



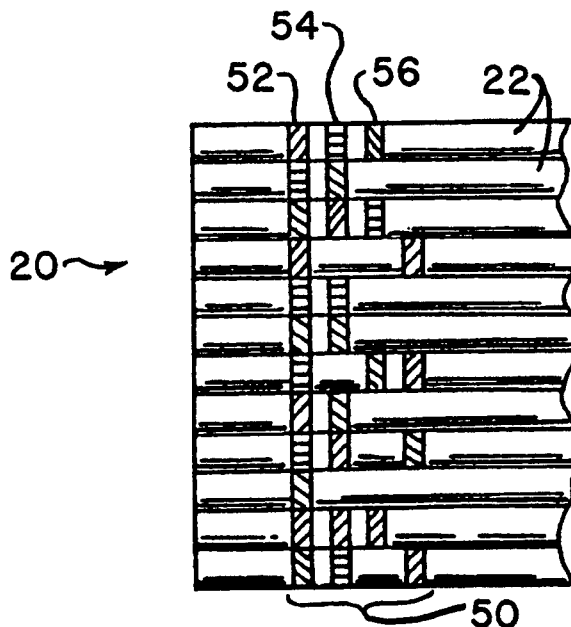
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<p>(21) International Application Number: PCT/US94/08749 (22) International Filing Date: 3 August 1994 (03.08.94) (30) Priority Data: 08/110,899 24 August 1993 (24.08.93) US (71) Applicant: UNITED TECHNOLOGIES AUTOMOTIVE, INC. [US/US]; 5200 Auto Club Drive, Dearborn, MI 48126-9982 (US). (72) Inventors: LAMM, Foster, P.; 56 Clinton Drive, South Windsor, CT 06074 (US). BARTLETT, John, M.; 215 Park Avenue, Colchester, CT 06415 (US). GOINGS, Scott, N.; 4555 Lynne Lane, Milford, MI 48382 (US). (74) Agent: HABELT, William, W.; United Technologies Automotive, Inc., Legal Staff - Patent, 5200 Auto Club Drive, Dearborn, MI 48126-9982 (US).</p>	<p>(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i></p>	

(54) Title: WIRE HARNESS ASSEMBLY HAVING COLOR CODED WIRES

(57) Abstract

In a wire harness including a plurality of individual insulated wires bundled and wrapped together to form a multi-branched cable having electrical connectors or terminals mounted to each end of its branches, each individual wire has its opposite ends marked with an indicia code uniquely identifying that wire and distinguishing the opposite ends of that wire from the ends of all other wires having the same color of insulation. The indicia code comprises one or more colored markings applied to the insulation of the wire near each end of the wire.



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**WIRE HARNESS ASSEMBLY HAVING COLOR CODED WIRES****Technical Field**

The present invention relates generally to wire harness assemblies of the type typically comprising a plurality of wires bundled and wrapped together to form a multiple wire cable generally having several branches extending therefrom. More particularly, the present invention relates to the marking of the opposite ends of each individual wire with its own particular code uniquely identifying that wire so as to distinguish the opposite ends of that wire from the other wires in the wire harness assembly.

**Background Art**

Wire harness assemblies comprise a plurality of elongated wires bundled together, usually being wrapped with tape and housed in a protective conduit, to form an elongated multiple-wire cable, generally having one or more branches extending from a central axially extending truck. Such wire harness assemblies are useful in various apparatus, including for example appliances, automobiles, aircraft, ships and building structures, wherein electrical connections must be made to establish distinct circuits between relatively distantly spaced electrical components, such as for example electric motors, instruments, lights, fans and other types of electrical equipment.

In automobiles, one or more wire harness assemblies are used to electrically connect the various electrical components in the interior of the vehicle to the vehicle's battery or to a fuse box, which in turn is connected to the vehicle's battery. Wire harness assemblies may also be used to interconnect various electrical components to each other or to a junction box. Typically, an

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5 automobile wire harness assembly will have a main axially extending trunk with several side branches extending therefrom leading to various electrical apparatus disposed at different locations all around the automobile. The main trunk and each of the branches comprises a plurality of individual wires, each of which must be electrically connected to a particular pin or socket of a connector or to a terminal adapted for subsequent connection to a specific electrical component in order to form the proper electrical circuits necessary to power the electrical component for operation.

