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METAL COVERED FLUID CONDUOTOR

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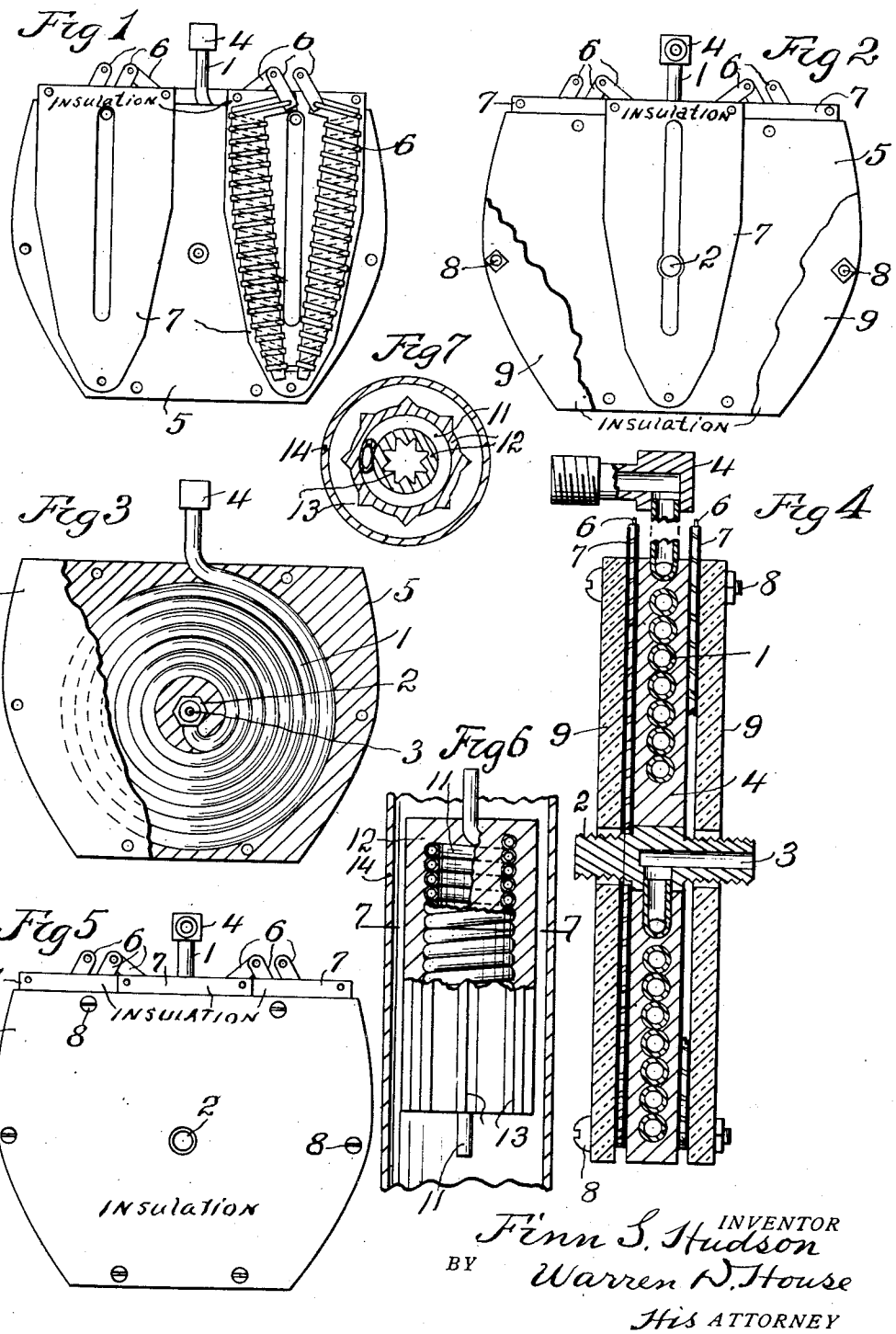

Finn S. Hudson INVENTOR

BY Warren D. House

His ATTORNEY

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METAL COVERED FLUID CONDUCTOR

Finn S. Hudson, Kansas City, Mo., assignor to Dealers' Manufacturing Company, Kansas City, Mo., a corporation of Missouri

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1 Claim. (Cl. 219—39)

My invention relates to improvements in metal covered fluid conductors.

