment. This use of manually performed soldering operations also is wasteful of both time and material and often results in poor and unsightly seals between the covers and terminals. An attempt to use induction heating of the solder in order to avoid the difficulties of manual soldering resulted in such deleterious vibration of the terminal members that the terminal insulating glass beads were often cracked and the solder connection jarred loose from the metal cover during the soldering operation.

An object of the present invention is to provide an efficient and dependable magnetic apparatus for assembling articles and particularly for the induction soldering of terminals to a transformer cover.

In accordance with one embodiment of this invention, a transformer cover carrying plate is provided with a plurality of narrow slots therein for aligning the terminal members which extend through openings in the transformer cover and thence into the slots in the carrying plate. A magnetic member is provided directly below the aligning slots for pulling the terminals into the slots by magnetic attraction and removably holding them in position in the slots to prevent vibration and the attendant difficulties caused thereby when the cover carrying plate is moved into an induction heating coil to solder the terminals to the cover.

Other objects and advantages of the present invention will be apparent from the following detailed description when considered in conjunction with the accompanying drawings wherein

Fig. 1 is a perspective view showing an article holding, magnetic fixture and a cooperating induction heating coil;

Fig. 2 is a side elevation view of this holding fixture showing a means for raising the fixture into the induction heating coil;

Fig. 3 is an enlarged fragmentary view of an adjustable means for adjusting the height of the carrying plate relative to the base of the fixture;

2

Fig. 4 is a plan view of the cover carrying plate showing the guide slots therein for receiving the terminals;

Fig. 5 is an enlarged sectional view taken along line 5—5 of Fig. 4 and showing an assembled cover and terminals before soldering;

Fig. 6 is an enlarged sectional view taken along lines 6—6 of Figs. 4 and 5 and showing an assembled cover with the terminals prior to the induction heating operation;

Fig. 7 is a fragmentary sectional view showing the terminal soldered to the cover after the heating operation; and

Fig. 8 is a perspective view of a portion of the cover carrying plate showing the manner in which the beveled slots therein serve to uniformly position the terminals.

Referring now to the drawings wherein like reference characters designate the same parts throughout the several views, particular reference being first had to Figs. 1 and 2, a metallic frame member 20 supports and has secured to it a wooden base member 22. The frame member 20 rests upon and is fastened to the upper surface of a ram of a hydraulic lift 23 to provide means for raising and lowering the frame 20, although any equivalent means such as an electric motor or solenoid could be used to raise and lower the supporting member 20. The underside of the base member 22 is provided with a pair of recesses 24 into each of which a bolt 26 and a nut 28 extend in securing a magnetic plate 30 in position on top of the base 22. The magnet 30 may be made of any suitable magnetic retentative metal, while it is preferred to use brass for the nuts 28 and the bolts 26 so that the magnetic properties of the plate 30 will remain unaffected.

A bracket 32, preferably made of brass, is secured to the rear end of the wooden base 22 by three wood screws 34 which extend through three longitudinally extending slots 36 in the bracket 32. The slots 36 allow the bracket 32 to be adjusted to a desired height before being secured in position by the screws 34. An upper 90° extremity of the bracket 32 which extends parallel to the base member 22 is provided with six openings 38 through which pervades the effective field of the magnet 30.

Referring now to Figs. 4, 5, 6 and 8, a pair of heat resistant plates 40, composed of any material such as asbestos board, are secured to the bracket 32 by screws 42. The plates 40 are each provided with three beveled slots 43 which are cut into the inner edge of the plate 40 and so positioned on the plate 40 that the slots 43

register slightly off center with respect to a center line through the openings 38 in the bracket 32. The edges of the slots 43 are beveled in order that any articles to be inserted therein may be guided and easily centered. A brass spacer bar 44 is secured to the upper surface of the bracket 32 by a screw 46 and is interposed between the pair of plates 40 so as to close the open ends of the slots 43.

