May 4, 1965 H. ROLFES 3,182,170

INDUCTION HEATING UNITS

Filed March 2, 1962

FIG. 1.

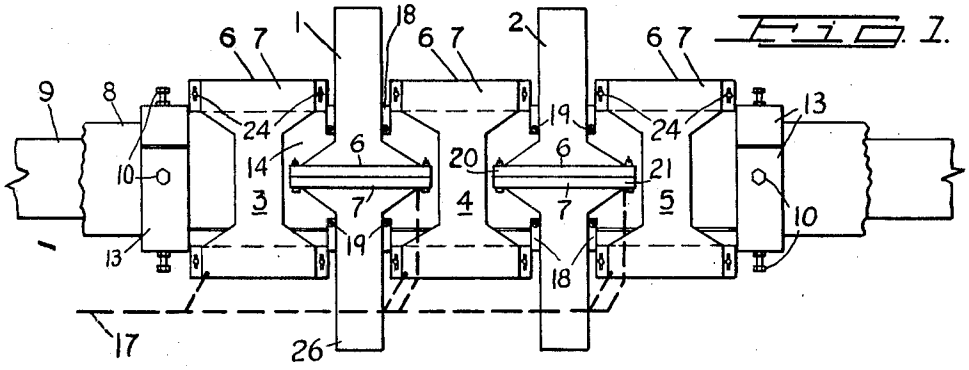


FIG. 2.

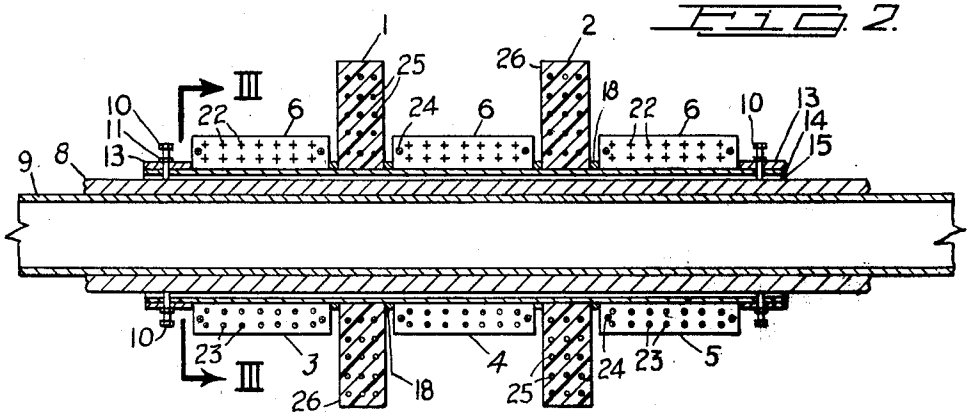


FIG. 4.

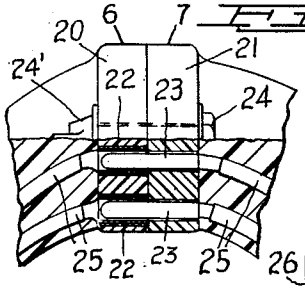


FIG. 3.

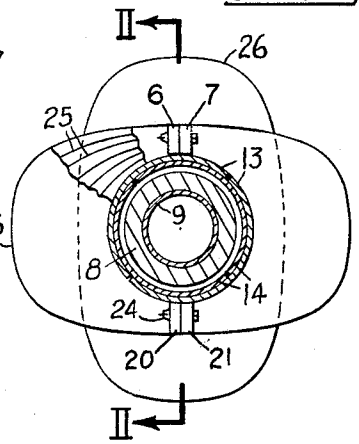
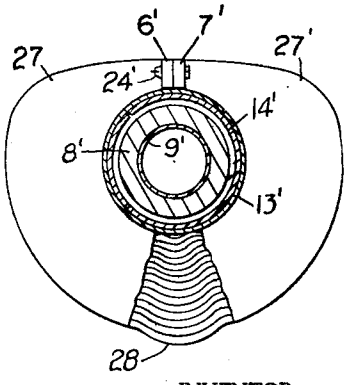


FIG. 6.