One of the objects of my invention is to provide a novel fluid conducting unit which has a maximum heat absorbing or heat radiating capacity, whereby it is enabled to heat or cool fluid passing therethrough with a maximum of efficiency.

A further object of my invention is to provide an apparatus of novel construction in which the constituent elements are united together to form an integral structure adapted for removal and replacement as a unit.

My invention provides still further a novel electrical heating unit which is simple, cheap, durable, strong, not likely to get out of order, and which has a maximum of efficiency.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawing, which illustrates the preferred embodiment of my invention, and a modification thereof,

Fig. 1 is one side elevation, partly broken away, of my improved unit, with the adjacent side insulation plate removed.

Fig. 2 is an elevation, partly broken away, looking at the opposite side of the unit.

Fig. 3 is a view partly in side elevation and partly in vertical section of the heat conductor and its metal covering.

Fig. 4 is an enlarged central vertical sectional view, partly broken away, of my improved unit.

Fig. 5 is a side elevation of the complete unit.

Fig. 6 is a view partly in side elevation, partly in longitudinal section and partly broken away, of a modified form of the unit shown disposed in a motor exhaust pipe.

Fig. 7 is an end view of the unit shown in Fig. 6, on the plane of the line 7—7 of Fig. 6.

1 designates the body of my improved fluid conductor which is of the form of a flat involute spiral, the inner end of the body 1 being attached to a central plug 2 having opposite ends threaded and provided with a discharge or receiving passage 3 leading to one of the threaded ends of the plug 2 and communicating with the interior of the spiral body 1.

The outer end of the body 1 is attached to and interiorly communicates with an elbow 4 adapted to receive or discharge fluid, as water or gas.

The body 1 and plug 2 are embedded in a metal covering 5 having flat smooth parallel opposite sides which are respectively parallel with the opposite sides of the spiral body 1.

The body 1 is, preferably, a metal of relatively high heat conductivity, and a high melting point, as copper. The metal covering 5, has, preferably, a melting point lower than that of the body 1, to enable it to be readily cast about and in intimate contact with the conductor body 1. The covering 5 has high heat conductivity to enable it to rapidly convey heat to or from the body 1. Such covering 5 is, for its cheapness and efficiency, aluminum, although silver could be advantageously used as the covering.

The complete conductor body 1 is immersed in the melted aluminum in a mold, not shown, which provides parallel smooth flat sides to the covering 5, the body 1 being disposed midway between the sides of the covering 5 and parallel therewith. The body 1 is preferably made from copper tubing which is circular in cross section. The tubing after being formed into the spiral form with the coils convoluted, or wound one on the other, as shown in Fig. 3, is exteriorly cleaned so as to be free from scale or other coating, whereby when immersed in the molten aluminum, it will have intimate contact therewith.

The aluminum covering will completely fill in between the coils of the body 1 and, when permitted to cool and removed from the mold will hold the body 1 from any distortion due to temperature changes or other cause.

As shown in Fig. 4, the ends of the horizontal plug 2 project from opposite sides respectively of the covering 5, whereby the closed threaded end of the plug may be employed as a supporting means to be attached to a suitable support, not shown. The threaded end of the elbow 4 and the threaded end of the plug having the passage 3 may be respectively connected with tubing, not shown, which is to supply the fluid to be heated or cooled, as the case may be.

If the fluid to be treated is to be cooled, ice or refrigerating brine may be applied to the covering 5, upon which the heat in the fluid treated will be absorbed through the body 1 and the aluminum covering 5.

