Feb. 10, 1959 J. P. COLLOPY 2,873,343

ELECTRO-MAGNETIC HEATER

Filed June 4, 1957

Fig. 1

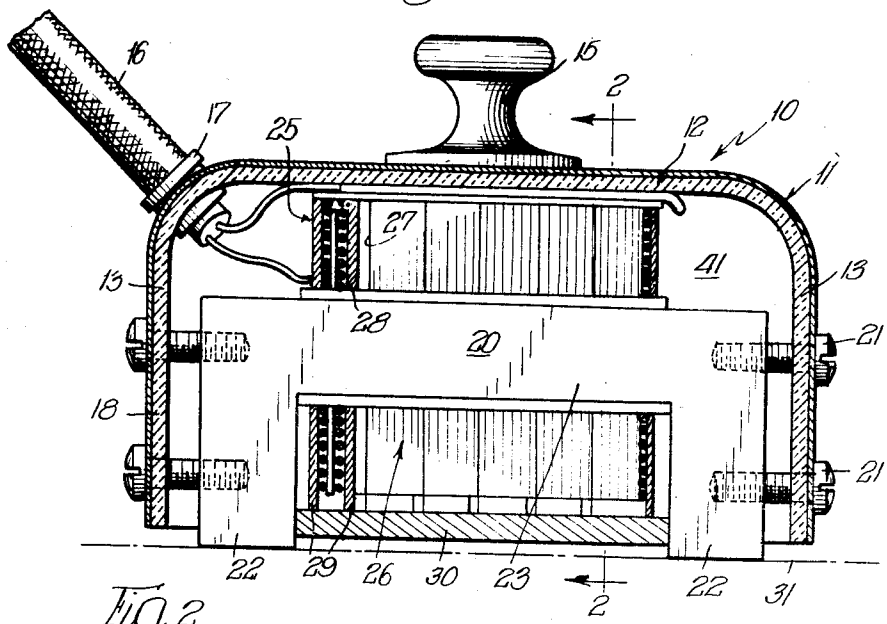


Fig. 2

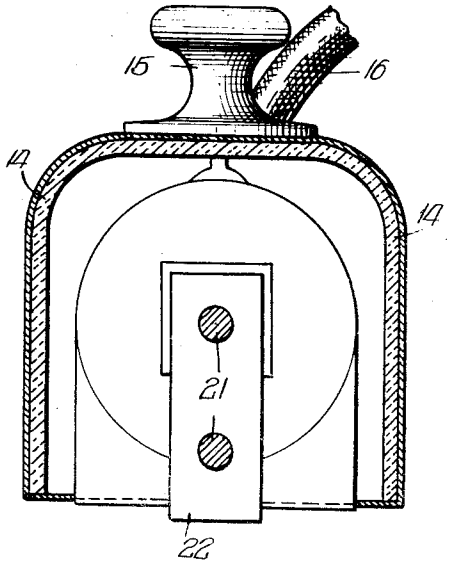
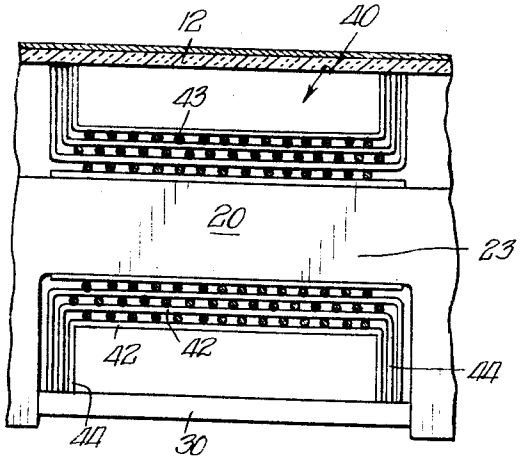


Fig. 3



INVENTOR.

Joseph P Collopy,

BY

Brown, Jackson, Boettcher & Dienner

Attys.

United States Patent Office 2,873,343 Patented Feb. 10, 1959

2,873,343

ELECTRO-MAGNETIC HEATER

Joseph P. Collopy, Phoenix, Ariz., assignor to Collopy Electro-Soil Company, Phoenix, Ariz., a corporation of Delaware

Application June 4, 1957, Serial No. 663,455

2 Claims. (Cl. 219—6.5)

The present invention is directed to an improved portable electric heater for providing localized heat to machinery and the like.

In brief, the improved heater of this invention constitutes an electrical utility heater combining certain principles of the familiar electro-magnetic and resistance-type heaters. Heaters of this class are designed particularly to heat selected areas of machinery for such purposes as heating lubricants and the like to facilitate easy starting and operation.

