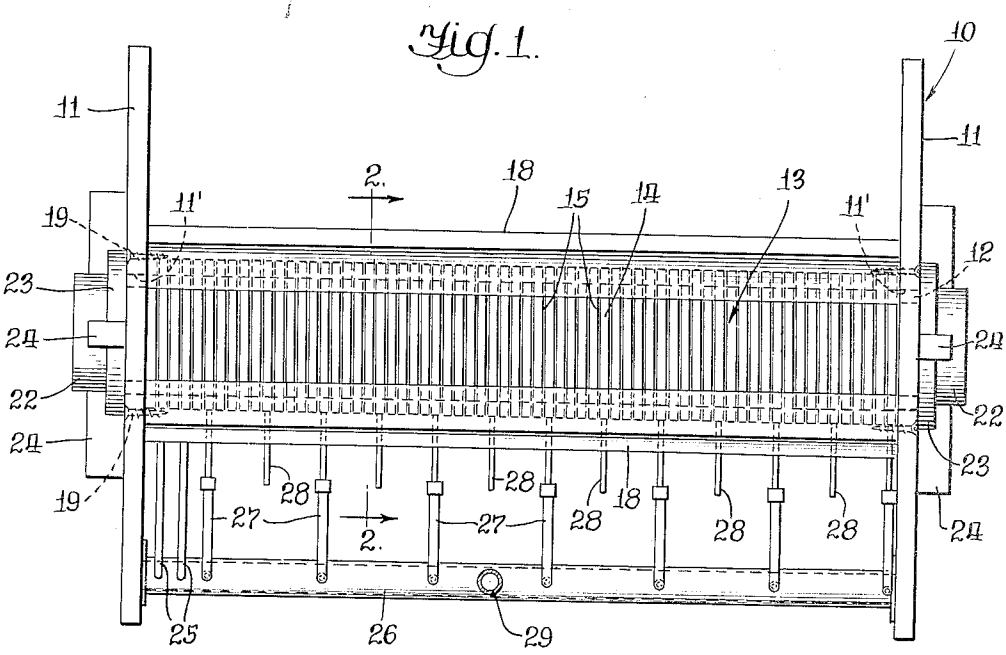
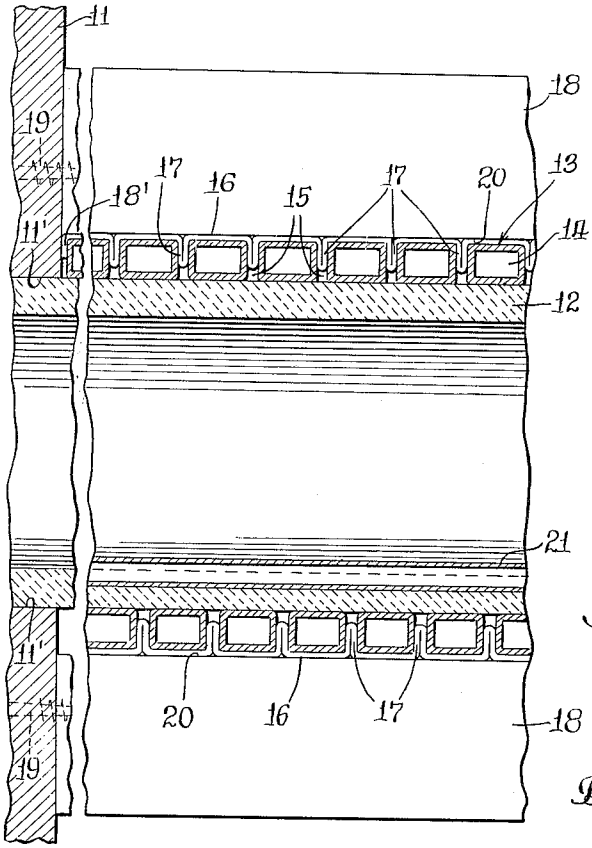
Aug. 30, 1955 N. J. CUTLIFF ET AL 2,716,695

INDUCTION HEATING UNIT

Filed April 12, 1952

Fig. 1.





