

Aug. 16, 1955

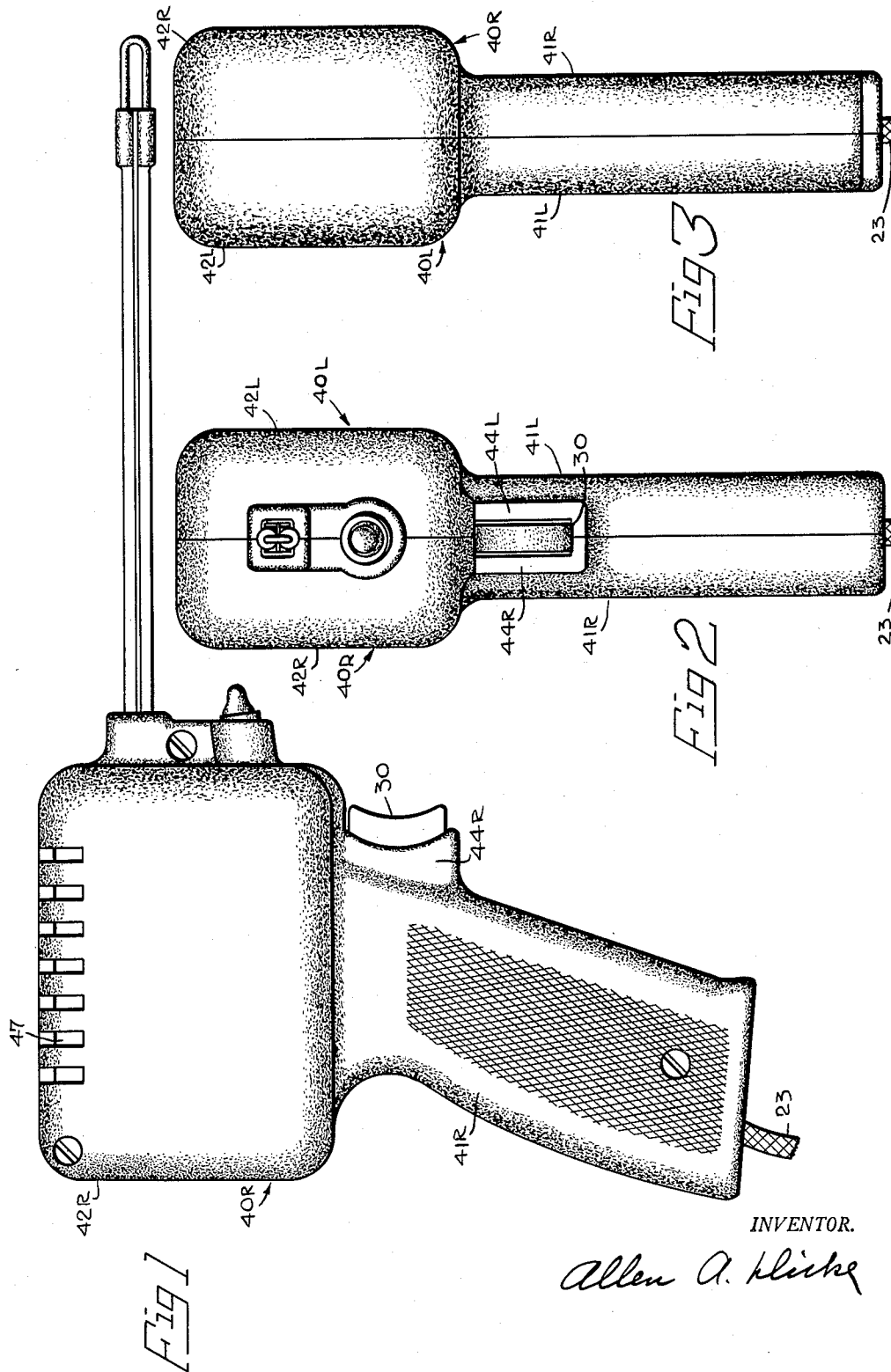
A. A. DICKE

2,715,670

ELECTRIC SOLDERING TOOL

Filed Oct. 1, 1951

3 Sheets-Sheet 1