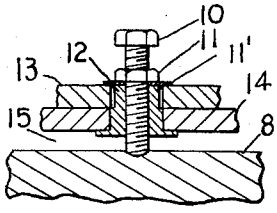


FIG. 5.

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INDUCTION HEATING UNITS

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6 Claims. (Cl. 219—10.79)

This invention relates to the heating of pipes, vessels, containers and the like by induction heating. More particularly, the invention deals with the use of a plurality of induction heating units, so constructed as to adapt the same for quick and simple mounting on the member to be heated, such, for example, as a pipe, vessel, container and the like.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the separate parts are designated by suitable reference characters in each of the views and, in which:

FIG. 1 is a diagrammatic plan view showing a number of coils mounted on a pipe member to be heated and schematically illustrating the wiring to the respective coils.

FIG. 2 is a sectional view, generally on the line II—II of FIG. 3, diagrammatically illustrating the coils and the pin and socket couplings between coil halves.

FIG. 3 is a sectional view, generally on the line III—III of FIG. 2.

FIG. 4 is an enlarged broken sectional view, diagrammatically illustrating the pin and socket couplings between the two coil halves.

FIG. 5 is an enlarged sectional detail view showing one of the number of screws employed for securing an assemblage on a pipe member and part of the supporting sleeve and retaining split ring; and

FIG. 6 is a sectional detail view, generally similar to FIG. 3, showing one only of a number of modified heating coils which I employ.

In illustrating one adaptation and use of my invention, I have diagrammatically shown in FIGS. 1 to 5, inclusive, an induction heating coil structure, wherein the coils are composed of two halves, as later described, and a number of the coils are arranged upon a pipe or other member to be heated. In the illustration of FIGS. 1 and 2, five of these coil units are employed in an interfitting relationship, that is to say coil units **1** and **2** are interfitted with coil units **3**, **4** and **5** by disposing the enlarged coil body portions of the units **1** and **2** at right angles to those of the units **3**, **4** and **5**. As each of the units are of the same construction, the brief description of one unit will apply to the other. Each induction coil is composed of two halves **6** and **7**.

Considering FIGS. 1 and 2, I have shown at **8** insulation arranged upon a pipe **9** to be heated. At **10** are shown a number of screws having lock nuts **11** thereon, the screws **10** engaging threaded inserts **12**, one of which is shown in detail in FIG. 5 of the drawing, these inserts being omitted in FIG. 2 to simplify the illustration. At **13** are shown split rings mounted on end portions of an elongated split supporting sleeve **14** which is positioned upon the insulation **8** and preferably spaced with respect thereto, as indicated at **15**, to form an air gap, this spacing being controlled by adjustment of the screws **10**, as illustrated in FIGS. 2 and 5 of the drawing.

Four of the inserts **12** are employed at each end of the sleeve **14**, two of the inserts being mounted in each half of the split sleeve **14** and the split retaining rings **13** are clamped upon the split sleeve by the screws **10**, the nut **11** of each screw engaging a washer **11'**, as clearly noted

in FIG. 5, and the rings **13**, in addition to retaining the split sleeve **14** in position, also retain the five coils in close proximity to each other on the sleeve **14**, as diagrammatically illustrated in FIGS. 1 and 2 of the drawing.

Considering FIG. 1 of the drawing, I have diagrammatically illustrated at **17** in heavy dot-dash lines the circuit wires extending to the respective coils **1** to **5**, inclusive. It will also be noted in FIGS. 1 and 2 that curved spacer sections **18** are employed between adjacent coils and fixed to the sleeve **14**, as diagrammatically illustrated at **19** in FIG. 1.

Each half **6** and **7** of the coil units have in their insulated connector flange ends **20**, **21**, respectively, male and female couplings, such, for example, as the socket coupling **22** shown in one flange end of the half **6** in FIG. 4 and the pin coupling **23** in the opposed flange end of the coil half **7**. The opposed flange ends of these two coil halves will have the opposed type of couplings. In other words, the half **6** will have pin couplings at its opposed end and the coil half **7** will have socket couplings at its opposed end. Thus, each coil half will have pin and socket couplings for the connector body portions **20**, **21**.

