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FLASHER SWITCH MECHANISM

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Fig. 1

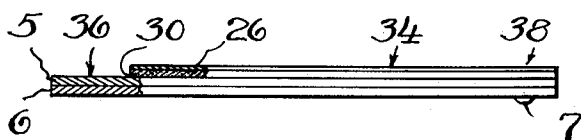
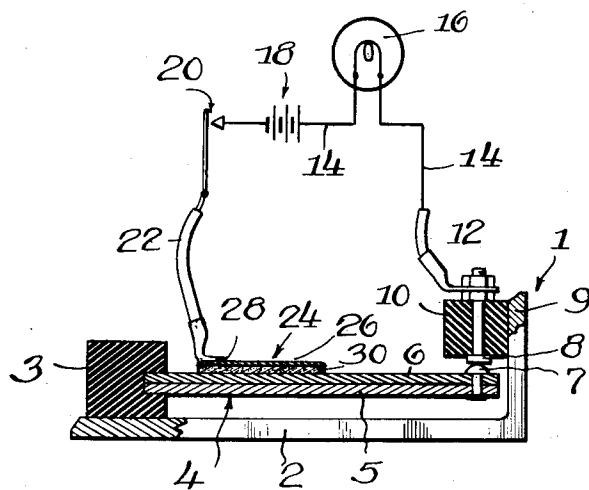
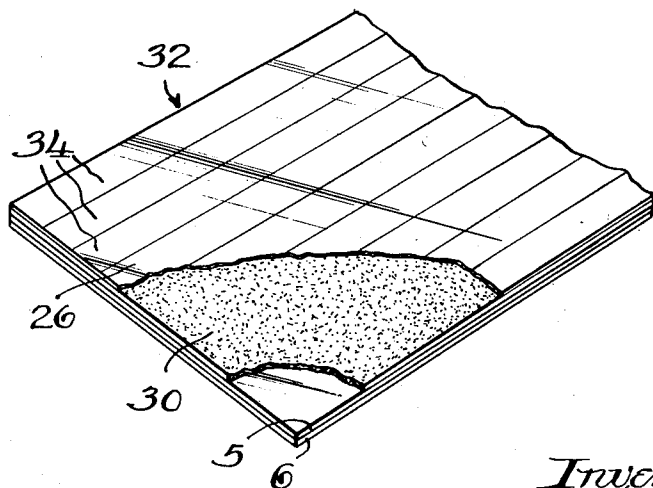


Fig. 3

Fig. 2



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FLASHER SWITCH MECHANISM

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7 Claims. (Cl. 200—122)

This invention relates to improvements in flasher signalling mechanism, and is more particularly concerned with a bimetallic-strip resistance-heater unit for operating a make-break switch in a flasher signalling mechanism.

Bimetallic-strip resistance-heater units have customarily been made by winding a resistance wire, which constitutes the heater coil, around a bimetal, with some electrical insulation means interposed between the heater coil and the strips. Such elements are customarily used in make-break circuits, the purpose of the heater coil being to heat the bimetal strip and deflect it and a contact affixed to it to break the circuit. Upon cooling of the strip, it returns to its normal position, in which position current is again allowed to flow through the heating coil, which in turn again deflects the strip, thus effecting a cyclic deflection of the bimetallic strip. Such units are relatively expensive and time consuming to manufacture. In addition, the interposition of electrical insulating means between the resistor and the bimetal necessarily also interposes thermal insulation with resulting loss of sensitivity of the element.

In the manufacture of flasher units, a bimetallic-strip resistance-heater unit represents a substantial part of the cost of the flasher unit and it is extremely desirable to provide a unit and a method for making same which reduces such cost.

Accordingly, it is one object of the invention to provide a bimetallic-strip resistance-heater unit which is relatively simple to manufacture in large quantities at low cost. It is a further object of the invention to provide a bimetallic-strip resistance-heater unit which maximizes heat transfer from the heater to the bimetal. Another object of the invention is to provide a flasher unit with a bimetallic-strip resistance-heater unit for operating a make-break switch to cyclicly interrupt the flow of current to a flasher element. A still further object of the invention is to provide a method of making bimetallic-strip resistance-heater units which is inexpensive and simple to perform. Other and further objects of the invention will become readily apparent from a reading of the description following hereinafter and from an examination of the drawings, in which:

Fig. 1 is a schematic representation, including structure partly in cross-section, of a flasher unit of the invention,

Fig. 2 is a perspective view, partially broken away, of an integral laminated sheet from which bimetallic-strip resistance-heater units are obtained according to the method aspect of the invention, and

Fig. 3 is a cross sectional view of an individual bimetallic-strip resistance-heater unit obtained, according to the method of the invention, from the sheet shown in Figure 2.

