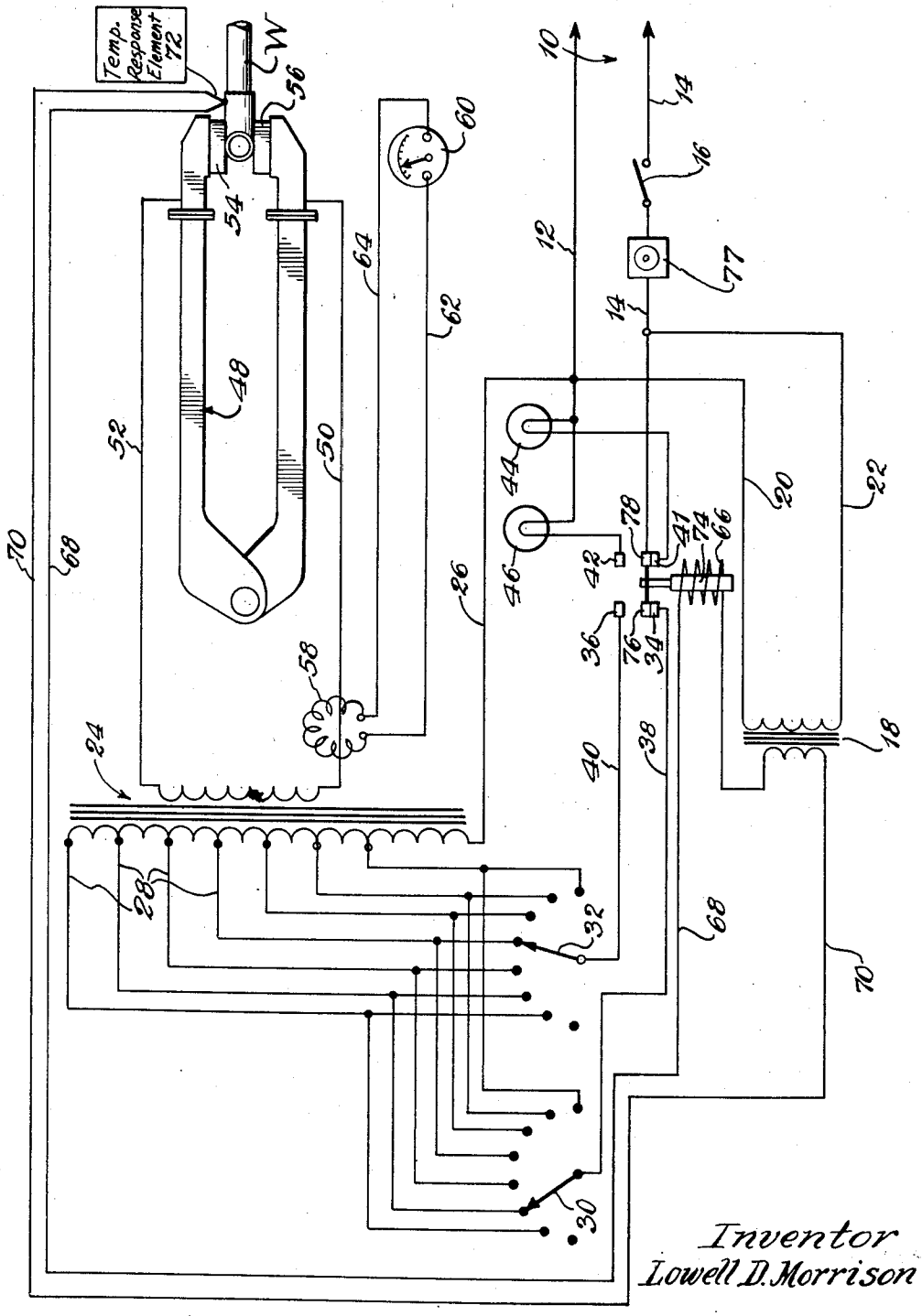
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LOW VOLTAGE HEATING CIRCUIT

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LOW VOLTAGE HEATING CIRCUIT

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1 Claim. (Cl. 219—50)

My invention resides in the field of apparatus for heating metal pieces to a predetermined temperature range so that they can be soldered, fused, or otherwise suitably secured together by the application of heat.

