April 23, 1957 P. E. DE VERRIER 2,790,058

TINNING TOOL FOR ALUMINUM

Filed June 8, 1955 3 Sheets-Sheet 1

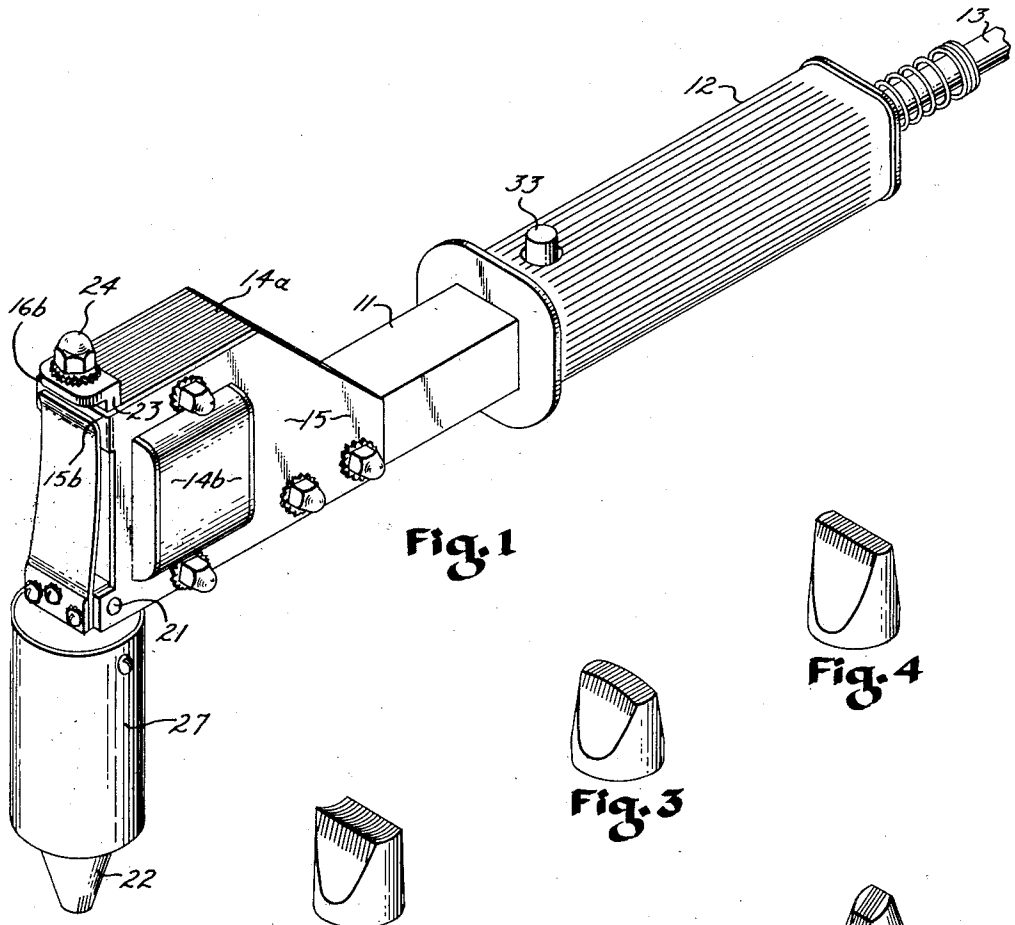

Fig. 1

Fig. 4

Fig. 3

Fig. 2

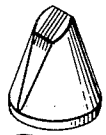