A screw 48, extending through each of the plates 40 and the bracket 32, projects a short distance above the upper surface of the plate 40. A screw 50, which extends through both the bracket 32 and the spacer bar 44 and projects slightly above the upper surface of the bar 44, together with the screws 48 form a tripod upon which a transformer cover 52 rests. This tripod arrangement is necessary in order to provide a clearance between the cover 52 and the heat resistant plates 40.

The transformer cover 52 is shown having six holes 53 which register with the slots 43 in the plates 40 and also with the openings 38 in the bracket 32. Obviously, the number of aligning holes and slots will be varied as required.

The actual connections are provided by terminal units 54 which comprise a conducting lead wire 56 of a magnetic susceptible material which is sealed into a flanged glass insulating bead 58. The glass bead 58 is provided with an annular layer 60 of electrodeposited copper or copper alloy at a lower extremity of the flanged portion. The terminal units 54 are placed in the holes 53 in the transformer cover 52 after rings of cold solder 62 have been placed around the holes 53. The solder ring 62 may be composed of any of the types of cold solder which are well known in the art.

Since the holes 53 and slots 43 are in alignment, the lead wires 56 will be pulled into the slots 43 by the magnet 30 and move the terminal units 54 into close contact with the solder rings 62 and, consequently, with the cover 52. Once the unit 54 is seated in the hole 53, the magnet 30 will rigidly hold the unit in position without bringing the wire 56 into actual contact with the bracket 32 as shown in Figs. 5 and 6. It is essential that this small clearance be maintained in order to allow the magnet 30 to pull the wire 56 down a short distance further when the solder ring 62 is melted.

The beveled slots 43 and hooks 64 which are formed in the ends of wires 56 function to guide the terminal units 54 into a uniform alignment since the width of the slots 43 are smaller than the width of the hooks 64 so that the hooks 64 will only pass into the slots 43 when the hooks 64 extend parallel to the long dimension of the slot 43. This is best illustrated in Fig. 8 wherein the hook 64 is shown both parallel to and perpendicular to the long dimension of the slot 43. The solid line showing of the hook 64 is perpendicular to the long dimension of the slot 43 and, consequently, the hook 64 will be turned 90° by the combined force of gravity and the pull of the magnet until it is parallel to the long dimension of the beveled slot 43 when it drops therein as shown in dotted outline.

After the terminal units 54 have been pulled into correct position by the magnet 30, the hydraulic lift 23 is actuated to raise the transformer cover 52 and the plates 40 into an induction heating coil 66 (Fig. 1) which is positioned directly above the cover 52. When the cover 52 is positioned within the coil 66, it is energized to melt the solder ring 62 thus permitting the magnet 30 to attract the terminal units 54 into a close seal with the cover 52 as shown in Fig. 7. In this figure, the solder ring 62 is melted and a tight solder joint has been formed between the metal of the cover 52 and the layer 60 on the glass insulating bead 58. The magnet 30 will hold the terminal units 54 and the cover 52 in this tight relationship until the solder hardens and it is desired to remove the completed cover.

From the foregoing detailed description, it is believed that the operation of the soldering fixture will be understood. Before the cover 52 or any terminal units 54 are assembled for soldering, it is necessary to first adjust the distance between the upper extremity of the bracket 32 and the upper surface of the magnet 30 so that the wires 56 of the terminals 54 to be assembled will be attracted by the effective field of the magnet 30. This adjustment in height is obtained by raising or lowering the bracket 32 with the slots 36 and subsequently tightening the wood screws 34 to secure the bracket 32 in an adjusted position.

The transformer cover 52 is then placed on the positioning screws 50 and 48 so that the cover 52 is retained a predetermined distance above the level of the plates 40. Rings 62 of the cold solder are placed upon the cover 52 so as to encircle the holes 53 and following this the terminals 54 are placed in the holes 53. The downward attraction of the magnet 30 seats the terminal unit 54 firmly in the holes 53 of the cover 52 and prevents vibration thereof.