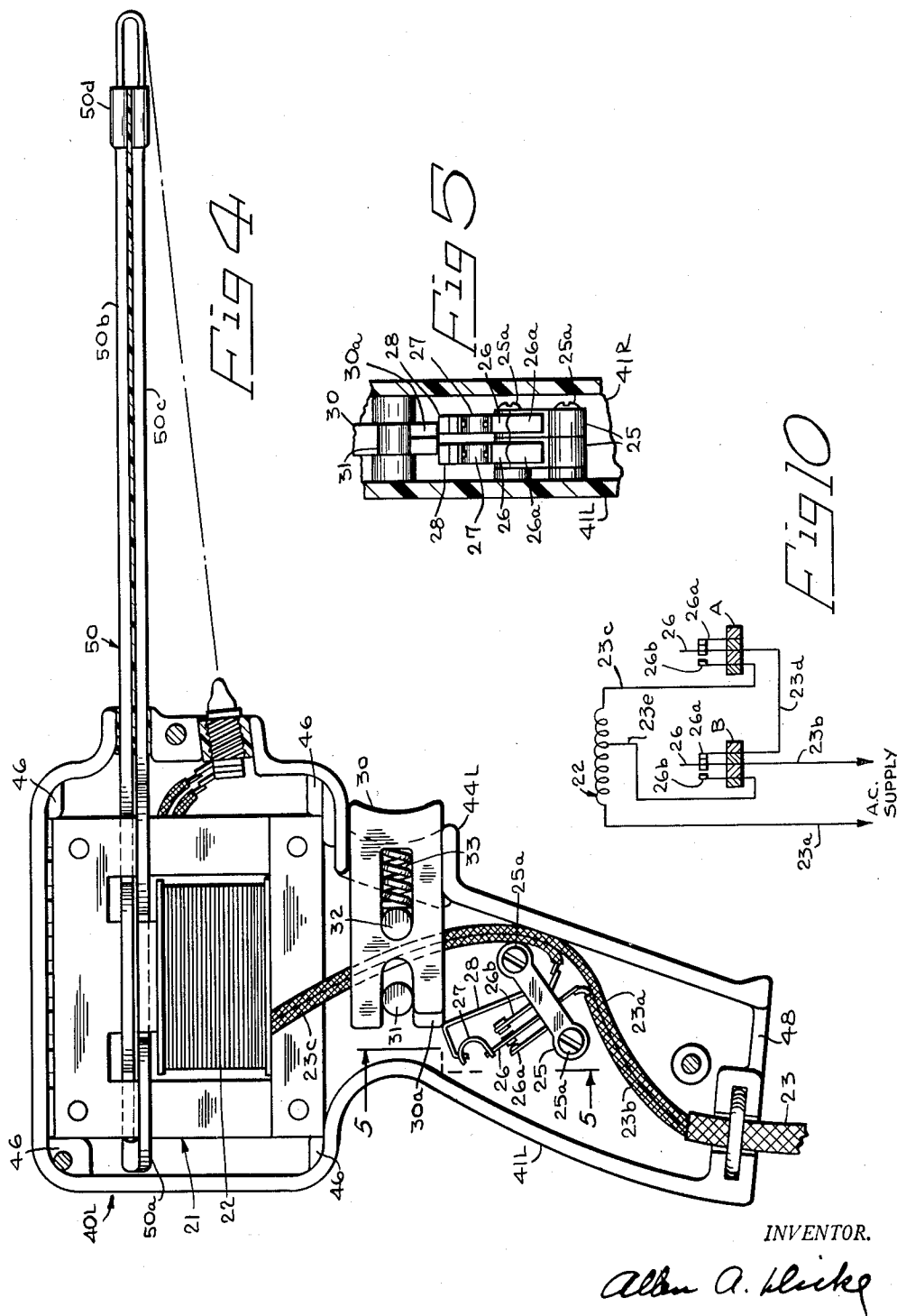
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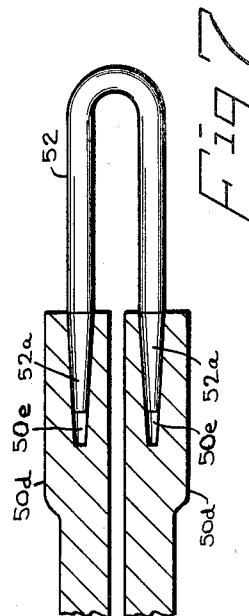
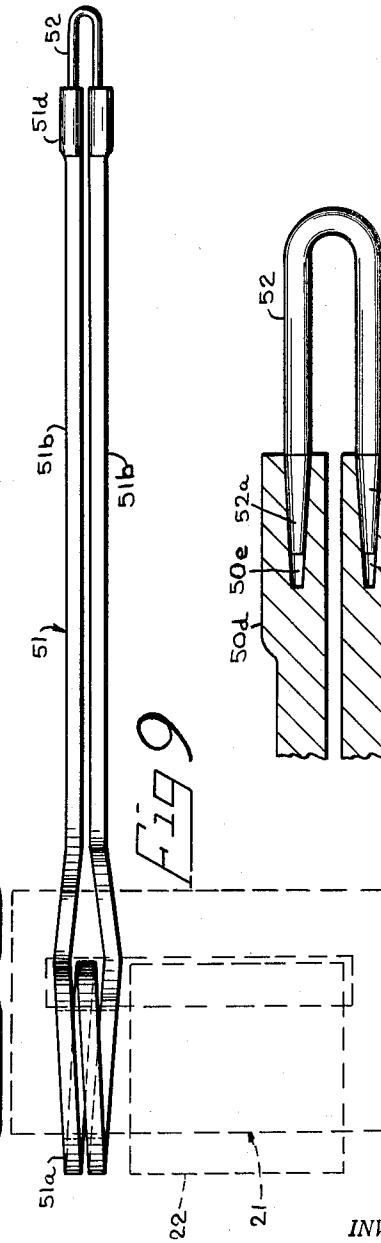
