March 16, 1948. F. KUHN ET AL 2,437,747

ELECTRICALLY HEATED TOOL

Filed May 4, 1942

FIG.1.

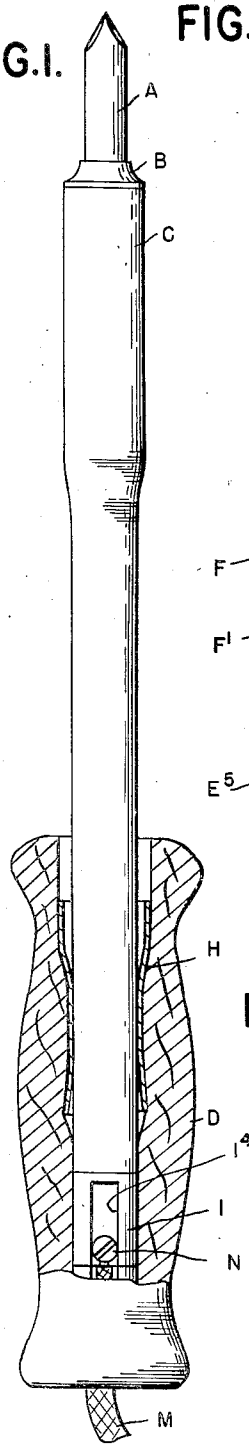


FIG.2.

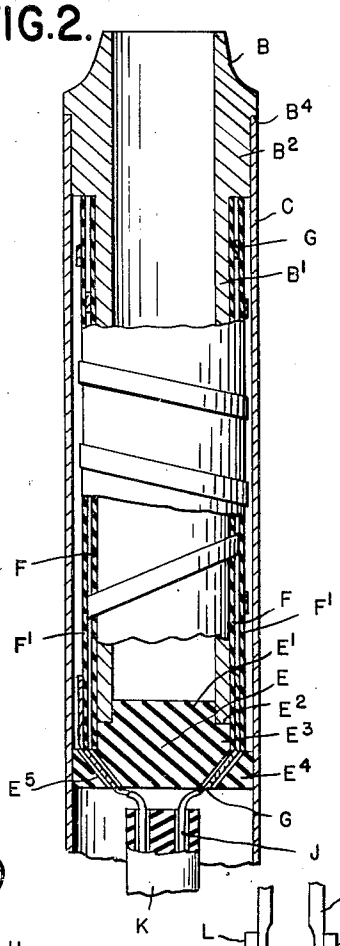


FIG.5.

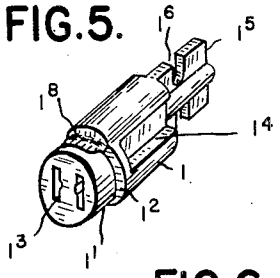


FIG.6.

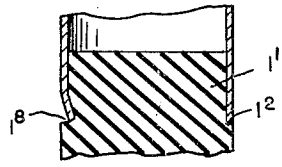


FIG.7.

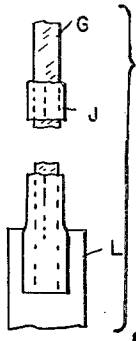


FIG.3.

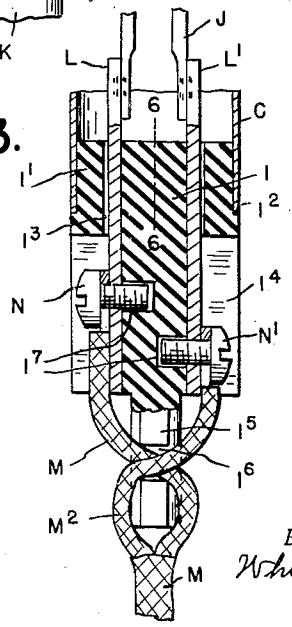
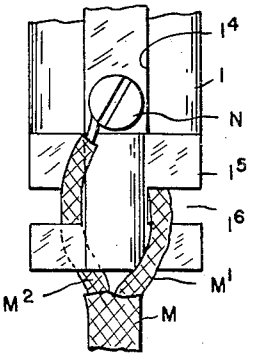


FIG.4.



