

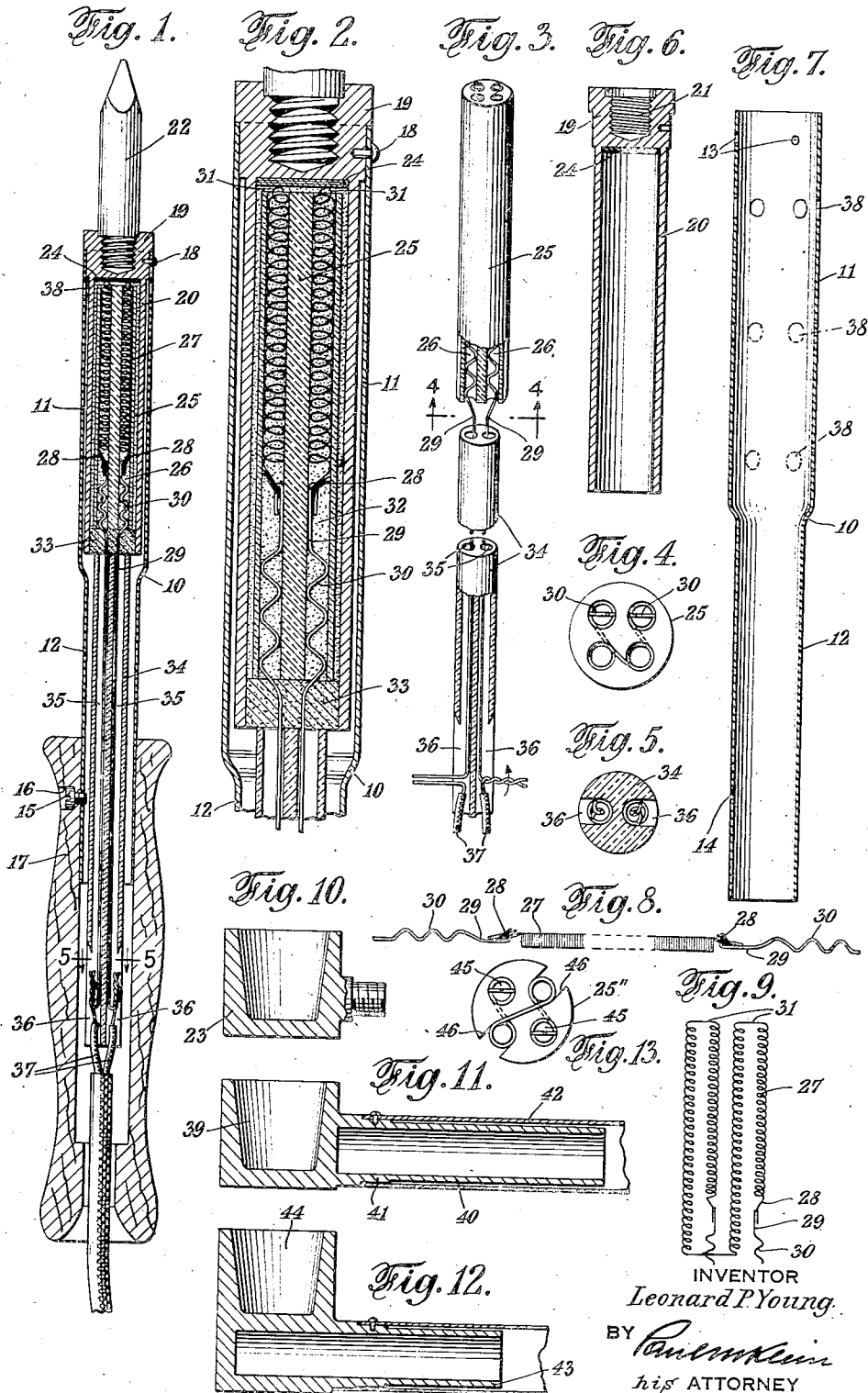
March 9, 1937.

L. P. YOUNG

2,073,259

ELECTRIC SOLDERING IRON

Filed June 20, 1934



UNITED STATES PATENT OFFICE

2,073,259

ELECTRIC SOLDERING IRON

Leonard P. Young, New York, N. Y.

Application June 20, 1934, Serial No. 731,443

8 Claims. (Cl. 219—26)

The present invention relates to electric heating devices in general, and particularly to what is known as electric soldering iron, and the like.

The principal objects of the present invention are to provide a highly efficient, inexpensively fabricable device of this kind in which the most important part, the heating element is so constructed as to combine simplicity of structure, efficiency in operation, and inexpensiveness in manufacture, as well as ready exchangeability when required.