In the flasher unit of the invention the known form of resistance wire coil-bimetal assembly is replaced with a

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bimetal-heater unit comprising a bimetallic strip having an area resistance element adherently engaging a surface thereof. In a preferred embodiment of the invention, a semi-conductive adhesive layer covers a substantial portion of a surface of the bimetal element and is, in turn, covered by copper foil as a terminal for connecting the semi-conductive layer in series in the electrical circuit. (The term "semi-conductive" is used herein in its broader sense, meaning partly conductive and partly resistive, and not in its restricted technical sense.) Current flowing through this resistance provides heat adequate to cause the bimetal to bend, thus causing the circuit to a flasher bulb to open. Then, as the bimetal cools, the circuit is again closed, thus actuating the flasher bulb. The method of aspect of the invention contemplates a simplified procedure for preparing bimetallic-strip resistance-heater units from a large laminated sheet of bimetal, semi-conductive adhesives layer and foil terminal. Such sheets are cut into strips to form the units. For mounting and terminal purposes, a portion of the resistance layer may be chipped off as required.

The flasher unit 1 of the invention, as shown in Fig. 1, comprises a body member 2, which has affixed to one end thereof a mounting block 3 of insulating material. This mounting block serves to hold rigid one end of the bimetal strip 4. The bimetal strip 4 comprises a strip of metal 5 having a low (or negative) co-efficient of thermal expansion and a strip of metal 6 having a high co-efficient of thermal expansion.

The outer free end of the bimetal strip 4 is provided with a contact element 7 which is movable into and out of engagement with the fixed contact element 8. The contact element 8 is mounted in a non-conductive block 10 which is in turn affixed to the body 2 at 9.

The contact 8 is electrically connected by an electrical lead 12 through conductor 14 to a flasher lamp bulb 16. The flasher bulb 16 is in series with a source of electromotive force 18, such as a battery. A manually operable starting switch 20 is connected in the circuit to control the flow of current from source 18 through lead wire 22 to the heater 24 of the make-break operator for contact 7 and through the balance of the circuit.

In the operation of the flasher unit 1, the manually operated switch 20 is first closed, causing current to flow from the source 18 to the heater 24. The heater 24 causes a deflection of the bimetal 4, thus separating the normally closed contacts 7 and 8, and thereby interrupting the circuit to the flasher bulb 16.

As soon as the switch 20 is closed the current flow from source 18 through lead 22, heater 24, bimetal 4, contacts 7 and 8, and conductor 14 causes the signal bulb 16 to light up. Only after the heater 24 causes the deflection of bimetal 4, and thereby the separation of contacts 7 and 8, is the current flow to the flasher bulb 16 discontinued. At this point the bulb 16 is extinguished, and current flow to the heater 24 is discontinued. The bimetal 4 thereby is allowed to cool off and assume its normal position. When it has done so the contacts 7 and 8 are again brought into engagement and the flasher bulb 16 is again activated. This cyclic activation and de-activation of the bulb 16 accomplishes the flashing action of the flasher unit 1.

Fig. 1 exemplifies an embodiment wherein the heater 24 is mounted on the bimetal 4 in contact with the metal 5 having the higher co-efficient of thermal expansion. Obviously, such an arrangement accomplishes a transmission of heat to the driving component of the bimetal with minimal time lag. It is also possible, and sometimes preferable, to have the heater 24 mounted upon the surface of the metal having the lower co-efficient of

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thermal expansion, i.e., element 5, in order to remove the possibility of undesirably stiffening the unit. Such an arrangement is shown in Fig. 3, which is discussed in further detail hereinafter in connection with the description of the method aspect of the invention. It should be noted, however, that in either construction the contact 7 must be mounted on the side of the bimetal 4 having the higher co-efficient of thermal expansion.

The heater 24 comprises an electrically conductive foil 26, which is preferably a copper foil, and to which the lead conductor 22 is affixed, as at 28. The foil 26 engages the surface of an electrical resistance adhesive layer 30 which, in turn, engages the surface of the bimetallic strip 4.

The bimetallic-strip resistance-heater units may be simply and economically prepared by first making an integral laminated sheet of bimetal-heater structure 32, as shown in Fig. 2. The integral sheet 32 is prepared by first joining metallic sheets 6 and 5 having differing coefficients of thermal expansion. Then, a sheet 26 of electrically conductive foil is bonded to the bimetallic sheets 5 and 6 by an electrical resistance adhesive material 30 which has previously been placed on the surfaces to be joined. The integral sheet 32 can then be cut into individual strips 34 to any length or width desired. The strips 34 may then (see Fig. 3) have a portion of the layers 26 and 30 stripped therefrom, at one end thereof, as at 36, so that the bimetal strips can be mounted within a holder. The other end of the strip 38 then has contact 7 affixed thereto.

An example of the manufacture of the laminated sheet of bimetal-heater structure is as follows: A bimetal sheet is first prepared (see Fig. 2, elements 5 and 6), or obtained from any of the commercially available sources. Next, a slurry of the adhesive composition is prepared. The adhesive must be non-thermoplastic. Any adhesive may be used, however rubber-phenolic adhesives are preferred. A preferred commercially available adhesive is "Plastilock #604," which is a non-thermoplastic, water-resistant and aromatic-oil resistant adhesive comprised of a mixture of nitrile rubber and phenolic resin, compounded with curatives. This adhesive was found to have exceptional bond strength in the flasher unit and stood up well under the moderate temperature at which the unit was operated. The other components of the slurry used were Great Lakes artificial graphite as the electrically conductive material and an organic solvent, e.g. methyl ethyl ketone. Other electrically conductive components could be used, such as acetylene black and other carbon blacks.