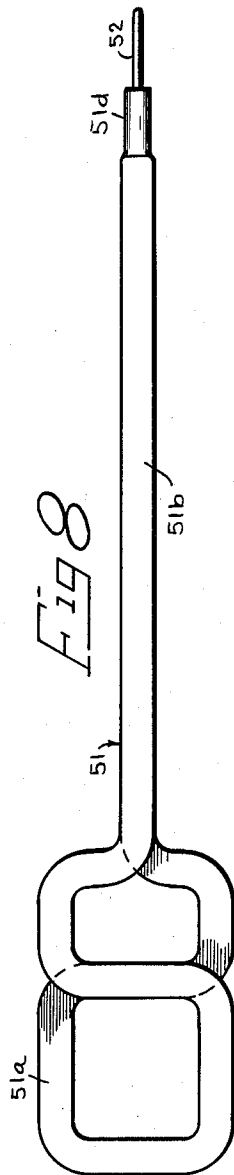
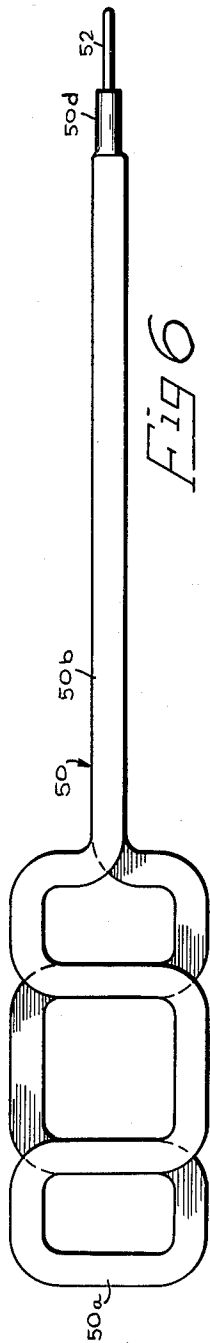
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ELECTRIC SOLDERING TOOL