When the terminals 54 have been firmly seated by the magnet, the assembly is ready to be heated and the lift 23 is actuated to raise the cover 52 into the induction heating coil 66. The induction coil 66 is energized to heat the assembly thus causing the solder rings 62 to melt. Since the downward pull of the magnet 30 continues during the entire heating cycle the terminal units 54 remain in rigid position without vibration and the danger of breaking the glass seals 58 is obviated. Also, the downward attraction of the magnet 30 during the heating cycle gradually urges the layer 60 of the glass bead 58 into a closer relation with the metal cover 52 as the solder ring 62 melts so that a tight solder joint exists between the terminal units 54 and the cover 52.

After the solder rings 62 have been completely melted and the solder joints completed, the lift 23 is actuated to lower the cover assembly from within the coil 66. The cover assembly then remains on the holding fixture for a few moments after leaving the coil 66 in order to allow the solder 62 to cool and harden so that the terminals 54 will be permanently secured to the cover 52. Thereupon the completely assembled cover is manually removed from the supporting screws 48 and 50 against the attraction of the magnet 30. The fixture is now ready for another complete cycle of operation similar to the one just described.

It is to be understood that the above described arrangement is simply illustrative of one application of the principles of the invention and that numerous other arrangements may be readily devised by those skilled in the art which will embody the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A soldering fixture for holding magnetically susceptible articles in a heating coil, comprising

a frame movable relative to the heating coil, a magnet secured to the frame, a non-magnetic member secured to the frame directly above the magnet for supporting a metal element and terminal units positioned in apertures in said element, each unit having a depending offset end portion of magnetically susceptible wire, said non-magnetic member having slots bevelled at their entrance ends at the upper surface thereof in alignment with the apertures in the metal element through which the magnet attracts and pulls the terminal units against said metal element for soldering, said bevels orienting said terminal units into aligned positions, and means for moving the non-magnetic member and terminal units and the metal element into the heating coil.

2. A soldering fixture for holding magnetically susceptible articles in a heating coil, comprising a frame movable relative to the heating coil, a magnet secured to the frame, a non-magnetic member secured to the frame directly above the magnet for carrying terminal units, each unit having a depending offset end portion of magnetically susceptible wire, a plurality of spaced pins secured in the non-magnetic member and projecting above the top surface of the member for holding a metal element having apertures in which the terminal units are to be soldered, said non-magnetic member having slots bevelled at their entrance ends at the upper surface thereof in alignment with the apertures in the metal element through which the magnet attracts and pulls the terminal units against said metal element for soldering, said bevels orienting said terminal units into aligned positions, and means secured to the frame for moving the terminal units and the metal element into and out of the heating coil.

3. A soldering fixture for holding magnetically susceptible articles in a heating coil, comprising a frame movable relative to the heating coil, a magnet secured to the frame, a non-magnetic member secured to the frame directly above the magnet for supporting a metal element and terminal units positioned in apertures in said element, each unit having a depending offset end portion of magnetically susceptible wire, said non-magnetic member having slots bevelled

at their entrance ends at the upper surface thereof in alignment with the apertures in the metal element through which the magnet attracts and pulls the terminal units against said metal element for soldering, said bevels orienting said terminal units into aligned positions, means for moving the non-magnetic member and terminal units and the metal element into the heating coil, and adjustable means for varying the distance between the non-magnetic member and the magnet.

4. A soldering fixture for holding magnetically susceptible articles in a heating coil, comprising a frame movable relative to the heating coil, a magnet secured to the frame, a non-magnetic member secured to the frame directly above the magnet for carrying terminal units, each unit having a depending offset end portion of magnetically susceptible wire, adjustable screws threaded in the non-magnetic member and projecting above the top surface of the member for supporting a metal element, said non-magnetic member having slots bevelled at their entrance ends at the upper surface thereof in alignment with the apertures in the metal element through which the magnet attracts and pulls the terminal units against said metal element for soldering, said bevels orienting said terminal units into aligned positions, and means secured to the frame for moving the terminal units and the metal element into and out of the heating coil.

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