Fig. 8

Fig. 7

Fig. 6

Fig. 5

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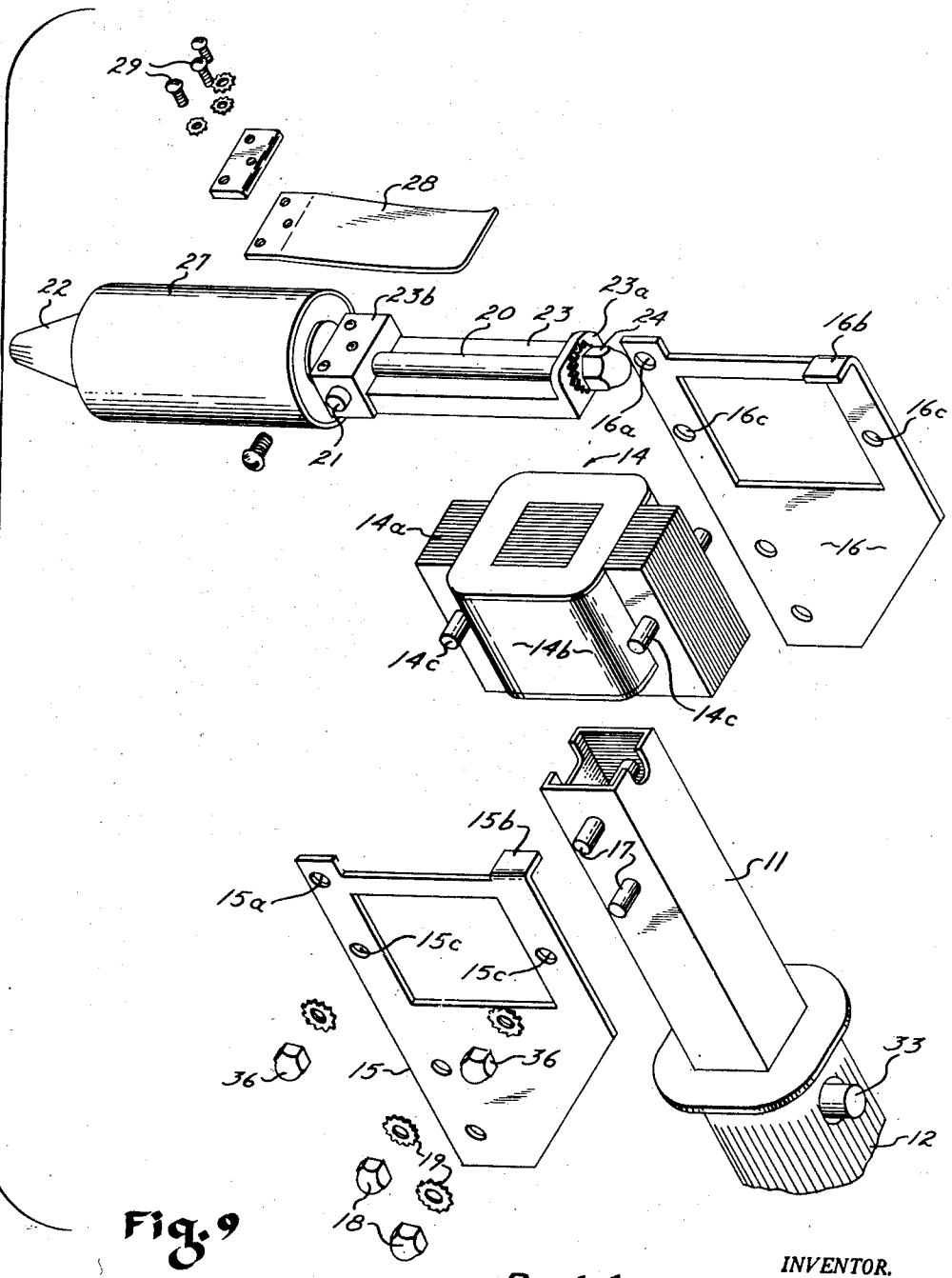

Fig. 9

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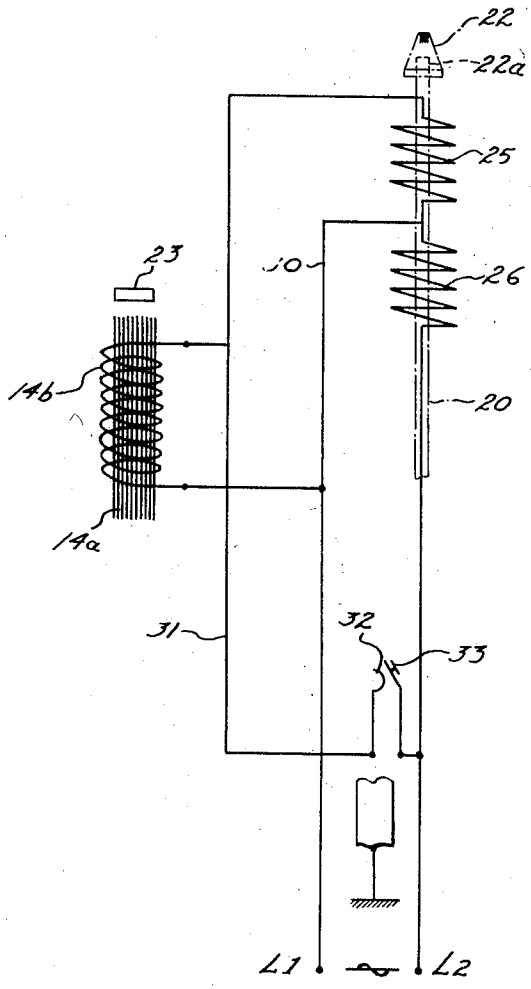