Allen A. Dicke, Montclair, N. J.

Application October 1, 1951, Serial No. 249,093

5 Claims. (Cl. 219—26)

This invention relates to improvements in an electric soldering tool and comprises in certain respects improvements on applicant's co-pending application Serial Number 208,370 filed January 29, 1951.

It is an object of the invention to provide such a tool comprising a laminated field of the core type arranged longitudinally of the tool, with a primary coil located preferably upon the center leg of the field and a secondary having one or more turns around said center leg and at least one turn around one or both of the end legs of the core, the turns being so arranged that the current induced in the various turns on the several legs is in the same direction.

Another object is to provide such a device having a unitary secondary and working finger having a rectangular cross-section, the width being substantially double the thickness so that the portions thereof comprising the working finger lie close together and form a substantially square combined cross-section.

Another object is to provide such a secondary in which the rectangular bar is bent edgewise to form one or more turns comprising the secondary proper and then again bent edgewise to form the working finger consisting of extensions of said bar overlying each other with their wider faces in contiguity.

Another object is to provide such a tool having a secondary and a working finger, the adjacent ends of which are formed with a tapered recess to receive correspondingly tapered ends of a U-shaped working tip made of material having a very much higher resistivity than the material of the secondary.

Another object is to provide such a tool including switching mechanism adapted to supply current to the entire primary coil or to supply current to a portion only of said primary coil, the remainder of the primary coil being open-circuited.

Further objects and advantages of this invention will be apparent from consideration of the specification as illustrated by the accompanying drawings of possible embodiments of the invention, in which drawings:

Fig. 1 is a right side elevation of one form of tool made in accordance with the invention;

Fig. 2 is a front view;

Fig. 3 is a rear view;

Fig. 4 is a side elevation of one form of tool, the right housing section having been removed so that the left cover section, the laminated field, the primary coil, the secondary, the working finger and the working tip, the lamp socket, the lamp bulb, the switch mechanism, the trigger slide, the trigger spring, and the supply conductors are shown in side elevation;

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a plan view of the form of secondary shown in Fig. 4 with the tip in place;

Fig. 7 is a view of the forward end of the working

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finger and the working tip, the working finger ends being shown in cross-section;

Fig. 8 is a plan view of a modified form of secondary;

Fig. 9 is a side view of the form of secondary shown in Fig. 8;

Fig. 10 is a more or less schematic view showing suitable connections of the switch mechanism for a two-heat tool.

Referring to said drawings, the tool is preferably of pistol type, viz., is formed with a handle and a switch operating trigger located at the front of the upper part of the handle for convenient operation by the index finger. In the form shown, a shell type laminated field is used made up of E and I laminations, the field being generally designated 21. Surrounding the center leg of said field is the primary coil 22 energized by alternating current supplied through duplex conductor 23 consisting of conductor 23a leading directly to the primary coil, and the conductor 23b leading to the switch mechanism. If only a single heat tool is involved, the switch is connected to the other side of the primary coil through conductor 23c.

For a single heat tool the switch mechanism may be as shown in Fig. 4. In that case, the switch consists of an insulator body 25, a switch blade 26, a switch spring 27 of C shape, and a switch spring operating arm 28, as shown. The switch illustrated is of a well-known commercial form and need not be described further.

The switch may be actuated by means of a switch trigger 30 mounted to slide on studs 31 and 32 and normally held forwardly by means of a trigger spring 33 mounted in a slot in the trigger and bearing against the forward edge of stud 32. The forward end of the trigger projects outside the housing. When finger pressure is applied thereto, the trigger 30 is moved rearwardly against the tension of spring 33. During said movement, the arm 28 of the switch is pressed rearwardly compressing C spring 27. When this movement has progressed sufficiently far, the switch blade 26 will snap forwardly from its normal position against switch blade 26a into contact with switch blade 26b, closing the circuit to the coil.

If it is desired to provide a two-heat tool, a second identical switch will be mounted directly over the switch described and preferably held in place by the same screws 25a, as appears more clearly from Fig. 5. In order to actuate the switches in succession, the trigger is cut away at its rear end, as shown, to provide a shoulder 30a forwardly of the rear end of the trigger 30. If now the trigger 30 is pressed inwardly it will first engage the arm 28 of the lower switch and cause said switch to be actuated. Upon further movement of the trigger 30 the shoulder 30a will engage the arm 28 of the upper switch and will cause it to be actuated.

