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INSULATION FOR THERMOCOUPLE HEAD AND ARM

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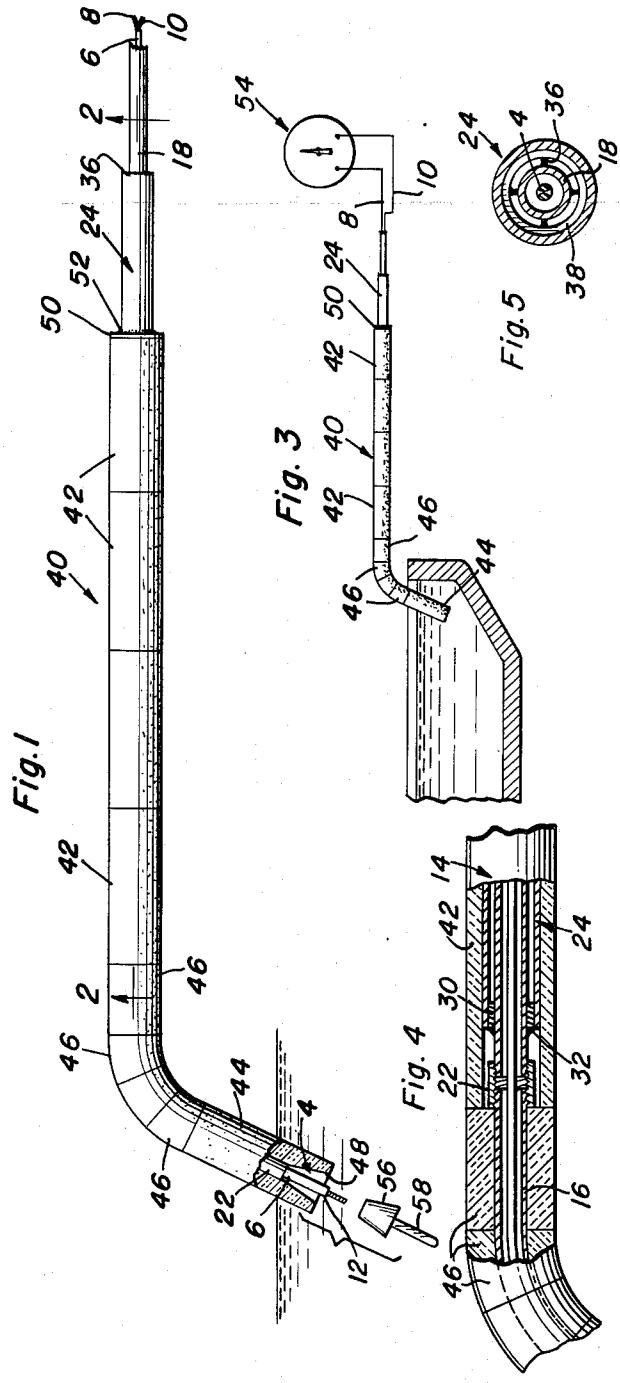


Fig. 1

Fig. 3

Fig. 5

Fig. 4

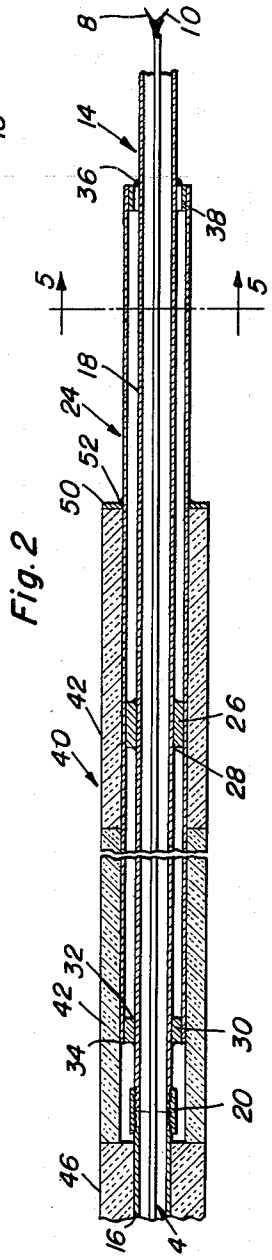


Fig. 2

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INSULATION FOR THERMOCOUPLE HEAD AND ARM

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1 Claim. (Cl. 136—4)

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The present invention relates to certain new and useful improvements, generally speaking, in a thermocouple construction, and more particularly to the head and arm portions thereof, the same having special reference to feasible and practical insulation means which affords greater and more satisfactory protection for the vulnerable platinum or equivalent wires which go to make up the thermocouple proper, as well as the leader means which is attached to the latter and is used to shove the thermocouple in a direction from the trailing toward the leading end of the head portion.