In FIG. 2 of the drawing, the ends of the coil halves **6** are shown and the socket couplings **22** are indicated diagrammatically by the cross marks in the upper part of FIG. 2 and the pin couplings **23** are diagrammatically illustrated by the small circular portions at the lower portion of FIG. 2 From this standpoint, it will be apparent that each coil half is actually of the same construction, in other words, a single coil half is produced and two of these halves are assembled in forming each of the coil units **1** to **5**, inclusive. The flanged ends of the connectors **20**, **21** are secured together by screws or other devices, as diagrammatically seen at **24** in FIG. 1 of the drawing. The heating coil wiring is indicated, in part, at **25** in FIG. 4 of the drawing and is also diagrammatically shown, in part, in the broken away portion of FIG. 3 and in the sections through the units **1** and **2** of FIG. 2. These heating coils are thin compared to the length of the flanged or connector ends **20**, **21** permitting overlapping of said ends in close nesting of the units as seen in FIG. 1 and are radially extended in large portions **26** of the respective coil units, as best illustrated in FIG. 3, and are encapsulated in an epoxy or a suitable cement, which is diagrammatically illustrated by the sectioning in FIGS. 2 and 4 of the drawing.

In the interfitted or nested arrangement of the coil units, the radially enlarged portions **26** of the respective units are arranged at 90° to each other. This will clearly appear from the illustrations in FIGS. 1, 2 and 3 of the drawing.

From the foregoing, it will be apparent that the entire induction heater comprising any desired number of the coil units defined can be arranged upon the member **9** with its insulation **8** thereon by first assembling the split sleeve **14** and the retaining split rings on the insulation **8** in a manner to provide the air gap, as at **15**, after which, the halves of each of the heating coil units are assembled on the sleeve **14** and the spacers **18** are then applied to retain the respective units in spaced relationship to each other. It will be understood that each heating coil unit will be clamped upon the sleeve **14** by the securing means **24**, part of one of these securing means being illustrated in more detail in FIG. 4 of the drawing. They will preferably comprise bolts, having wing nuts, as at **24'**, at one end thereof. It will be understood that the degree of efficiency in operation of the induction heating coil, or coils, can be determined by the mounting of the unit, or units, upon the member to be heated and the extent of insulation provided between the coil units and the member being heated and further the spacing controlled by the gap **15**. By providing the two halves in each of

the coil units, assemblages can be made on any type and kind of member, in connection with which the unit is employed without necessitating any disassemblage of the member and the mounting of the induction heating units can be quickly and easily accomplished.

In FIG. 6 of the drawing, I have shown a modified form of heating coil, comprising relatively movable coil halves 27, 27', wherein 6' and 7' would represent male and female couplings at one end of an expandable coil sleeve, defined by the halves 27, 27', expansion of the sleeve being provided by hingedly off-setting the coils or halves 27, 27', as diagrammatically illustrated at 28, in the broken away porton of the coil, this construction facilitating separation of the coupling ends 6', 7' sufficiently to pass over the split sleeve 14', similar in all respects to the sleeve 14. In FIG. 6, part of the split retaining ring is indicated at 13', this ring being similar to the ring 13 shown in FIGS. 1, 2 and 5 of the drawing. In FIG. 6, 8' diagrammatically illustrates the insulation and 9' the pipe or member, similar to the member 9. In FIG. 6, one of the bolts for clamping the sides 6', 7' together is indicated at 24''.