One suitable circuit for a two-heat tool is shown in Fig. 10 where it will be seen that conductor 23a leads directly to the primary coil 22. The two switches are there designated "A" and "B" and are normally in the positions shown. It will be noted that the conductor 23b is connected to the switch blade 26 of switch "B" which normally engages its contact finger 26a from which extends a conductor 23d to the contact blade 26 of switch "A" which normally stands in the position shown. If now switch "A" is actuated, the circuit will be completed through its contact 26b, through conductor 23c to the other end of the primary coil. If now, through further movement of the trigger, switch "B" is also actuated, contact blade 26 will leave contact 26a and engage contact 26b which is connected through conductor 23e to an

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intermediate part of the primary coil 22. Thus, the supply voltage will be applied to a fewer number of turns, causing more current to flow in the primary and causing the tool to operate with more energy.

It will also be noted that those turns of the primary coil 22 which are not used are open circuited. If this were not done, heavy alternating currents would be caused to flow therein, causing excessive and unnecessary heating and loss of energy.

The housing consists of two substantially similar housing parts 40R and 40L which are joined preferably at the central plane of the tool. Each housing part comprises the hollow handle portion 41R and 41L and the two hollow transformer enclosing portions 42R and 42L. Near the junctions of these parts are the hollow trigger enclosing portions 44R and 44L within which the forward end of the trigger slides.

The edges of the core type field bear against suitable lugs 46 in the housing parts. The housing also is shown provided with a more or less square exit opening for the working finger portion of the secondary 50.

Ventilating exit openings 47 (Fig. 1) are provided near the top of each of the housing parts. At least one ventilating air entry opening is provided near the bottom of the tool, such as the opening 48 in the bottom of the handle. By such an arrangement a chimney effect is produced so that cool air is drawn in at the bottom and warm air is discharged at the top. In this way the primary coil 22, the field 21, and the secondary turns are kept properly ventilated and cooled.

The form of secondary shown in Figs. 4 and 6 comprises the rear loop 50a which surrounds the rear leg of the field. Its ends cross each other and extend, respectively, along the other sides of the central leg where they again cross and their further extensions pass around the forward leg of the field and then are brought together in overlying position and bent reversely into the same plane to form overlying extensions 50b and 50c which form a long slender working finger. To its end are electrically connected the working tip 52 which is of U formation, as shown. The ends 52a of the tip are shown as having a conical or tapered conformation and are received in corresponding conical or tapered recesses 50e in the ends of the working finger. The taper angle is so proportioned that the working tip is held in place frictionally. Due to the large area of contact, an excellent electrical connection can be provided in this manner. As the thickness of the material of the secondary and working finger is preferably not over $\frac{1}{8}$ ", and this is not always sufficient to provide a recess of proper size, it is preferred to swage the ends of the working finger, as shown at 50d, into cylindrical form.

In the form shown in applicant's co-pending application Serial Number 208,370, it is disclosed how a combined secondary and working finger may be formed from a continuous length of rectangular (or similar) cross-section but the difficulty was encountered that it was necessary to locate the transformer field transversely in the housing. This necessitated forming the housing rather wide, producing a somewhat unsatisfactory appearance. Merely turning the field into the longitudinal plane of the tool and extending the secondary forwardly around the forward leg of the field was found unsatisfactory because the magnetic flow in said forward leg induced a voltage in the secondary opposed to the voltage produced by the center leg. It was found that this objectionable effect was overcome by forming the secondary as shown in Figs. 4 and 6. It will be noted that when the magnetization of the field is at a certain phase the lines of force will, say, flow upwardly in the center leg and downwardly in the front and back legs. By forming the secondary in the duplicate figure 8 conformation shown in Figs. 4 and 6, it will be noted that the magnetism flowing through each of the three loops induces voltages therein which add and therefore aid each other. At the same

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time, the working finger can be arranged conveniently in the same plane as the field laminae so that a comparatively narrow tool may be provided.

Furthermore, the vertical height of the secondary does not greatly exceed twice the thickness of the bar from which the secondary is made so that adequate space remains for the primary coil on the center leg.