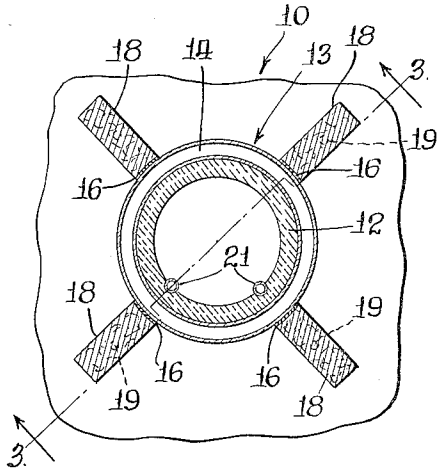


Fig. 2.

Fig. 3.

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INDUCTION HEATING UNIT

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4 Claims. (Cl. 219—10.79)

This invention relates to an improvement in induction heating units and more particularly to the assembled construction of an induction coil. More specifically the invention relates to an improved construction for supporting and for providing suitable insulation for the induction coil of an induction heating unit.

In an induction heating unit of the type shown in the patent to Strickland 2,408,350 patented September 24, 1946, an induction coil consists of a longitudinally extending refractory tube about which an induction coil is supported. The induction coil consists of a plurality of spirally wound coil-turns, each of the coils being spaced longitudinally with respect to the other. Billets to be heated are inserted at one end of the refractory tube and are conveyed therethrough to the other end whereupon they are discharged after being fully heated. In an induction coil of the multi-turn construction it is necessary to longitudinally space the coil-turns with respect to each other and to insulate them from each other by suitable spacing means. This is necessary in order to accomplish proper flow of current through the induction coil. In constructions of the type shown in the above mentioned patent the spacing of the individual coil-turns has been accomplished by placing, around the induction coil, longitudinally extended strips of Micarta or other fibre non-conductive material, this material being tightly wrapped by means of an insulating tape of an appropriate character. The wrapping is then covered with a resilient insulating varnish which, in turn, is baked upon the assembly.

In practice it has been found that the type of construction above described is exceedingly expensive in construction and maintenance. The wrapping of the coil in this manner does not at all times assure proper spacing of the coil-turns in order to secure full and complete insulation therebetween. It is, therefore, a prime object of this invention to provide an improved induction coil assembly which is inexpensive to construct and which is effective in its function over long periods of time without constant maintenance and disassembly of the unit.

It is another object of this invention to provide an improved structure for maintaining the coil turns of an induction coil in suitable longitudinally spaced and insulated relation.

Still another object is to provide an improved induction coil for induction heating units, the coil including a plurality of longitudinally spaced coil sections each of the coil sections being in contiguous relation with respect to a plurality of electrical insulating pads which are disposed between the coil sections to maintain them in suitable spaced relation.

Still another object is to provide an improved construction for insulating the individual coil turns of an induction coil, the construction including a plurality of longitudinally extending non-conductor strips which are circumferentially spaced about the induction coil, the strips having fold portions which extend toward the axis of the induction coil, the fold portions lying in the spaces formed by the spaced induction coil-turns.

A still further object is to provide an improved construction for insulating the coil-turns of a spirally wound induction coil and for supporting the coil and the refractory tube which is encircled by said coil, the structure comprising a plurality of longitudinally extending and circumferentially spaced non-conductor strips, the strips having portions extending toward the axis of the coil, the portions

providing insulating pads for suitably spacing the coils with respect to each other, and a plurality of circumferentially spaced longitudinally extending supporting members which are suitably supported to engage and maintain the circumferentially extending pads in position and to suitably support the induction coil and the refractory tube.

These and further objects will become more readily apparent from a reading of the specification when examined in connection with the accompanying sheet of drawing.

In the drawing:

Figure 1 is a plan view of an induction heating unit disclosing the embodiments of the invention.

Figure 2 is a cross-sectional view through the induction heating unit and particularly the induction coil, taken along the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view through an induction coil and associated structure, the view being taken substantially along the line 3—3 of Figure 2.