If the fluid in the body 1 is to be heated, heat is applied to the covering 5, and will be absorbed therefrom through the body 1 by the fluid. For heating and boiling water, the covering 5 serves as an efficient conductor of heat to the water.

For heating fluid in the body 1, I have shown two V shaped flat units composed of electrical resistance wires 6 disposed respectively between two pairs of flat insulating plates 7, as mica, and arranged flatwise against one side of the covering 5.

A similar V shaped resistance wire 6 mounted between insulating plates 7 is disposed against the opposite side of the covering 5. By having these heating units disposed flatwise, as shown against the flat smooth surfaces of the sides of the covering, the conduction of the heat therefrom through the covering 5 is evenly distributed throughout the resistance wires, thereby preserving the wires from injurious uneven heating. By having the body 1 in the form of a flat spiral with the coils convoluted and tightly wound upon each other, and opposite sides of the spiral embedded in the metal covering or body 5, a very compact structure is afforded in a minimum of space, thus enabling a maximum heating effect to be obtained with the heating units at a minimum expense for electrical current.

The convoluting of the tubing in flat form in making the spiral body 1, enables the latter to be easily, quickly and cheaply formed without liability of kinking or making abrupt bends that would interfere with the passage of fluid therethrough. It also enables the employment of a minimum amount of covering metal 5 for the length of tubing used, thus reducing weight and cost.

Fastened by bolts 8 to opposite sides of the covering 5, at the outer sides respectively of the mica insulation plates 7, are two protecting insulation plates 9, having holes 10 through which respectively extend the end portions of the plug 2.

The covering 5 so rapidly absorbs heat that when exposed to the sun, and the elements 6, 7 and 9 are removed, water placed in the fluid conductor may be raised to the boiling point, and steam produced. The constituent elements of the heating apparatus just described, and which is shown in Figs. 1 to 5, are united together so as to form an integral structure adapted for removal or replacement as a unit, thus making for convenience and economy in assembling where it is to be used, or in making repairs when needed.

In the modification shown in Figs. 6 and 7, the fluid conductor is in the form of a helical spiral 11 of tubing, preferably of copper, which is embedded in and integrally united to a metal covering 12, preferably aluminum, or a metal having a melting temperature lower than that of the conductor 11. Such embedding is effected by immersing the conductor 11 in the molten metal 12 and permitting the latter to solidify in a suitable mold, not shown. The inner and outer surfaces of the covering 12 are, preferably provided with longitudinal ribs 13 which facilitate the conduction of heat to the conductor spiral 11.

As shown in Fig. 6, the unit, comprising the conductor 11 and the metal covering 12, is shown disposed in an exhaust pipe 14 of an explosive engine, not shown. The hot exhaust passing through the pipe 14 will highly heat the metal covering 12, which will heat the conductor 11 and such fluid as may be passed through the latter.

As used herein, the term "embedded", as applied to the manner of associating the conductor 1, or 11, as the case may be, with the metal covering 5, or 12, means the integrally uniting in intimate contact of the covering metal with the metal conductor, such as is obtained by immersing the conductor in the molten covering metal and permitting the latter to solidify upon the conductor, as distinguished from merely mechanically attaching the conductor to and between two metal plates.

The invention is subjective to various other modifications, within the scope of the appended claim, without departing from the spirit of the invention.

What I claim is:—

In an apparatus of the kind described, a convoluted flat spiral metal tubing, the coils of which contact with each other, the ends of the tubing being respectively at the inner and outer ends of the spiral, a solid metal covering in which said tubing, excepting its ends, is embedded, said covering at opposite sides of the spiral having flat surfaces, two heating units one being against and electrically insulated from each of said surfaces, and two thermal insulation members respectively against the outer sides of said heating units, said metal covering having a melting point higher than that to which it will be heated by said units, said elements being united together to form an integral structure adapted to be removed or replaced as a unit.

FINN S. HUDSON.