The prior art has demonstrated two general classes of electrical heaters, a magnetic-type of heater and a resistance-type of heater. The magnetic heater employs an electro-magnetic coil and core designed to pass magnetic flux through the object to be heated and to which the heater magnetically adheres; the flow of magnetic flux serving to heat such object, as for example, the housing of a transmission or the like. The heating operation of such an electro-magnetic heater is dependent by and large on the density and flow of the magnetic flux and various means are employed to keep the electro-magnetic coil cool so that the highly conductive wires thereof will not over heat and destroy themselves. Because of the energy requirements involved in this class of heaters, the same are generally large and cumbersome.

The resistance-type heater does not induce heat directly in the metal to be heated as does the electro-magnetic type, but produces heat by passing electrical energy through a high resistance coil which radiates heat to the item to be heated.

The heater of my present invention is directed to improvements in the two above-named heater types in that certain features of both types are embodied therein. Briefly, I employ a steel or magnetic core member which is wound with a heater coil of insulated wire in a manner somewhat similar to a transformer. The resistance wire is supplied by an ordinary 110 volt A. C. source, and the current passing through the resistance coil produces sufficient magnetic flux in the steel core to hold the heater tightly to a magnetic object to be heated. The resistance windings also produce sufficient resistance heating to conductively heat the magnetic core piece and radiate heat to the object to be heated in a manner similar to a conventional resistance heater. By thus combining the desirable features of the magnetic and resistance heaters presently known, I am able to economize in the construction of my heater unit and reduce the size and cumbersome characteristics of the normal magnetic heater by selecting a resistance coil wire of a desirable characteristic sufficient to obtain proper magnetic pull in the core member, as well as the desired amount of resistance heating.

The main object of this invention is to produce a new and improved portable electrically energized heater which heats inductively, conductively, and radiantly.

Another object of this invention is to provide an improved electro-magnetic heater in which a magnetic core piece of ferrous material, for instance, is wound with a resistance coil, so that while the core piece is magnetized sufficiently to hold the heater to a magnetic object to be heated, the resistance of core winding also heats such object.

Still another object of my invention is to provide a new and improved portable heater especially adapted for localized heating of metal objects; the same heating by the flow of magnetic flux through the object and by conduction and radiation from a resistance coil.

The above and further objects, features, and advantages of this invention will appear to those familiar in the art from the following detailed description and specifications of a first preferred and modified embodiment thereof shown in the accompanying drawings.

In the drawings:

Figure 1 is a view in side elevation of my new heater assembly with portions of the heater housing and coil broken away in section to illustrate the features of construction and assembly of the improved heater of my invention.

Figure 2 is a cross-sectional view taken substantially at line 2—2 of Figure 1 and looking in the direction of the arrows thereon; and

Figure 3 is a partial enlarged cross-sectional view of a modified core construction for use with the heater assembly set forth in Figure 1.

Turning now to the features of the improved heater of this invention, indicated generally by numeral 10 in Figure 1, it will be recognized that the same includes an outer inverted cup-like housing 11 which is substantially U-shaped in cross section, as best seen in Figure 2, and includes a top wall 12, two end walls 13, 13, and two side walls 14, 14 all integrally related. The housing 11 is open at its bottom side and includes a manually engageable handle 15 located centrally of its top wall 12. An electrical conductor 16 enters through housing 12 substantially at the junction of one end wall 13 and the top wall 12, as best shown in Figure 1. Conductor 16 is preferably insulated from the housing 11 as by a rubber ferrule 17 or a similar means. The walls of housing 11 are preferably covered on their inner faces by a suitable insulating material such as asbestos, indicated generally at 18.

Mounted within housing 12 and extending substantially longitudinally thereof is a solid metal core 20 of iron, steel, or like magnetic material. Core 20 is preferably cast to avoid the expense of a laminated construction. Four holding bolts 21, 21 extend through end walls 13, 13 of the cover 11 and thread into arm portions 22, 22 of the core member 20 to hold the latter in position. The core member 20, as best shown in Figure 1, is substantially C-shaped in side elevation and includes in addition to the arm portions 22, 22 an innerconnecting body portion 23. The arms 22, 22 of the core member 20 lie substantially transverse to the main body portion 23 thereof so as to formulate the C-shaped core piece arranged with the arm members portions 22, 22 depending from the body portion 23 (see Figure 1).