At this time, it is pointed out that no attempt has been made to identify any type or kind of insulation, as at 8 or 8', as this insulation can vary in many of the uses to which the induction heating system can be applied and depending entirely upon the structure of the member 9 which is to be heated. From this standpoint, it is further to be understood that the cross-sectional contour of 27, or the combined halves 6 and 7 of the coils 1 to 5, can be modified to suit the particular member upon which the coils are arranged.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An induction heating unit for members of the character defined, said unit having relatively movable halves adapted to envelop a member to be heated, said halves having on adjacent surfaces interengaging pin and socket electrical connectors for completion of the circuit through coils of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, said last named means comprising a split sleeve, means at ends of said sleeve for support of the sleeve on said member, a plurality of said units being arranged longitudinally of said sleeve intermediate said means on the ends of the sleeve, means for spacing said units one with respect to the other, each of said units including radially enlarged coil portions, and the enlarged coil portions of one unit being arranged angularly to those of adjacent units in nesting the units one with respect to the other on said sleeve.

2. An induction heating unit for members of the character defined, said unit having relatively movable halves adapted to envelop a member to be heated, said halves having on adjacent surfaces interengaging pin and socket electrical connectors for completion of the circuit through coils of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, the halves of said unit comprising similar coil parts having interengaging connector ends supporting said pin and socket connectors, one connector end of each part having socket contacts, the other connector end of each part having pin contacts adapted to be coupled with the socket contacts of the companion part, a plurality of said units being arranged longitudinally of said sleeve intermediate said means on the ends of the sleeve, means for spacing said units one with respect to the other, each of said units including radially enlarged coil portions, and the enlarged coil portions of one unit being arranged angularly to those of adjacent units in nesting the units one with respect to the other on said sleeve.

3. An induction heating unit for members of the character defined, said unit having relatively movable halves

adapted to envelop a member to be heated, said halves having on adjacent surfaces interengaging pin and socket electrical connectors for completion of the circuit through coils of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, said last named means comprising a split sleeve having ends extending beyond said unit, means on said sleeve ends for support of the sleeve on said member, and the relatively movable halves of said unit being joined in an offset hinge portion centrally of the coils of the unit permitting relative flexing of the halves of the unit in enveloping the member to be heated.

4. An induction heating unit for members of the character defined, said unit having relatively movable similar halves adapted to envelop a member to be heated, said halves having on adjacent surfaces a plurality of longitudinally and transversely spaced interengaging pin and socket electrical connectors for completion of the circuit through respective coils in the halves of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, said last named means comprising a split sleeve having ends extending beyond said unit, means on said sleeve ends for support of the sleeve on said member, the coils of the unit comprising thin enlarged portions projecting radially with respect to said member, and in the use of a number of said units on the member the enlarged coil portions of one unit are arranged angularly to those of adjacent units in nesting the units one with respect to the other on said sleeve.

5. An induction heating unit for members of the character defined, said unit having relatively movable halves adapted to envelop a member to be heated, said halves having on adjacent surfaces interengaging pin and socket electrical connectors for completion of the circuit through coils of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, the halves of said unit comprising similar coil parts having interengaging connector ends supporting said pin and socket connectors, one connector end of each part having a plurality of longitudinally and transversely spaced socket contacts, the other connector end of each part having a corresponding number and arrangement of pin contacts adapted to be coupled with the socket contacts of the companion part, the coils of the unit comprising thin enlarged portions projecting radially with respect to said member, and in the use of a number of said units on the member the enlarged coil portions of one unit are arranged angularly to those of an adjacent unit in overlapping the connecter ends and nesting the units one with respect to the other on said member.

6. An induction heating unit for members of the character defined, said unit having relatively movable similar halves adapted to envelop a member to be heated, said halves having on adjacent surfaces a plurality of longitudinally and transversely spaced interengaging pin and socket electrical connectors for completion of the circuit through respective coils in the halves of said unit, means for retaining said halves in coupled relationship around said member, means supporting said unit in spaced relation to the walls of said member, the relatively movable halves of said unit being joined in an offset hinge portion formed centrally in the coils of the unit permitting relative flexing of the halves of the unit in enveloping the member to be heated, the coils of the unit comprising thin enlarged portions projecting radially with respect to said member, and, in the use of a number of said units on the member, the enlarged coil portions of one unit are arranged angularly to those of adjacent units in nesting the units one with respect to the other on said member.

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