Referring to the drawing, an induction furnace is generally designated by the reference character 10. The induction furnace 10 comprises a pair of longitudinally spaced supports 11, the spaced supports 11 being provided with center openings 11′ in longitudinal alignment. The spaced supports may be constructed of a suitable non-conductor material such as fibre-board, wood, etc. A tube 12 of a refractory material is supported in the center openings 11′ of the supports 11. An induction coil 13 is carried by the refractory tube 12, the induction coil 13 including a plurality of interconnected coil-turns 14. As best indicated in Figures 1 and 3, the induction coil 13 is constructed in spirally wound fashion to encircle the refractory tube 12. The coil-turns 14 are suitably spaced longitudinally to provide a plurality of longitudinally disposed spaces as indicated at 15. Thus though the coil-turns 14 are interconnected, the major portion of each coil-turn is suitably insulated or spaced from the adjacent coil-turn 14.

In order to retain the coil-turns in the longitudinally spaced relation, a plurality of longitudinally extending strips 16 are circumferentially spaced about the induction coil 13. The strips 16 may be constructed of a suitable heat resistant and non-conducting material such as asbestos, the said strips 16 being suitably folded to provide a plurality of inwardly extending pads or folds 17 which extend toward the axis of the coil 16 into the longitudinally disposed spaces 15. Due to the resiliency of the spirally wound copper induction coil 13, the folds 17 are securely held in the spaces 15. As indicated at 18′ the ends of the asbestos strips 16 are turned downwardly into the spaces formed by the longitudinally spaced supports and the adjacent coil turns 14.

In order to properly support each of the folds or pads 17 in position in the spaces 15, a plurality of longitudinally extending bars or supports 18 are provided. The bars or supports 18 are circumferentially spaced about the coils 16, the bars 18 being securely connected at their opposite ends to the longitudinally spaced supports 11 by means of screws 19 as best indicated in Figures 2 and 3. Each bar 18 is provided with a longitudinally extending flat surface 20 which is tightly held in engagement with the longitudinally extending strips 16 so that the folds or pads 17 are held in position. As best shown in Figures 2 and 3, the interior surface of the refractory tube 12 supports a pair of tubular tracks 21, the tracks functioning to support the billets as they are pushed through the induction furnace 10. The tracks 21 may be cooled by a cooling liquid which flows therethrough in a conventional manner.

A collar 22 is provided on the outer face of each of the supports 11, each collar 22 including a flange 23 which is suitably engaged by brackets 24 which connect the collar 22 to the spaced supports 11.

A pair of inlet connections 25 are suitably connected to the tracks 21 for supplying a coolant liquid therethrough from a manifold 26, the ends of the manifold 26 being suitably connected to the inner surfaces of the spaced supports 11. Inlet conduits 27 in communication with the manifold 26 also provide a coolant liquid to the induction coil 13, the inlet conduits being suitably connected to the coil turns 14. Outlet conduits 28 are provided to discharge the coolant liquid from the induction coil 13. A pipe connection 29 is connected to the manifold 26 for delivering liquid thereto.

The operation of the induction coil 13 is conventional, the said coil being suitably connected to a source of high frequency current. Billets of steel which are to be heated are pushed through the coil 13, the billets being suitably supported on the tracks 21. Coolant liquid from the manifold 26 assures proper cooling of the induction coil 13 and the tracks 21. In order to secure proper operation of the coil 13, the individual coil turns must be suitably insulated from each other and this insulation is effectively accomplished by means of the asbestos strips 16 and the folds 17 which are so disposed as to constantly maintain the coil turns in their spaced relation. Thus effective and proper insulation of the coil turns is effected without the need of expensive and complex wrappings. The individual pads 17 or folds are suitably held in place by means of the longitudinally extending bars or supports 18 which engage the strips 16 so that the insulated relation of the folds with respect to the coil-turns is maintained. The longitudinally extending bars 18 are preferably formed of a non-conductor material such as fibre or wood and these supporting members effectively support the coil and the refractory in a manner wherein excessive damage to the refractory is greatly diminished and maintenance can be held at a minimum. It can be appreciated that the steel billets within the induction coil may be quite heavy, but with the novel arrangement of the supports 13, a strong and rigid structure is provided to accommodate the work load within the coil.