10 As the wire harness assembly or assemblies, as the case may be, are hidden from view from within the vehicle interior below the floor, or above the headliner, or within the side panels and doors of the vehicle, it is extremely important during manufacture that all of the individual wires of the wire harness assembly or assemblies are properly connected to a specific terminal or a particular pin or socket of a connector. In order to facilitate the proper connection of the individual wires to their respective connection members, i.e. terminal or connector, it is necessary to be able to distinguish each wire from the other wires in the harness assembly. One scheme for identifying individual wires is to use a plurality of wires having insulation of different color configuration, either of a solid color or striped with two or more colors, in forming the wire harness assembly such that no two wires have the same color configuration. While practicable, using such an identification scheme is expensive to implement in that several different color configurations of insulated wire must be purchased and maintained on hand.

35 Another scheme for identifying individual wires is to apply an identifying indicia to the insulation

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of each wire at each end of the wire, preferably sufficiently inwardly from the ends of the wire to accommodate stripping of the wire for electrical connection. Such identifying indicia may comprise a  
5 separate collar bearing a numeric, alpha or alphanumeric code wrapped about the wire, or a colored tape wrapped about the wire, or an indelible indicia code actually stamped onto the surface of  
10 the wire insulation. Applying a separate collar or tape to the wire insulation is again expensive and time-consuming and stamping an indicia code onto the wire insulation requires expensive stamping machinery.

#### Summary of the Invention

15 It is an object of the present invention to provide a wire harness assembly comprised of a plurality of wires having insulation of the same color, with each wire having its opposite ends marked with a unique indicia code.

20 It is a further object of the present invention to provide a wire harness assembly comprised of a plurality of wires having insulation of the same color, with each wire having its opposite ends marked with a unique indicia code comprising one or  
25 more colored markings applied to the wire insulation near the terminus of the wire .

A wire harness subassembly comprising a plurality of individual insulated wires bundled and wrapped into a cable having a least two ends, each  
30 end of the cable adapted to receive at least one electrical connection means, for example a terminal or a connector, is provided wherein each individual wire has its opposite ends marked with an indicia code uniquely identifying that wire and  
35 distinguishing the opposite ends of that wire from the ends of all other wires having the same color of

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insulation, the indicia code comprising one or more colored markings applied to the insulation of the wire near each end of the wire. Preferably, all wires in the wire harness assembly have the same color insulation and each wire is marked with a series of colored markings of one or more colors. In this manner, the opposite ends of each individual wire are uniquely identified whereby the ends of the individual wires may be distinguished one from another and the opposite ends of each individual wire may be identified at different ends of the harness subassembly.

#### **Brief Description of the Drawings**

The present invention will be described herein with reference to the drawing wherein:

Figure 1 is a perspective view of a wire harness assembly;

Figure 2 is an enlarged perspective view of an end of a cable of the wire harness assembly of Figure 1 prior to attaching a connector thereto; and

Figure 3 is a plan view of the end of the cable of Figure 2 with the individual wires thereof laid out flat to illustrate the color markings disposed thereon.

#### **Detailed Description of a Preferred Embodiment**

The wire harness subassembly of the present invention is useful in manufacturing wire harnesses suitable for use in a wide variety of apparatus, including large appliances, structures, aircraft, ships and, in particular, automobiles, wherein electrical connections must be made between relatively distantly spaced electrical contacts. The wire harness subassembly of the present invention will be discussed herein in reference to a wire harness of the type commonly used in automobiles.

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Referring now particularly to Figures 1 and 2 of the drawing, there is depicted therein an automobile wire harness 10 comprised of a plurality of wires 20, each having an insulation layer 22, bundled together to form a cable 12, which may be directly wrapped with tape or, as depicted, may be disposed within a conduit 30 comprising a tubular member 32 and, when desired, also a foam outer covering 34, and wrapped with a tape 36. The wire harness 10 has an axially extending central main line 14, commonly referred to as a trunk, and several sublimes 16, commonly referred to as branches, extending outwardly therefrom. The branches 16 may be of different lengths and extend in any direction and contortion to reach the various electrical components (not shown) to which it is desired to transmit electrical signals.

The bundled and wrapped wires form a wire harness subassembly having multiple endpoints to which various connection means 40 must be correctly connected to form the wire harness 10 and provide the necessary circuits for transmitting electrical signals, in particular power signals, throughout the automobile. The various connection means, which may include for example pin connectors 42, socket connectors 44 or terminals 46, are connected to the ends of the branches 16 of the wire harness subassembly to facilitate electrical connection to the various electrical components scattered through the automobile. The truck 14 of the wire harness 10 is also connected to connection means 40 for facilitating electrical connection to a power supply (not shown), such as a battery or a fuse box, or a junction box (not shown) or a grounding bus bar (not shown).