A further object of this invention is to provide a heating member in which the heating element or resistance is hermetically sealed against oxidation within a hollow casing of highly heat-conductive material, and in which the element is tightly packed by a high heat-conductive, pourable, crystalline or amorphous dielectric, adapted to maintain the windings of the element in desired position within the casing.

A still further object of this invention is to provide within the heating member a suitable element support, by means of which the element may be suspended within the casing in a plurality of courses, so as to provide the maximum radiating surface possible, distributed in the most uniform relation in respect to the casing.

Still another object of this invention is to provide terminals for the element, adapted to extend from the sealed casing and equipped with frictional means, designed to engage the element support in such a way as to maintain the element in its desired expanded position until the powder-formed dielectric completely fills all available space within the casing so that each portion of the element is tightly packed, supported and reinforced by the dielectric; the terminals are also instrumental in holding the element support in a floating position within the casing, until packed tightly in place by the dielectric.

A still further object of this invention is to provide in conjunction with the heating member an outer housing made of one piece of material and having two portions of varying diameters, the housing portion of the larger diameter adapted to receive said heating member and further adapted to provide air circulation between the heating member and the housing, whereby the housing is kept relatively cool, thus preventing injury to the handle of the device.

A further object of this invention is to provide for the leads, extending from the heating member, a suitable insulator having through-passages which terminate in channel formations, said passages adapted to accommodate the great-

er part of the leads, while said channel formations are intended to receive the bent-over connections between the lead ends and exterior electric conductors entering the handle of the device.

A still further object of this invention is to provide in conjunction with the housing portion of the smaller diameter a dielectric handle, having the added property of not being heat conductive, said handle provided with a depression for receiving attaching means, adapted to engage the smaller housing portion, said depressions being of sufficient depth to receive said attaching means in such a way as to preclude contact therewith, while the handle is being held.

The foregoing and a great many other objects and advantages of this invention will become more fully apparent from the ensuing description, in connection with the accompanying drawing, which latter, although forming a part of this invention, are not intended to limit the same to the actual showing, and in which

Fig. 1 is a longitudinal cross-sectional view through one form of the present invention,

Fig. 2 is an enlarged longitudinal cross-sectional view of the heating member portion of the device,

Fig. 3 is a perspective view, partially in section of an assembly, comprising the heating element, the element support and the terminal or lead insulator,

Fig. 4 is an enlarged end view of the element support, showing the element suspended therein, as observed in the direction of lines 4—4 of Figure 3,

Fig. 5 is a cross-sectional view through the terminal insulator, taken on lines 5—5 of Figure 1, and showing the channel formations,

Fig. 6 is a longitudinal cross-sectional view of the element casing,

Fig. 7 is a longitudinal cross-sectional view through the outer housing of this device,

Fig. 8 illustrates the heating element in its original close, helical form, with the terminals or leads attached,

Fig. 9 illustrates a diagrammatical view of the expanded element as it would appear when borne by the support,

Fig. 10 illustrates a miniature melting pot, as one of the exchangeable tools heatable by the device, and

Figs. 11 and 12 are cross-sectional views through modified heating members, terminating in miniature melting pots, and

Fig. 13 is an enlarged end view of a modified form of an element support.

Referring now specifically to the figures, numeral 10 denotes the outer housing of the device, made preferably of one piece of tubing, and consisting of a portion 11 having a larger diameter and a portion 12 of a smaller diameter. At the end of the larger portion there are provided apertures 13 for receiving element casing attaching means, while at the housing portion of the smaller diameter there will be noted an aperture 14 adapted to receive attaching means 15 imbedded in depression 16 of handle 17. (See Fig. 1.) The larger housing portion is secured by rivets or screws 18, passed through openings 13 into suitable holes provided in enlargement or head 19 of the element casing 20. The latter consists of a hollow cylinder, open at one end and closed by the head formation 19, within which latter is provided a threaded socket 21 for receiving, and conductively connecting therewith a heatable tool, as for instance a tip 22 or a melting pot 23, such as illustrated in Figure 10. Obviously any other heatable tool may be inserted and heat-conductively connected with head 19, since the tools are intended to be exchangeable in this construction.