Immersion-type thermocouples are used, as is understood by those familiar with the art of measuring heat and temperature, for determining temperatures of molten metal. It is common practice to encase and thus armor the thermocouple in many and varied ways, this with a view towards prolonging the life and required properties of usefulness of said thermocouple. Usually, the covered thermocouple means is contained in a length of metal tubing, frequently called a conduit, the same having a straight arm portion and a laterally bent head portion. All sorts of constructions have been utilized for reducing the degree of heat in and throughout the length of said conduit. The present invention has to do with reliable and more efficient means, it is believed, for housing and insulating said conduit and which, at the same time appreciably reduces the weight requirements and overcomes the possibility that the overall construction will be too heavy and/or unwieldly while being handled.

More specifically, the invention herein has to do with the adoption and use of graphite insulating means which has been found to greatly prolong the life of the thermocouple and its conduit, the same being desirable in that it is not only lighter in weight, but is easily replaceable and offers greater resistance to abnormal damaging heat and reduces maintenance costs to a minimum.

In carrying out the principles of the invention, the stated graphite insulation means is actually made up of a plurality of preformed insulating units each in the form of a sleeve. These sleeves are arranged end to end and are such in shapes and sizes to allow them to be readily applied and removed whenever necessary or desired.

A further objective is to provide outer tubing for the conduit which is of a diameter greater than the inner conduit tubing and which is properly welded on a prescribed portion of the main arm portion of said inner tubing to provide insulating spaces between the two components, said outer tubing being, in addition, a highly satisfactory mount or foundation for the snug fitting but nevertheless readily applicable and removable insulator-sleeves.

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In addition to regular occupational hazards faced by those who must handle a thermocouple during temperature taking requirements, the construction of a thermocouple must be such that it too has to stand rough handling and withstand the tell-tale effects of terrific heat conduction. It is, therefore, another object of the invention to not only make the construction as safe and easy to handle as is practically possible but, what is more important, to render repairs and maintenance conditions as efficient and economical as is reasonably possible.

Other objects, features and advantages will become more readily apparent from the following description and the accompanying sheet of illustrative drawings.

In the accompanying sheet of drawings wherein like numerals are employed to designate like parts throughout the views:

Figure 1 is a side elevational view, with the portions shown in section, of a thermocouple construction constructed in accordance with the principles of the present invention.

Figure 2 is an enlarged fragmentary sectional view showing the principal constructional features.

Figure 3 is a view in section and elevation showing a fragmentary portion of the molten metal container and showing how the thermocouple is connected with its metering means.

Figure 4 is a fragmentary view showing the separable coupling means at the juncture of the head and arm portions, parts being in section and elevation, and the thermocouple itself being omitted.

Figure 5 is a cross-section, on an enlarged scale, taken on the plane of the vertical line 5—5 of Figure 2 looking in the direction of the arrows.

The thermocouple, considered as a unit of the over-all combination, is denoted by the numeral 4. It embodies the usual covering 6 for the platinum or equivalent wires 8 and 10, the left hand end of said wires in Figure 1 being twisted or otherwise joined together as at 12, as is common. The thermocouple is contained or housed in the usual metal inner tubing which constitutes the conduit, this being denoted generally by the numeral 14 in Figure 2. It is made up of suitable complemental head and arm sections 16 and

18 respectively separably joined together by readily separable coupling means 20. The laterally bent portion 22 constitutes the pilot end of the head 16 and the horizontal portion 18 constitutes the arm.