An inexpensive and effective insulation for the individual coil-turns of an induction coil has thus been provided including further novel elements of construction which provide for an improved induction furnace. Thus the objects of the invention have been fully achieved and it must be understood that changes and modifications in the structure may be made which do not depart from the spirit of the invention as disclosed nor from the scope thereof as defined in the appended claims.

What is claimed is:

1. An induction heating unit comprising a pair of longitudinally spaced supports having center openings in longitudinal alignment, a refractory tube supported within said openings, an induction heater supported on said tube, said induction heater including a spirally shaped hollow coil encircling said refractory tube, the coil having interconnected hollow coil sections spaced longitudinally with respect to each other, longitudinally extending strips of insulating material circumferentially spaced about said coil, said strips having longitudinally spaced folded portions extending inwardly toward the axis of the coil into the spaces provided by the spaced coil sections for insulating said sections from each other, a plurality of longitudinally extending supporting members of non-conducting material circumferentially disposed about said coil, said supporting members having longitudinally extending surfaces engaging said insulating strips for maintaining the folded portion in position and for rigidly supporting said induction heater, means connecting the opposite ends of said supporting member to said longitudinally spaced supports, a coolant liquid manifold extending longitudinally adjacent said induction heater, inlet conduits connecting the manifold and the coil section to provide for communication therebetween, and outlet conduits connected to said coil sections.

2. An induction heating unit comprising a pair of longitudinally spaced supports having center openings in longitudinal alignment, a refractory tube supported within said openings, an induction heater supported on said tube, said induction heater including a spirally shaped hollow coil encircling said refractory tube, the coil having interconnected hollow coil sections spaced longitudinally with respect to each other, longitudinally extending strips of insulating material circumferentially spaced about said coil, said strips having longitudinally spaced folded portions extending inwardly toward the axis of the coil into the spaces provided by the spaced coil sections for insulating said sections from each other, a plurality of longitudinally extending supporting members of non-conducting material circumferentially disposed about said coil, said supporting members having longitudinally extending surfaces engaging said insulating strips for maintaining the folded portion in position and for rigidly supporting said induction heater, means connecting the opposite ends of said supporting members to said longitudinally spaced supports, a coolant liquid manifold extending longitudinally adjacent said induction heater and inlet conduits connecting the manifold and the coil section to provide for communication therebetween.

3. An induction heating unit comprising a pair of longitudinally spaced supports having center openings in longitudinal alignment, a refractory tube supported within said openings, an induction heater supported on said tube, said induction heater including a spirally shaped hollow coil encircling said refractory tube, the coil having interconnected hollow coil sections spaced longitudinally with respect to each other, longitudinally extending strips of insulating material circumferentially spaced about said coil, said strips having longitudinally spaced folded portions extending inwardly toward the axis of the coil into the spaces provided by the spaced coil sections for insulating said sections from each other, a plurality of longitudinally extending supporting members of non-conducting material circumferentially disposed about said coil, said supporting members having longitudinally extending surfaces engaging said insulating strips for maintaining the folded portions in position and for rigidly supporting said induction heater, and means connecting the opposite ends of said supporting members to said longitudinally spaced supports.

4. An induction heating unit comprising a pair of longitudinally spaced supports having center openings in longitudinal alignment, a refractory tube extending longitudinally between said supports, an induction heater supported on said tube, said heater including a hollow induction coil having a plurality of interconnected coil turns encircling said tube, said coil turns having portions longitudinally spaced with respect to each other, a plurality of circumferentially disposed strips of insulating material disposed about said coil, said strips having longitudinally spaced folds extending inwardly to the axis of the coil into the spaces formed by the spaced turns portions to provide insulation therebetween, a plurality of longitudinally extending supporting members of non-conducting material circumferentially disposed about said coil, said supporting members having end portions connected to said supports, and portions on said supporting members engaging said insulating strips for maintaining said folds in position.

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