The same advantageous results can be secured by having the secondary embrace only the central and the forward legs, namely, at least one turn around each of these legs.

Figs. 8 and 9 show such a modified construction wherein the secondary 51 comprises two turns 51a adapted to surround the center leg. The ends of said turns overlap each other and are then bent in the reverse direction to surround the forward leg of the field core passing therearound in the opposite direction. They are thereupon bent reversely to form overlying finger parts 51b forming the working finger 51. It will be noted that in this form of secondary the turns are so directed that the voltage induced therein add to each other rather than counteract each other as would be the case if the figure 8 conformation were not employed. The secondary of Figs. 8 and 9 may be used in place of the form of secondary shown in Figs. 4 and 6 or it may be used on a rectangular field 21', as shown in dotted lines in Fig. 9.

It will be noted that with both forms of construction the secondary comprises at least one turn passing around a transformer leg in one direction in series with at least one turn passing around an adjacent transformer leg in the opposite direction. Since the magnetic flow in adjacent legs of the field is in opposite direction, electric potential in the same direction is induced in the turns of the secondary.

Having described illustrative embodiments of the invention it is pointed out that various changes and modifications therein may be made without departing from the invention as set forth in the following claims.

I claim:

1. An electrical soldering tool comprising a primary winding and a secondary winding, a magnetic field member passing through said primary winding and at least twice through said secondary winding, said secondary winding being part of a combined secondary winding and working finger consisting of one continuous bar of highly conductive material, the secondary winding portion consisting of at least one turn of said bar material surrounding said field member at each of at least two spaced points, and said working finger portion comprising two complementary closely adjacent highly conductive finger parts electrically insulated from each other and the ends of which are closely adjacent to each other, and a U-shaped soldering tip electrically connected to the ends of said finger parts.
2. An electrical soldering tool comprising a primary winding and a secondary winding, a magnetic field member passing through said primary winding and at three points through said secondary winding, said secondary winding being part of a combined secondary winding and working finger consisting of one continuous bar of highly conductive material, the secondary winding portion consisting of at least one turn of said bar material surrounding said field member at each of said three points, and said working finger portion comprising two complementary closely adjacent highly conductive finger parts electrically insulated from each other and the ends of which are closely adjacent to each other, and a U-shaped soldering tip electrically connected to the ends of said finger parts.
3. An electrical soldering tool comprising a primary winding and a secondary winding, a magnetic field member passing through said primary winding and at least three times through said secondary winding, said secondary winding being part of a combined secondary winding and working finger consisting of one continuous

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bar of highly conductive material, the secondary winding portion consisting of at least one turn of said bar material surrounding said field member at one point, of at least one turn surrounding said field member at another point, and at least one turn surrounding said field member at a third point, and said working finger portion comprising two complementary closely adjacent highly conductive finger parts electrically insulated from each other.

4. In a tool of the character described for operation by alternating current, a magnetic field member having three legs in parallel consisting of a center leg and two side legs, a top member connected to the tops of each of said legs and a bottom member connected to the bottom ends of each of said legs, a primary winding on the central leg thereof and a secondary threaded by the said central leg and the two side legs of the field member, the secondary consisting of one turn passing around one of the end legs, one turn passing around the central leg in the opposite direction and one turn passing around the other end leg in the same direction as the turn passing around the first mentioned end leg.

5. An electrical soldering tool comprising a primary winding and a secondary winding, a magnetic field member passing through both of said windings, said secondary winding being part of a combined secondary winding and working finger consisting of one bar of highly conductive material, the secondary winding portion consisting of at least one turn of said bar material surrounding said

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field member, and said working finger portion comprising extensions of said bar so formed as to provide two complementary finger parts with their flat sides in contiguity and electrically insulated from each other and the ends of which are closely adjacent to each other, and a U-shaped soldering tip electrically connected to the ends of said finger parts, said U-shaped tip being formed with tapered ends firmly and closely fitted into tapered recesses in the ends of said working finger parts, the angle of said tapered ends and tapered recesses being the same and being sufficiently small to assure that the tip is held in place by friction.

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