Fig. 10

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United States Patent Office 2,790,058 Patented Apr. 23, 1957

2,790,058

TINNING TOOL FOR ALUMINUM

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Application June 8, 1955, Serial No. 514,049

5 Claims. (Cl. 219—26)

This invention relates to improvements in a soldering iron and more particularly to a tool useful in tinning aluminum and the like.

It is well known to those skilled in this art that it is very difficult to put a coating of tin on aluminum or its alloys. As soon as the aluminum gets hot enough to take the coating of tin, an oxide is formed on the aluminum which prevents the adherence of good coating of tin to the base metal. The present invention solves this problem by holding the tinning metal in a heated bit or nose while the bit is caused to rapidly oscillate across the aluminum material whereby the oxide film is removed at the same time that a deposition of the tinning solder is provided.

Other objects of the present invention include the provision of small capillary openings at the work-engaging end of the bit for holding the molten tinning metal while the same is being deposited, novel electromagnetic means for causing vibration or oscillation of the bit, and operator-operated control member on the handle of the tool for readily controlling the vibration of the bit, coupled preferably with means for heating the bit at the same oscillation is provided, together with standby heating means for the bit independent of the control member, and novel arrangements for carrying out the purpose of this invention as will presently appear.

Other objects and advantages of the present invention will be apparent from the accompanying description and drawings and the essential features thereof will be set forth in the appended claims.

In the drawings,

Fig. 1 is a perspective view of the complete tool;

Figs. 2 through Fig. 8 inclusive show various designs of bit useful with my improved tool;

Fig. 9 is an exploded view showing most of the parts of Fig. 1 is disassembled position; while

Fig. 10 is a diagrammatic showing of the electrical energizing circuits for the bit heating means and for the electromagnetic bit vibrating means.

This tool is similar in shape and weight to conventional soldering irons with a bit heated by an electrical element.

The device comprises a handle **11** having a grip **12** at the lower end thereof and, preferably an energizing electrical cable **13** is connected with the lower end of the handle and provides electrical conductors, later described, for energizing the various parts of the tool. On the upper end of the handle is mounted an electromagnet **14** which comprises the usual iron core **14***a* and electrical energizing winding **14***b*. Side housing plates **15** and **16** are provided with suitable openings to receive the screws **17** which project from the handle **11** and nuts **18** hold the side housings and plate, preferably with suitable lock washers **19**. An arm **20** is mounted for oscillating movement generally in a plane extending through the longer dimension of the arm. The particular arm shown here carries a transverse pivot **21** intermediate its ends. This pivot has opposite ends which extend through openings **15***a* and **16***a* respectively in upstanding ears of the housing plates so that the arm **20** oscillates about the pivot **21**.

The construction of arm **20** may take various forms. The form shown here comprises an elongated cylindrical rod extending from end to end of the arm. At the outer end of this arm, a bit **22** is secured to the arm preferably by a threaded connection **22***a* as indicated in Fig. 10. At the other end of the arm, on the opposite side of the pivot **21**, is provided a magnetic armature **23** through which the rod **20** extends. The rod passes through a suitable opening (not shown) in an upstanding flange **23***a* of the member **23** and a nut **24** is threaded on the end of rod **20**, preferably with lock nuts as shown to hold the parts assembled on the arm. A pair of electric heating coils **25** and **26** operatively surround the bit end of the arm within a casing or housing **27** for the purpose of heating the bit in a well known electrical manner.

When the parts of Fig. 9 are assembled as shown in Fig. 1, the ears **15***b* and **16***b* of the side plate housings overlie the armature **23** to limit the movement of the armature away from the electromagnet. This armature is normally closely spaced above the upper pole electromagnet so as to be attracted to the magnet when it is energized. The device is so constructed that the weight of the bit **22** and the heating coils within the casing **27** normally bias the armature **23** away from the electromagnet. To assist in this biasing action, a leaf spring **28** has one end secured by screws **29** to the block **23***b* of the armature portion, and the free end of this spring bears against the upper faces of the ears **15***b* and **16***b* as shown in Fig. 1. This action tends to tilt the arm in such a fashion that the armature **23** is urged away from the electromagnet in a more positive manner.

