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L. N. HAMPTON ET AL

2,369,045

ELECTRIC HEATING UNIT

Original Filed Feb. 8, 1940

FIG. 1

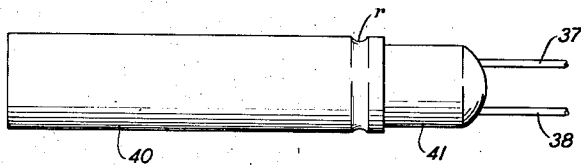


FIG. 3

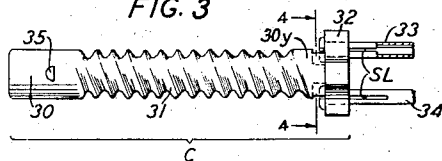
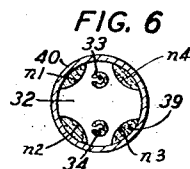
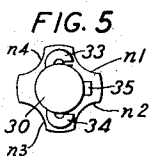
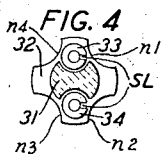
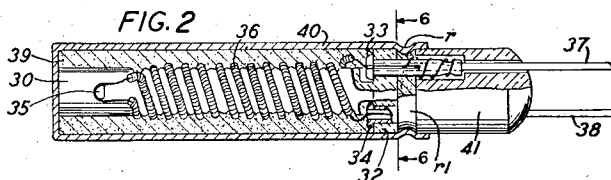


FIG. 2



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ELECTRIC HEATING UNIT

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Original application February 8, 1940, Serial No. 317,798, now Patent No. 2,274,408, dated February 24, 1942. Divided and this application January 1, 1942, Serial No. 425,270

2 Claims. (Cl. 201—67)

This invention relates to electrically heated tools and more specifically to a heating element for use in connection with such tools. It is a division of our copending application Serial No. 317,798, filed February 8, 1940 (now Patent No. 2,274,408, dated February 24, 1942).

The object of the invention is to provide a heating element which will be simple in construction, cheap to manufacture and efficient in operation.

In accordance with this invention, a heating element is provided in which a core is constructed of a heat treated plastic material which has good electric insulating and good heat conducting characteristics. This core is formed with a plurality of means in the form of a cylindrical portion, a helically double threaded groove formed longitudinally thereof, a second cylindrical portion and a collar portion, with means in the form of terminals embedded in the collar portion disposed contiguous to the second cylindrical portion for connecting with the resistance wire wound in the screw thread in the core and with lead-in wires forming part of the heating unit.

Means in the form of a metallic sleeve closed at one end and constructed of a non-scaling alloy such as nickel-silver serves as a housing for the resistance wire and the core with the annular space formed between the core and the sleeve filled with a plastic material similar to that of the core, such material adhesively uniting the core, the resistance wire and the nickel-silver sleeve into an homogeneous unit structure which has a high heat conductivity and a high dielectric characteristic.

Means in the form of a ceramic plug fitted into the open end of the sleeve serves for protecting the terminals embedded in the core and the connecting ends of the resistance wire wound thereon while forming a closure at this end of the sleeve, the plug being provided with means for receiving a collar inwardly pressed from the sleeve for securing the plug in position in the sleeve, while the anchoring of the terminals in the core avoids the breaking of the resistance wire connected thereto upon a pulling force applied to the lead-in wires connecting with the terminals.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto reference being had to the accompanying drawing in which:

Fig. 1 is an assembly view;

Fig. 2 is a longitudinal sectional view thereof;

Fig. 3 is a plain view of the core and the terminals embedded therein;

Fig. 4 is a cross-sectional view of the core taken on line 4—4 of Fig. 3;

Fig. 5 is a left-end view; and

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 2.