More specifically, my invention relates to an electrical device for heating aluminum tubing, or the like, so that it can be maintained between two predetermined temperatures within a selected temperature range for a predetermined period of time so that the aluminum tubing will "soak" or heat for a selected period in the desired temperature range.

A primary object of my invention is an electrical heating device generally of the above-described character for bringing aluminum tubing up to a predetermined temperature range, and maintaining it within that temperature range for a predetermined period of time.

Another object is an electrical heating device of the above-described character which requires very little supervision by the operator once the aluminum tubing has been clamped in position and the device turned on by the operator.

Another object is an electrical heating device of the above-described character which will very accurately maintain aluminum tubing or similar pieces between an upper and lower temperature which describes the temperature range, and will oscillate the temperature of the aluminum tubing back and forth between these two limits for a predetermined period of time.

Other objects will appear from time to time in the ensuing specification and drawing in which a schematic wiring diagram with various associated parts of my invention is diagrammatically illustrated.

In the drawing, a conventional source of line current is provided at **10**, it being understood that this current is the usual 115 volts A. C. The current is carried to the invention through a pair of conventional leads **12** and **14**. A manually operable switch **16** is provided in the line **14**, but it could be in either lead. A step-down transformer **18** is connected in parallel with the line current through a pair of leads **20** and **22**.

The high side of a main step-down transformer **24** is connected to the line **12** through a lead **26**. The high side of this transformer **24** is provided with a plurality of taps **28**, each of which is connected to the pair of tap switches **30** and **32** through an appropriate number of leads. For purposes of illustration, tap switch **32** will be referred to as the high temperature tap switch, while tap switch **30** will be referred to as the low temperature tap switch. The switch selector arm of each tap switch is connected to a pair of contacts **34** and **36** through appropriate leads **38** and **40**. Contacts **34** and **36** are associated with another pair of contacts **41** and **42** respectively, each of which may be connected to the line **12** through lamp indicators **44** (for contact **41**) and **46** (for contact **42**).

The low side of the main step-down transformer **24** is connected to the ends of an appropriate clamping mechanism, indicated generally at **48**, through a pair of appropriate leads **50** and **52**. The clamping mechanism **48** can be of any conventional shape or configuration and its ends are designed to releasably clamp a workpiece W. The clamping mechanism **48** may have a pair of pivoted clamping elements spring-biased toward each other with electrodes **54** and **56** on its ends so as to rigidly clamp a workpiece W between them. With a workpiece positioned between the two electrodes, the circuit for the low side of the main step-down transformer will be completed.

A toroidal coil **58** may surround the lead **50** and is connected to an appropriate meter **60** through a pair of leads **62** and **64**. The meter **60** is appropriately graduated so that the amount of current is readily reflected and observable.

The low side of the step-down transformer **18** is connected in series with a relay coil **66** and by appropriate leads **68** and **70** to a thermostat **72** positioned on the workpiece W adjacent the electrodes **54** and **56**. The core **74** on the relay coil **66** carries a pair of contacts **76** and **78** which engage contacts **34** and **41**, or **36** and **42**. It should be understood that the core **74** of this relay can be spring-biased into one position and moved into the other position when the relay **66** is energized.

If desired, a timing mechanism and switch **77** can be put in one of main line leads **12** or **14** so that the unit will automatically be deenergized after a selected period of time.