Adjacent to the closed head portion of the casing there is provided an insulator disc 24, such as mica, the purpose of which will be explained presently. Into the casing there is inserted an element support 25, consisting of a cylinder made of dielectric material and provided with a plurality of through-passages 26, which are preferably cylindrical in form. A heating element 27, originally comprising a close helix, as shown in Figure 8, is connected at its two ends 28 to leads or terminals 29. The portion of the terminals, immediately adjacent to their connections with the element, are curved in a wave-like form, as seen at 30, so as to frictionally engage the interior of two passages provided in the element support. In Figures 3 and 4 the element support is shown to have four such through-passages, and the element is in engagement with all four of them.

In this construction the insertion of the element is accomplished as follows: Both terminals, to which the ends of the element are attached, are first passed through two of the passages and then returned through the two other passages. By these successive operations the originally close helix is stretched so that each winding of the helix is separated from the other. The wave-like ends of the terminals frictionally engage the walls of their respective passages and thus hold the element in its stretched position within the support. While being held by the terminals, the support with the stretched element therein, is inserted into the casing so that the portions 31 of the element, shown clearly in Figure 9, bear against insulating disc 24 first inserted into the casing. Element support 25 is now held equally spaced from the interior wall of the casing, so as to assume a floating position therewithin. Now all available space within the through-passages and between the individual windings of the element, and between the element support and the casing is completely filled and tightly packed by a pourable, sand-like or amorphous dielectric indicated at 32. While the process of packing the dielectric into the casing is taking place, the frictional engagement of the wave-like formation of the terminals with the through-passages of the element support prevents a displacement of the element windings within the support.

It will be observed that the element casing is somewhat longer than the element support, so that the latter is completely housed, and is capa-

ble of being hermetically sealed therewithin. The seal is clearly indicated at 33. It consists of a heat resisting dielectric substance which will readily adhere to the metallic surfaces of the casing and of the terminals, and which has the same coefficient of expansion as that of the metal.

Adjacent to seal 33, and extending therefrom through the reduced portion 12 of the housing, and beyond the housing into handle 17, there will be observed a terminal or lead insulator 34, comprising a cylindrical structure with two through-passages 35, which latter terminate into channel formations 36. These channel formations are adapted to receive the connections between the terminals and the exterior electric conductors 37 entering the outer end of handle 17. The connection between the terminals and these conductors is preferably accomplished in the following manner: The ends of the terminals are passed through passages 35 and bent over and out at right angles to the channel formations. The ends of the electric conductors are bent in similar way and then the terminals and the conductors are twisted together in the approved fashion and either soldered or welded together; now the connections are bent backwards, in the direction indicated by the arrow in Figure 3, and clearly seen in their final position in Figure 1. The channels completely house these connections, insulate them, and prevent undesired bulkiness usually found in similar devices. These connections also decidedly reduce the cost of the device, in that screw attachments or similar wire connecting means are successfully eliminated thereby, thus greatly simplifying production. The arrangement of the element casing and of the insulator for the terminals within the outer housing provides a very beneficial air space so that air circulation within the housing and the handle may be provided. In order to promote circulation suitable air holes 38 may be arranged in the larger housing portion adjacent to the element housing. There is sufficient air space provided within the handle for cold air to enter therein, whereas hot air may be dispelled through aperture 38.

Referring now to the modified forms of the element housing shown in Figures 11 and 12, the latter are primarily intended for use in connection with heating devices where the heating tools is to be permanently attached to, or is to be integral with the heating member. In Figure 11 is shown a miniature melting pot 39 provided with a tubular extension 40, adapted to serve as element casing of the device, and is provided with a stepped-up connecting enlargement 41 to which housing 42 is secured in similar manner as shown in Figure 1.

When it is desired that more intense heat be supplied to the pot formation, the position of the element casing may be changed, as proposed in Figure 12. In this figure the element casing 43 extends below the bottom of melting pot 44. In all other respects the construction of the element casing and its attaching provisions to the housing is the same as in Figures 1 and 11.

In Figure 13 there is illustrated an element support 25', provided with two through-passages 45, and with two outwardly open channels 46, corresponding to the two other through-passages of the support shown in Figure 4. This modified construction of the element support possesses the advantage of facilitating a more ready attachment of the element thereto, permits a better distribution of its expanded windings, and pro-

motes more direct heat radiation from those parts of the element which are held in the channels.

From the foregoing description of the few specific forms of the present invention it becomes evident that a good many variations may be provided in order to enhance the quality of, and to adapt the device for various specific purposes and uses.

Due to the compact and simple arrangement of the sealed heating member, the latter may be readily exchanged, in which case its attaching provisions to the outer housing will require some slight alterations. In any modified form, however, there is always provided sufficient air space between the element casing and the housing, so as to promote air circulation and cooling of the housing, to not only preserve the handle, but also to maintain a perfect connection between the handle and the smaller housing portion secured thereto.