INVENTORS
FRANK KUHN
LAURENCE H. THOMAS
BY Whittemore Hulbert & Belknap
ATTORNEYS

Patented Mar. 16, 1948

2,437,747

UNITED STATES PATENT OFFICE

2,437,747

ELECTRICALLY HEATED TOOL

Frank Kuhn, Detroit, and Laurence H. Thomas, Birmingham, Mich., assignors to American Electrical Heater Company, Detroit, Mich., a corporation of Michigan

Application May 4, 1942, Serial No. 441,698

1 Claim. (Cl. 219—26)

1

The invention relates to electrically heated tools, such for instance as soldering irons.

It is one of the objects of the invention to obtain a construction adapted for operation with electric currents of relatively low voltage. Thus for use on aircraft, the highest voltage available sometimes does not exceed twenty-four volts, and consequently constructions designed for use with commercial currents would not be suitable.

A further object of the invention is to obtain a construction which can be manufactured at low cost and which has various advantageous mechanical and electrical characteristics.

With these objects in view, the invention consists in a construction as hereinafter set forth.

In the drawings:

Figure 1 is an elevation of our improved tool, with the handle portion partly shown in section;

Figure 2 is an enlarged longitudinal section through the socket for receiving the tool and the heating element associated therewith;

Figure 3 is a similar enlarged longitudinal section through the terminal connections;

Figure 4 is an elevation of a portion of Figure 3, viewed at right angles thereto;

Figure 5 is a perspective view of the insulator block in which the electrical terminals are secured;

Figure 6 is a section substantially on line 6—6 of Figure 3, illustrating the manner of locking the metallic socket to the insulator head; and

Figure 7 is an enlarged elevation showing the manner of attaching the heating resistor to the terminal contacts.

As illustrated in Figure 1, A is a soldering tool the shank portion of which is inserted in a socket B within a tubular housing C having a handle D at its rear end. The socket B is electrically heated and is of the following construction:

B′ is a metallic tube having integral therewith at its forward end an enlarged head B^2. At its rear end is an insulator head E, preferably formed of a refractory material which, in addition to its insulating properties, is also heat resisting. A suitable material for this purpose is that which is commercially known as "Lava." Surrounding the tubular portion B′ is an electrical heating unit formed by a helically wound resistor and an insulation therefor, preferably mica. As specifically shown in Figure 2, the refractory head E has a portion E′ extending within the end of the tubular portion B′, a shoulder E^2 which abuts against the end of the tube B′, and a portion E^3 of enlarged diameter which is flush with the outer surface of the tube B′ and extends rearward therefrom.

2

There is also an enlarged portion E^4 in rear of the portion E^3. F is a mica sheet wound around the outer surface of the tubular portion B′ and extending beyond the rear end thereof to overlap the portion E^3 of the head E. The resistor G, preferably formed of a flat ribbon, is wound about the mica F in the form of a helix. A second mica sheet F′ is then wound about this helix, and a return helix formed by an extension of the resistor is wound about the sheet F′. The opposite ends of the resistor pass through obliquely extending apertures E^5 in the head E, from which point they extend through the casing C into the handle D to the terminal connections, which will be hereinafter described. In brief, the heating element comprises a resistor having two superimposed helical portions with mica insulation, surrounding the metallic tubular portion B′. It will be noted that short-circuiting of the resistor through the metallic tube B′ is effectively prevented by extending the insulation F beyond the end of said tube to overlap the portion E^3 on the head E. Thus, as the resistor is outside of the mica sheet F, it cannot come in contact with the metal tube.

The tubular casing C has its forward portion which surrounds the heating element slightly expanded in diameter, and the forward end of this portion engages the enlarged head B^2 abutting against a shoulder B^4. The rear end of the casing C extends within the handle D and engages a resilient clip H which centers it within the handle and also compensates for any change due to shrinkage or expansion. At the rear end of the casing C is an insulator block I of suitable moldable material such as "Bakelite," which is of the following construction: The block I has a portion I′ which fits within the end of the tube C and with a shoulder I^2 abutting against the end of said tube. The portion I′ has a pair of slots I^3 extending longitudinally therethrough on opposite sides of the axis, and these slots communicate with open recesses or channels I^4 on diametrically opposite sides of the block. Beyond this recessed portion is a central fin portion I^5 having notches I^6 in opposite edge portions thereof. The block I is inserted within the rear end of the handle D and supports the terminal connections for the resistor, which are of the following construction:

The end portions of the resistor, after passing out from the head E, are preferably reinforced by a metallic strip J wrapped thereabout, and these reinforced portions extend through an insulator tube K, preferably of porcelain, to a point adjacent to the block I. At their rear ends the

reinforced portions of the resistor are connected to terminal bars L and L', preferably by spot welding. These bars are adapted to be inserted through the slots I^3 into the open channels I^4 and are there connected to the flexible conductors in the following manner: M is the flexible conductor cord containing the insulated strands M' and M^2, which latter are passed on opposite sides of the fin I^5 and oppositely through the notches I^6. They then extend forward into the channels I^4, and the conductor wire is attached to the bars L and L' by screws N and N'. These screws engage threaded apertures in said bars and are of sufficient length to enter into recesses I^7 which serve as a locking means preventing the withdrawal of the bars from the block I. They also in connection with the notched fin I^5 form an anchorage for the flexible conductor cord M, preventing the accidental disengagement thereof.

The elements of our improved electrically heated tool, as above described, are assembled as follows: The head E is first attached to the rear end of the socket B by cementing the portion E' into the end of the tubular portion B'. A sheet of mica insulation is then wrapped around the tubular portion B' and the portion E^3 of the head which is flush therewith. The resistor G is then passed through one of the apertures E^5 in the head E and wound helically about the mica insulator F to the upper end portion of the tube B'. A second mica sheet F' is then wrapped about the helix, and the resistor is wound thereabout helically in a downward direction, then passing through the second aperture E^5 in the head E. The opposite end portions of the resistor which have been reinforced by the metallic strip J, as previously described, are then passed through separate channels in the porcelain tube K to project out from the lower end thereof. The projecting end portions are then spot welded to the bars L and L', as previously described. The outer casing or tube C is then sleeved over the socket B and the insulated resistor thereon, the upper end of said tube engaging the portion B^2 of the socket and abutting against the shoulder B^4. The block I is next engaged with the bars L and L' and the portion I' of said block is inserted in the rear end of the tube C with the end of said tube abutting against the shoulder I^2. A portion of the tube is then bent inward to engage a notch I^8 in the portion I', thereby locking the block from disengagement from the tube C.

The flexible conductor M is next attached to the block I, as previously described, after which the casing C and block I are inserted within the handle D and resilient clip H. When thus assembled, all of the elements of the tool are secured from displacement.

While we have specifically described our improved electrically heated tool as a soldering iron, it is obvious that it is adapted for other uses.

What we claim as our invention is:

A terminal connection for an electrical heating resistor comprising a longitudinally extending metallic strip wrapping for the end portion of the resistor, a bar of greater thickness and cross section welded to the outer end portion of said wrapping, and a binding screw threadedly engaging said bar and adapted to secure a service conductor thereto.

FRANK KUHN.
LAURENCE H. THOMAS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
897,674	Swan	Sept. 1, 1908
979,904	Wooge	Dec. 27, 1910
1,027,337	Holmes	May 21, 1912
1,127,280	Read	Feb. 2, 1915
1,154,415	Kuhn et al.	Sept. 21, 1915
1,270,303	Kuhn et al.	June 25, 1918
1,388,373	Richtmyer	Aug. 23, 1921
1,693,899	Horle	Dec. 4, 1928
1,810,164	Fay et al.	June 16, 1931
1,819,554	Hanson	Aug. 18, 1931
1,824,447	Richter	Sept. 22, 1931
1,952,426	Ellinger	Mar. 27, 1934
1,961,496	Holmes	June 5, 1934
1,975,623	Siegel	Oct. 2, 1934
2,003,625	Boyer	June 4, 1935
2,041,018	Persons	May 19, 1936
2,064,645	Abbott	Dec. 15, 1936
2,177,509	Abbott	Oct. 24, 1938
2,258,252	Lang	Oct. 7, 1941

FOREIGN PATENTS

Number	Country	Date
800,316	France	Apr. 27, 1936