The heating element of the invention as shown in the drawing, consists of a core C best seen in Fig. 3, made as by molding and heat treating plastic material containing substantially 50 to 56 per cent ferro-silicate, 44 to 50 per cent zircon and phosphoric acid as a binder. The core C is formed as by molding with a cylindrical portion 30, a double threaded screw portion 31, a second cylindrical portion 30Y and a collar portion 32. Figs. 2, 3, 4, 5 and 6, into which wire terminals such as 33 and 34 are embedded. The cylindrical portion 30 is formed with a radially projecting lug 35 provided for anchoring the middle length portion of a helically coiled resistor wire 36 non-inductively wound in the double threaded screw portion 31 of the core, the resistance wire being made of a material known as "kanthal" which comprises iron 67 per cent, chromium 25 per cent, aluminum 5 per cent, cobalt 3 per cent.

The ends of the resistor wire 36 are passed through openings and into slots SL in the terminals 33 and 34 for connection at the periphery thereof and with the ends of lead-in conductors such as 37 and 38 fitted into the terminals, the lead-in conductors 37 and 38 being made of an alloy of manganese and nickel and are secured to the terminals by pressing the free ends of the latter over their respective conductors to form indentations as shown in Fig. 2. A sleeve 40, Figs. 1, 2 and 6, of a non-scaling material well known in the trade as nickel-silver, described in Metals Handbook, 1939 edition, closed at one end, serves as a casing for housing the core and the resistor wire 36 coiled thereon while the annular space formed by the sleeve 40 and the core is filled with a plastic material 39 of a composition consisting of substantially 50 per cent ferro-silicate, 50 per cent zircon and phosphoric acid as a binder. This plastic material is used for the core and for filling the concentric space between the core and the metallic sleeve in the heating unit thus constructed when heat treated has been found to possess very nearly the dielectric property of phenol plastic and the thermal conductivity and hardness of cast iron while capable of resisting great temperature changes and adhering well with the preformed core thus forming a continuous heat path therebetween, the sleeve and the resistance wire, the notches n1, n2, n3 and n4 in the collar 32 being provided for per-

mitting the escape of gases from the plastic material between the core and the sleeve during its heat treating operation.

A ceramic bead 41 shown in Figs. 1 and 2 is fitted into the sleeve 48 in abutting relation with the collar portion 32 of the core. This bead as shown in Fig. 2 is provided with two diametrically parallel disposed bores telescopically engaging the terminals 33 and 34 to which the conductors 37 and 38 and the ends of the resistance wire 36 are connected, the bead 41 being held securely therein by pressing a ridge *r* from the sleeve into a circular groove *r*1, formed at the periphery of the bead.

Heating units constructed according to this invention have been found to possess a high degree of efficiency and long life in actual service.

What is claimed is:

1. In an electrical heating unit, a core of a molded heat-hardened material consisting of 50 per cent silicon, 50 per cent zircon and phosphoric acid as a binder, a resistance wire coiled thereon, a metallic sleeve of a copper-nickel-zinc alloy housing said core and said wire, and a heat-hardened material consisting of 50 per cent silicon, 50 per cent zircon and phosphoric acid as a binder filling the concentric space between said core and said sleeve and adhesively uniting said core, said wire and said metallic sleeve.

2. An electric heating unit comprising a molded core made of a heat-hardened plastic material, said core comprising a cylindrical portion having a radial projection, a double helical screw thread portion, a second cylindrical portion and a collar portion, a pair of diametrically opposite terminals embedded in said collar portion in parallel relation to each other and in parallel relation to the longitudinal axis of said core, a resistance wire having its middle portion hooked onto said projection and wound non-inductively in the double helical screw thread in said core, each of said terminals having a longitudinal bore and slotted radially through which the ends of said resistance wire extend from said double screw thread portion for winding along the free end of said terminals, lead-in conductors fitted into bores in said terminals and secured therein by compressing the terminals on said lead-in conductors, a metallic sleeve housing said core and said wire, and a heat-hardened plastic material filling the concentric space between said core and said sleeve and adhesively uniting the whole to form a continuous heat path, the heat-hardened material for said core and said filling consisting of 50 per cent silicon, 50 per cent zircon and phosphoric acid as a binder.

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