The electrical wiring diagram of this device is shown in Fig. 10. The main conduits **L1**, **L2** extend through the cable **13** and preferably connected to a source **60** cycle AC current in the normal manner. The line **L1** is connected through line **30** and heating coil **26** back to the line **L2**. This provides the stand-by current to keep the bit **22** warm. The energizing circuit for heating coil **25** is through line **30**, coil **25**, line **31**, normally open switch **32**, back to line **L2**. An operating button **33** extends outwardly from the handle **11** through the grip **12** and serves the purpose of closing the switch **32** when the button is pushed inwardly. The coil **14***b* of the electromagnet is connected between lines **30** and **31** so that, upon closing the normally open switch **32**, the electromagnet causes the arm **20** to vibrate and at the same time the additional heating coil **25** becomes effective upon the bit **22**. The effect is to cause the bit **22** to oscillate rapidly about the pivot **21** at the frequency of the A. C. current to which the lines **L1**, **L2** are connected.

Preferably, to get the best results, the bit **22** is provided with small capillary openings which open away from the arm in order to hold the tinning solder. By the term "capillary openings" in the specification and claims I intend to cover openings of such a small size that the molten solder is held therein by capillary action. Thus, it is possible to use my tinning tool in any position. The preferred form of capillary opening is shown in the drawings as comprising a plurality of parallel layers **34** cut in from the work-engaging end of the bit and integral with the bit and separated by small capillary slits **35**. I have had good results where the layers were a little less than 1/16 inch thick, the slits **35** were a few thousandths of an inch, not much over .005 inch, in width, and these slits were approximately 1/4 inch in their extent inwardly from the work-engaging end of the bit. These layers **34** have a natural period of vibration responsive to the frequency of the alternating current connected to the lines **L1**, **L2**. I conceive

the frequency of the layers **34** to be in the ultra-sonic range when the tool is in use, thus aiding in the removal of the oxide film from the aluminum and aiding in the spreading of the tinning solder on the clean aluminum surface.

In use, I allow about ten minutes for heating of the bit after the lines **L1**, **L2** are plugged into the alternating current means at the usual 110 to 120 volts. Using pure, or ninety percent pure tin for solder, some of this material should be placed inside of the capillary slits **35**. The bit **22** should be hot enough to melt the solder when applied to the tip of the bit immediately. The bit should be rubbed smoothly back and forth on the surface of the aluminum metal while pressing on the knob **33** to set the electromagnetic vibrator in motion, and also to bring the secondary heating element **25** into action. The solder will cover the aluminum where the bit is rubber upon it and the aluminum oxide will come up to the surface in the form of a gray dross.

The electromagnet is held in place by screws **14***c* passing through openings **15***c* and **16***c* and held in place by nuts **36**.

What I claim is:

1. In a tinning tool, an elongated arm, a bit mounted at one end of said arm, a handle, said arm having a pivotal mounting on said handle intermediate the ends of said arm with said bit-carrying end thereof extending laterally away from said handle, the portion of said arm on the side of said pivotal mounting away from said bit end providing a magnetic armature, an electromagnet mounted on said handle and having a magnetic pole normally closely spaced from said armature and having

an energizing electrical circuit, and said circuit and mounting means arranged to cause alternate attraction of said armature to and release of said armature from said magnetic pole, whereby said bit is caused to oscillate rapidly.

2. The combination of claim 1, there being small capillary openings in said bit opening away from said arm.

3. The combination of claim 1 including electrically energized heating means for said bit, an electrical circuit operatively associated with said heating means and having a normally open switch in series in said circuit, and means for closing said electrical circuit for said electromagnet coincidentally with closing said switch.

4. The combination of claim 3 including a heating means for said bit having an electrical circuit normally closed independently of said switch.

5. The combination of claim 1 wherein said bit has a work-engaging end having a plurality of parallel layers integral with said bit and separated by capillary slits, means for alternately energizing said electromagnet at a predetermined frequency, and said layers having a natural period of vibration responsive to said frequency.

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