The use, operation and function of my invention are as follows:

To connect two aluminum pieces together, the heating period used is dependent upon the material used to connect the two workpieces. In my specific case, I use a thermo-setting plastic which involves a curing process. This plastic sets after a certain period of time and any additional heat applied to such a connection will only burn the plastic. My unit has a main circuit and a secondary circuit jointed together by a step-down transformer **24**. A pair of branch circuits form a part of the main circuit and connect a plurality of taps on the high side of the transformer to the source of electric power. The taps are connected to two tap switches which complete the branch circuits. An auxiliary circuit controlled by the thermostat **72** includes the relay **66** and the relay selects one of the branch circuits.

Sections of aluminum tubing or the like in the form of workpieces W to be secured together are positioned between the electrodes **54** and **56**. The thermostat element **72** is positioned on the workpieces W directly adjacent the electrodes so that it will reflect the temperature of the joint. The operator then positions the manually settable tap switches **30** and **32** at selected positions to establish the desired upper and lower temperature limits of the temperature range and closes the manually operable switch **16**. The thermostat **72** is normally open and the relay **66** is not energized. Contacts **76** and **78** are spring-biased into engagement with the contacts **36** and **42** so that the current passing through the step-down transformer **24** is controlled by the high temperature tap switch **32**. As soon as the temperature of the workpiece W reaches the selected high temperature value, the thermostat **72** closes and energizes relay **66** drawing the contacts **76** and **78** into engagement with contacts **34** and **41**. This closes the low temperature tap switch circuit, and the step-down transformer **24** is then on the low temperature heat for the electrodes **54** and **56**. The temperature of the workpiece W will then gradually cool until in a short period of time the thermostat **72** will open again and

deenergize the relay 66. This reverses the contacts and the high temperature tap switch 32 is in use again.

The lamps 44 and 46 are in parallel with the two tap switch circuits so that the operator can quickly tell whether the unit is on low or high heat.

The coil 58 with its meter 60 reflects whether the unit in general is operating satisfactorily. Its primary function is to reflect whether or not proper contact has been made between the electrodes 54 and 56 and the workpiece W.

It should be understood that the tap switches 30 and 32 are manually settable so that the upper and lower temperature limits are adjustable. Each of the tap switches are shown as individually adjustable but they could be suitably connected together so that they would be adjusted together while being disposed at a fixed angle with respect to each other.

While I have shown and described the preferred form of my device, it should be understood that many alterations, modifications and changes can be made without departing from the invention's fundamental theme. For example, I have described the device as being used primarily for welding, soldering, or joining together aluminum tubing; however, it should be understood that the device can be used to heat any type of workpieces when the operator desires to hold the workpiece in a temperature range between upper and lower temperature limits for a predetermined period of time. The current used in the line 10 could also be any voltage. I have stated that the thermostat 72 is normally open; however, this could be reversed with the contacts 76 and 78 being spring-biased into engagement with the contacts 34 and 41. I, therefore, wish that my invention be unrestricted except as by the appended claim.

I claim:

In a device for electrically heating aluminum tubing workpieces and the like, a main circuit adapted to be connected to a source of electric power, a secondary circuit with a pair of electrodes adapted to engage the aluminum tubing workpieces to be heated, a step-down transformer between the main and secondary circuits with its low side in the secondary circuit, the main circuit including a pair of parallel branch circuits, each completing the main circuit between the high side of the transformer and the source of electric power, two sets of control switches in the branch circuits, the high side of the step-down transformer having a plurality of taps, each of the branch circuits including a manually adjustable tap switch connected to the taps, the tap switches being in parallel, each having contacts connected to all of the taps, auxiliary circuit connected to and energizable by the main circuit by an auxiliary step-down transformer, the auxiliary circuit including a temperature responsive switch responsive to the temperature of the aluminum tubing workpieces for opening and closing the auxiliary circuit, and a relay in the auxiliary circuit controlling the sets of control switches for closing one set of control switches when the temperature responsive switch is closed, thereby closing the auxiliary circuit, to energize one branch circuit and for closing the other set of control switches when the temperature responsive switch is open, thereby opening the auxiliary circuit, to energize the other branch circuit.

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