The slurry was prepared by mixing 77 parts of Plastilock #604 containing 71% solids with 23 parts of graphite (-200 mesh) and a sufficient amount of methyl ethyl ketone to obtain a slurry having a viscosity of 15 centipoises. Such a mixture is then subjected to a milling treatment, e.g. in a ball mill. After the milling operation is completed, the slurry is screened and ready for use.

The electrically conductive foil may be a copper foil. The foil is preferably cleaned before its joinder to the bimetal, e.g. by immersing it in an aqueous acid solution. After the foil is cleaned it is rinsed thoroughly and dried. The surface of the bimetal to be joined is also cleaned, and any commercially available household cleanser may be used for this purpose.

The laminate is prepared by first coating one side of the conductive foil and one surface of the bimetal with the slurry. The coatings are then allowed to dry, and if desired a second coat may be applied to these parts. A stiffener material, may also be placed on the freshly coated foil, if desired, and a second coating of the slurry may be spread on top of this material. After the coatings are dried (all the solvent is volatilized from the adhesive), the laminate may be completed by placing

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the foil on the bimetal strip with the coated sides in contact.

The joinder of the metals is accomplished under the influence of heat and pressure. For example, a pressure of 40 pounds per square inch and a temperature of 400° F. may be used. The assembly is preferably cooled while still under pressure. This method of preparation, in one example, resulted in the production of a laminate sheet having an overall thickness of .030 inch, and in which the conductive adhesive layer had a thickness of about .012 inch. As indicated above, the laminated sheet, the preparation of which has just been described, can thereafter readily be cut to the desired size, and portions of the adhesive and conductive foil may be stripped from each laminated strip in accordance with the resistance requirements of the unit.

As an alternative procedure, a spray coating of a terminal element may be used. Thus, the bimetallic strip may be coated with a layer of conductive adhesive, and the terminal element, e.g. copper, can then be sprayed thereover.

The integral strip containing both the bimetallic strip and the resistor-heater is readily manufactured according to the method described above, and the necessity of forming small heaters and attaching them with suitable insulation to a bimetallic strip is eliminated. By eliminating this electrical insulation between the heating coil and the bimetal, the effectiveness of the heater is markedly increased, since the electrical insulation of necessity also is a heat insulator. The bimetallic-strip resistance-heater unit obtained is more flexible than those previously known, and is much more sensitive since the resistance-heater elements can readily move with the strip and can be made to extend throughout the length of the bimetallic strip, if desired.

While only particular embodiments of the invention have been disclosed and described above, it will be readily apparent to those skilled in the art that various modifications may be made without departing from the spirit and scope of the invention.

Invention is claimed as follows:

1. A bimetal strip-heater unit assembly comprising a bimetal strip, an electric resistance element covering a substantial portion of an exposed surface of said bimetal strip in electrical and thermal contact therewith, said resistance element comprising a flexible layer of semi-conductive composition, and terminal means in contact with a substantial portion of the exposed surface of said resistance element for electrically connecting said resistance element and said strip in series in an electrical circuit, whereby said resistance element and said strip are heated upon energization of said circuit.

2. A bimetal strip-heater unit assembly in accordance with claim 1 wherein said semi-conductive composition comprises a flexible binder material impregnated with electrically conductive particles.

3. A bimetal strip-heater unit assembly in accordance with claim 1 wherein said terminal means comprises a thin layer of metal covering the exposed surface of the resistance element.

4. A bimetal strip-heater unit assembly in accordance with claim 1 wherein said terminal means comprises metal foil bonded to the exposed surface of the resistance element.

5. A flasher unit comprising a body member, a non-conductive mounting means on said body member, a bimetallic strip affixed at one end to said mounting means and having an electrical contact element at its free end, a fixed electrical contact element mounted on an insulated portion of said body member in juxtaposed position to said movable electrical contact element, resistance heater means for said bimetallic strip comprising a thin layer of a semi-conductive composition comprised of a flexible binder material impregnated with electrically conductive

particles on one surface of said strip, terminal means in contact with a substantial portion of the exposed surface of said layer, an electrical circuit including a signal flasher element, said contacts, bimetal strip, layer, and terminal means, wherein when said contacts are in engagement current flows through said terminal means, said layer and said contacts to the signal flasher element.

6. A flasher unit in accordance with claim 5 wherein said terminal means comprises a thin layer of metal covering the exposed surface on said semi-conductive layer. 10

7. A flasher unit in accordance with claim 5 wherein said terminal means comprises metal foil bonded to the exposed surface of the semi-conductive composition.

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