Referring now to Figure 3, each individual wire 20 is marked on its insulation 22 at its

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opposite ends with an indicia code 24 uniquely identifying that wire and distinguishing the opposite ends of that wire from the ends of all other wires having the same color of insulation. In accordance with the present invention, the indicia code comprises at least one colored markings 50, such as a bar or a dash, applied to the insulation 22 of the wire 20 near each end of the wire. Preferably, all wires 20 in the wire harness assembly have the same color insulation 22 and each wire is marked with a series of colored markings 50, which may comprise several markings of one color or of different colors, disposed in abutting or axially spaced relationship. The colored markings 50 may be readily applied, for example, by jet inking or by contact inking during the process of cutting the individual wires that make up the harness to the desired length, which as noted before may vary among wires.

In this manner, the opposite ends of each individual wire 20 are uniquely identified whereby the ends of the individual wires may be distinguished one from another and the opposite ends of each individual wire may be identified at different ends of the harness subassembly. When installing the connection means to the ends of the branch lines 16 and the trunk line 14, the opposite ends of any given wire 40 may be readily identified by the colored markings 50 thereby enabling the installer to ensure that the ends of that wire will be connected to the proper contacts on their respective connection means and, therefore, ensuring that the necessary circuits within the wire harness 10 are correctly established.

In a preferred embodiment of the present invention, all wires 40 have the same color insulation and each individual wire is marked on its



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insulation with a series of colored markings 50, with each marking by its color and position, as well as the absence of a marking in a particular position, uniquely identifying a particular wire. Additionally, a particular color in a particular position may denote a selected item of information useful during the installation of the connection means to the ends of the various cable ends of the wire harness 10, or it may convey product or customer information.

For example, as illustrated in Figure 3, several of the wires 40 of the end of this particular cable are marked near their ends, but sufficiently upstream from the actual terminus of the wire to accommodate stripping of the end portion of the insulation to facilitate electrical connection, with a series of colored markings 50, shown, for illustration purposes only, as being located in up to four spaced positions, with the markings being of a first color 52, a second color 54, a third color 56. In this example, the twelve wires at the end of this cable are uniquely identified through the use of only three colors. The twelve possible color combinations of the dashes in the first and second positions, or the presence of a colored dash in the first position and the absence of a colored dash in the second position, inward from the end of the wire uniquely identify each of the twelve wires. The presence of additional dashes in either or both of the two further inboard positions from the end of the wire serve to communicate additional information as these dashes are not needed, in the case of a twelve wire cable, to identify the wire per se.

As will be apparent to persons skilled in the art, various modifications and adaptations of the color coding system hereinbefore described will

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become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

**Claims**

1. A wire harness subassembly comprised of a plurality of wires bundled together to form a cable, each of said wires having an insulation layer and first and second ends, the insulation layer of each of said wires having an identifying code disposed thereon near both its first and second ends, said identifying code comprising at least one colored marking applied to the insulation layer, the colored marking applied to any one of said wires being unique to said one wire and different from a colored marking applied to all other of said wires.
2. A wire harness subassembly as recited in claim 1 wherein at each end of said wire said identifying code comprises at least one colored marking extending transversely across the insulation layer of said wire, said at least one colored marking being in at least one of a plurality of selected locations positioned at axially spaced intervals inwardly from and near the respective wire end.
3. A wire harness subassembly as recited in claim 2 wherein the insulation layer of all wires of said plurality of wires is of a same first color.
4. A wire harness subassembly as recited in claim 3 wherein for each of said wires, the presence or absence of at least one second color in at least one preselected location of said selected locations uniquely identifies each of said wires from all other of said wires, the at least one second color being selected from a plurality of second colors, each of the second colors being different from the first color and all other second colors.