Mounted about the body portion 23 of the core member 20 is a winding of resistance wire, indicated generally by numeral 25. The resistance winding 25 is selected suitably such that the core member 20 is heated and magnetic flux set up therewithin by the electrical energization of the windings. Ordinarily, the supply cable 16 will lead from a source of 110 volt, 60 cycle A. C., although other values of alternating current supply may be employed, the windings 25 being selected accordingly. In any event, as shown in the drawings, the resistance winding 25 is formed in a series of pancake units 26, 26 separated by air spaces 27, as desired. It will be noted that the resistance wire 28 of each pancake means 26 is insulated suitably and wound in spiral about the body

portion 23 of the core member. Metal discs 29, 29 are employed to conduct heat from the resistance wire; there being one such disc at each end of the pancake units 26. Several such pancake units 26 are mounted along the length of the core body portion 23 until the space provided by the design of the core member is fully employed, as desired. The spiral windings of each pancake unit may be connected in series, in series-parallel, or in parallel to suit the voltage most convenient and the amount of heat desired. A metal base plate 30 is employed preferably beneath the body of the core member 20 in contacting engagement with the several metal heat conductor discs 29, 29 for the purpose of transferring the heat generated by the resistance windings to the surface of an object to be heated, as indicated, for example, by line 31 of Figure 1.

It will be appreciated, of course, that energization of the windings 25 serves to set up magnetic flux in the solid metal core member 20 which, in turn, causes magnetic attraction between the lower ends of the core arm portions 22, 22 and the magnetic material to be heated, such as a transmission or differential housing. Normal eddy current and hysteresis losses, which are usually avoided in the conventional electro-magnetic heater are encouraged in the present device, since such heat losses are transferred to the object to be heated and thus increase the efficiency of my improved heater.

With reference to Figure 3 of the drawings, I have therein shown a modified form of core winding, indicated generally by numeral 40. The general assembly of a heater embodying this modified core winding is as above described, except for the resistance winding 40 which, as shown in Figure 3, is wound in the form of a helix having concentric layers paralleling the body portion 23 of the core member 20. In this form of coil, part of the heat from the resistance winding is carried to a space 41 (see Figure 1) within housing 11 and to the base plate 30 by series of annular metal members of substantially U-shaped cross section, indicated by numeral 42, 42 in Figure 3. Such members 42 serve to separate adjacent layers of wire 43 which constitutes the winding 40 and also include arm portions 44 which contact plate 30 to transmit heat thereto. Members 42, 42 are preferably of a material capable of conducting heat at a high rate, such as aluminum, and suitable air spaces may be included between members 42 to assist in the transfer of heat, as desired.

In both forms of the device illustrated in the drawings, the current flow in the windings produces an alternating magnetic flux in the core member 20 and the metal being heated. In this manner, part of the heating takes place directly in the object being heated through the inductive pulsation of the magnetic flux therein. The winding also produces magnetic pull between the heater and the object being heated to insure good contact with the core arms 22, 22. The resistance coil also conducts heat through the core piece and radiates heat to the object.

From the foregoing, it is believed that those familiar with the art will recognize the virtues, features, and novel aspects of the improved heater of my invention, and will particularly appreciate the combined advantages gained by utilizing a resistance heating coil as the coil winding of an electro-magnet whereby the desirable magnetic and resistance heating effects previously known individually are now obtainable in a single device according to my invention. It is further to be recognized that while I have herein shown and described the features of my invention as it appears in association with a preferred and modified form thereof shown in the accompanying drawings, numerous changes, modifications, and substitutions of equivalents may be made therein without necessarily departing from the spirit and scope of my invention. As a consequence, it is not my intention to be limited to the particulars of the device herein shown and described except as may appear in the following appended claims.

I claim:

1. A heater for applying localized heat to an object of magnetic material, comprising, a magnetic metal core member having spaced extending arm portions adapted to contact the object to be heated, a coil of electrically conductive wire surrounding said core member for inducing electro-magnetic flux therein whereby the heater may be magnetically attracted and secured to said object, said coil comprising an electrical resistance heater, and thermal conductor means extending substantially between the coil and said object to conduct heat generated by said coil to said object.

2. A heater for application to the housing of a transmission or the like, comprising, an electro-magnetic coil comprising plural adjacent pancake coil elements connected in series circuit relation, a core member of magnetic material surrounded by said coil whereby the same is magnetized by energizing said coil, extending arm portions on said core for engaging the housing to be heated, said coil constituting an electric resistance heater, and means for conducting heat generated by said coil to the object to be heated comprising metal disc elements extending substantially between said pancake coil elements and the object to be heated.

References Cited in the file of this patent

UNITED STATES PATENTS

457,561	Kennedy	Aug. 11, 1891
1,322,416	Fossati	Nov. 18, 1919
1,996,502	Brown	Apr. 2, 1935
2,010,622	Brown	Aug. 6, 1935
2,430,285	Ferris	Nov. 4, 1947
2,804,535	Tuttle	Aug. 27, 1957

FOREIGN PATENTS

311,121	Italy	Sept. 21, 1933