One improvement has to do with the readily and easily separable head and arm complements making up a sectional conduit and a further improvement has to do with an outer metal tube 24 of a diameter greater than the diameter of the inner tubes 16 and 18, thus creating a space between the two tubes 18 and 24 as shown. The inner tube is provided with one or more bushings 26 welded or otherwise secured thereto as at 28. The outer tube fits over and is reinforced by these bushings. It will be noticed that the outer tube houses the greater part of the horizontal arm portion of the inner tube. At the left of tube 24 as seen in Figs. 2 and 4 there is a collar or bushing 30 which is welded at 32 to the inner tube and welded at 34 to the adjacent end of the outer tube thus sealing and closing this end of the outer tube. A suitably vented closure 36 is provided at the opposite end of tube 24 and this includes, if desired, a reinforcing collar 38. The space between the tubes 18 and 24 is an insulation space. The outer tube serves not only to define these insulation spaces between itself and the inner tube but provides a firm foundation or mount for the aforementioned graphite insulation sleeves. Graphite, it has been found, is an excellent medium or material to serve as an insulator in a construction of the type under consideration. Actually, the insulation "means" is made up of a plurality of sleeves, the means being denoted generally at 40 and the sleeves by the numerals 42—42, 44 and 46. All of these are preformed and axially bored to fit their component parts. The sleeves 42 are of suitable length and are long sleeves and are snug-fitted on the tube 24 and the remaining sleeves 44 and 46 are shorter sleeves and properly curved and are bored to fit the head portion 16 as shown in Figure 1. The terminal sleeve 44 has an enlarged conical or flaring bore 48. The endmost sleeve toward the right in Figure 1 abuts a washer 50 which is welded at 52 on the outer tube. The inner tube at this end of the structure extends beyond the closure 36 where the wires are connected with a suitable temperature metering device 54.

Figure 4 of the drawings compared with Figures 1 and 2 shows that the novelty in the instant disclosure has to do with the holding and protecting means for the thermocouple. The thermocouple is therefore no part of the invention and for this reason is merely mentioned and shown in an incidental manner. For example, the thermocouple appears in Figures 1 and 2 whereas in Figure 4 it is omitted to emphasize the fact that the novelty has to do with the inner and outer metal tubes forming the conduit and insulating means and also forming mounts for the readily applicable and removable graphite sleeves.

It may be helpful in the disclosure of the invention and in connection with Figure 1 to refer to the usual attachable and detachable conical plug 56 which is adapted to be fitted into the conically flared and enlarged end of the insulation sleeve, that is the pilot sleeve 46. As is customary this plug is provided with a silica or equivalent protective tube or sheath 58. The sheath serves to receive the twisted end portions of the elements of the thermocouple. It will be understood that the plug and sheath means form no part of the invention but are shown to help clarify the over-all disclosure and they are used here and referred to only broadly inasmuch as they are a phase of the disclosure in a patent to Leroy Tingle, 2,556,238, of June 12, 1951.

It will be noticed that the left hand end of the inner tube extends beyond the corresponding end of the outer tube where it spins in the usual way and the insulating sleeves are directly in contact with this, that is have snug fitting relation thereto.

By armoring and shielding the inner tube with the outer tube 24 and insulation sleeves a highly satisfactory and efficient thermocouple construction is had.

Minor changes in shape, size, materials and rearrangement of parts may be resorted to in actual practice provided no departure is made from the invention as claimed.

Having described the invention, what is claimed as new is:

In a thermocouple construction, linearly straight outer tube means, inner tube means of a diameter less than said outer tube means and having a linearly straight portion extending through and beyond the respective ends of said outer tube means with one end portion separable and laterally bent, longitudinally spaced bushings carried by the straight portion of said inner tube means and spacing said outer tube means for the inner tube means, at least one end of the said outer tube means being sealed closed, and a plurality of sleeves of insulation material fitted in end-to-end relation entirely over said outer tube means and also over the bent end and adjacent portion of said inner tube means, all of said sleeves being made from graphite and being removable, and those sleeves which are applied to said laterally bent end being short and comformingly shaped to follow the elbow-like contour of the bend, the leading sleeve in the latter group having a flaring conical bore and the trailing sleeve being engaged with abutment means on said outer tube member.

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