While I am aware of the existence of heating devices, designed to serve similar purposes to that of the present invention, I do not know, to the best of my knowledge, of any devices employing the principles of construction described above, and having in mind the possible necessity of varying the details of the construction illustrated, I herewith reserve for myself the right to modify, and improve thereupon, without departing from the broad scope of my idea, as set forth in the annexed claims.

I claim:

1. In an electric heating device, the combination with a tubular, one-piece outer housing, having two portions of different diameters, of an element casing disposed partially within and secured to the housing portion of larger diameter, said casing comprising an integral, hollow cylindrical member, made of heat conductive material, and provided with an enlarged, closed end extending beyond, and in engagement with said larger housing portion, and including means for removably attaching a heatable tool thereto; the other, or inner end of said casing being open, a heating element within said casing, hermetically sealing and terminal holding means provided at the open end of said casing; an insulating element within, and next to the enlarged end of said casing, a pair of heating element terminals secured within, and extending from said sealing and terminal holding means, an insulator for said terminals, extending from said casing into the housing portion of the smaller diameter, and provided with interior passages and end channels, the latter serving for accommodating the connections between the terminals and exterior electric conductors.

2. In an electric heating device, as set forth in claim 1, a handle in engagement with the end of the housing portion of the lesser diameter, and means imbedded in said handle for retaining the latter and said housing portion at desired relation to one another.

3. In a heating device, the combination with a tubular, one piece housing having one portion of a smaller, and another portion of a larger diameter, of an integral, tubular element casing having a reduced, inner open end and an enlarged, outer closed end, said closed end provided with means for accommodating and holding a heatable tool, said closed end secured to, but distanced from the end of the housing portion of the larger diameter, an insulating member disposed within, and next to the enlarged end of said

casing, a heating element within said casing, hermetically sealing and terminal supporting closing means at the inner or open end of the casing, terminals extending from said closing means, an insulator extending from said casing into and beyond the housing portion of the smaller diameter and provided with a pair of through-passages for receiving said terminals, these passages ending in channel formations, the ends of the terminals extending into said channel formations and being connected with external electric conductors, their connections being bent back and secured in said channel formations, a handle in engagement with the housing portion of the smaller diameter and extending over said insulator, and attaching means connecting said housing with the handle, arranged within the handle material and below its outer surface, so as to preclude contact therewith.

4. An electric heating device comprising an outer housing having enlarged and reduced portions, a one-piece heating element casing within the enlarged housing portion and provided with a closed, enlarged end, forming an integral part of the casing, said enlarged end extending beyond said housing portion, the other end of said casing being open, a pair of undulated terminals in frictional engagement with the interior of, and extending from said casing, hermetic sealing means provided at the open end of the casing and immovably holding said undulated terminals by way of their undulations.

5. An electric heating device comprising an outer housing having enlarged and reduced portions, a one-piece heating element casing associated with, disposed within and spaced from said enlarged housing portion, said casing having at one end a closed head provided with a recessed portion to which the housing is secured, the unrecessed part of the head extending beyond the housing and forming one end of the device, the closed head forming an integral part of said casing, the other end of said casing being open, a pair of undulated terminals in frictional engagement with the interior, and extending from the open end of said casing, hermetic sealing means provided at the open casing end and immovably holding said undulated terminals against disengagement from said casing by way of their end undulations.

6. An electric heating device as per claim 5, a dielectric terminal guide disposed within and extending beyond the reduced housing portion and provided at its outer end with longitudinally arranged means for accommodating twisted connections between said terminals and exterior electric conductors.

7. An electric device as per claim 5, a dielectric terminal guide disposed partially within and extending beyond the reduced housing portion and provided with through passages terminating in enlarged, longitudinally arranged channel portions for accommodating the twisted connections between said terminals and exterior electric conductors, and a hollow handle associated with the reduced housing portion and so arranged as to accommodate the extending end of said terminal guide.

8. An electric device as per claim 5, a one-piece substantially cylindrical dielectric terminal guide extending from said hermetic sealing means of said casing throughout and beyond the reduced housing portion, and provided with a pair of through passages terminating at the outer end of the guide in channel formations for accom-

modating the twisted connections between said terminals and exterior electric conductors, said channel formations constituting longitudinally arranged continuations of said passages, a hollow handle associated with the end of the reduced housing portion and accommodating the chan-

neled end of said guide, and handle attaching means in engagement with the reduced housing portion, and disposed within the handle material and below the outer surface, for precluding contact therewith.

LEONARD P. YOUNG.