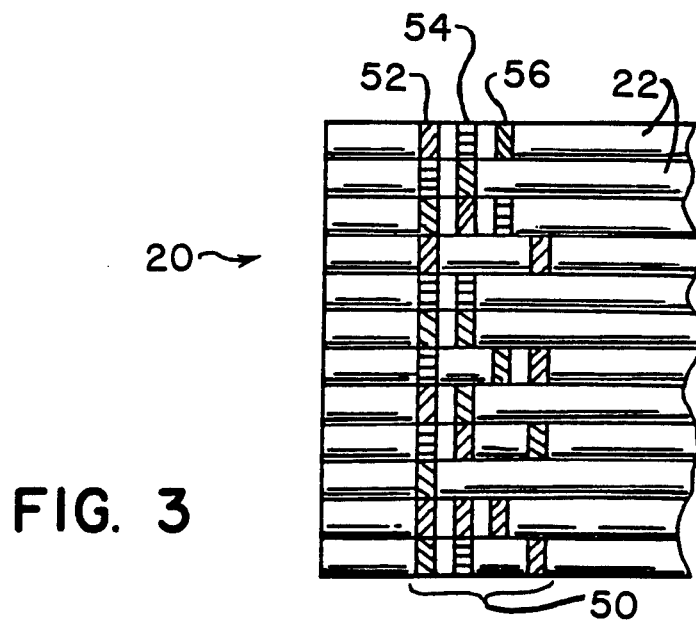
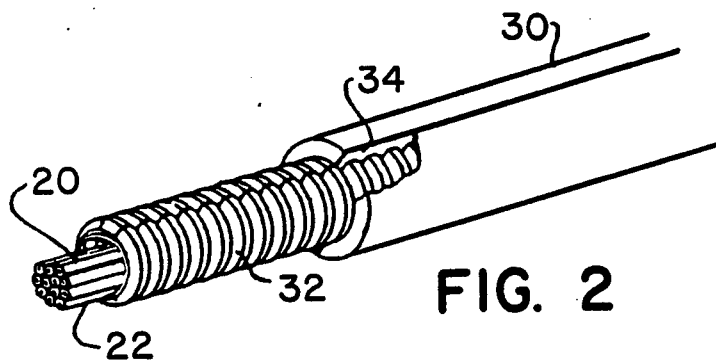
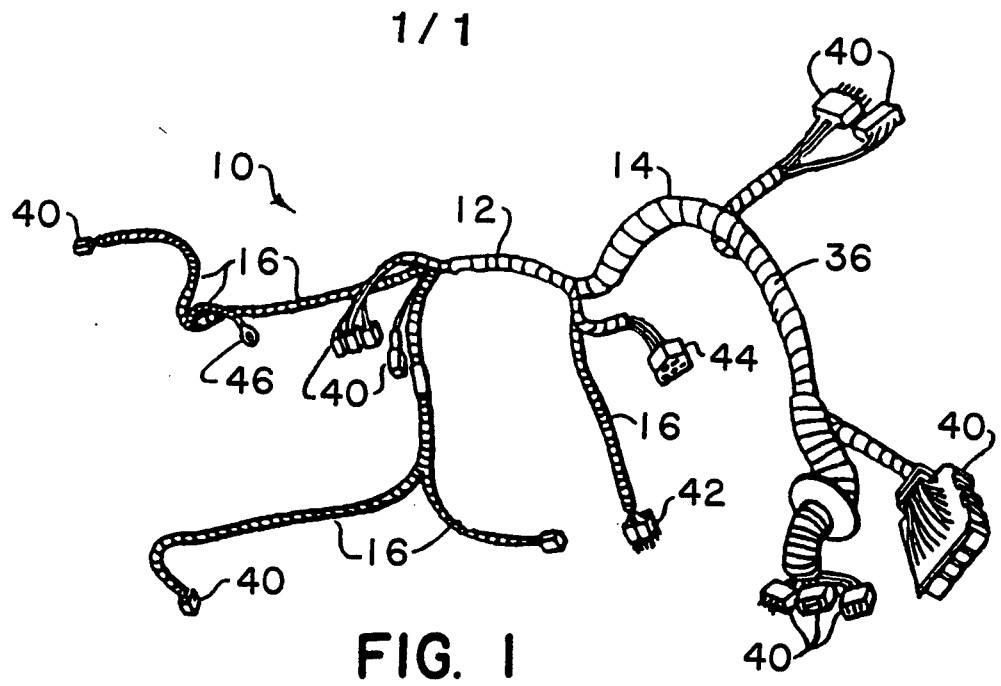
5 5. A wire harness subassembly as recited in claim 4 wherein for each of said wires, the presence a second color in a preselected second location of said selected locations conveys nonidentification information, the second color being selected from a plurality of second colors, each of the second colors being different from the first color and all other second colors.

5 6. A wire harness subassembly as recited in claim 1 wherein at each end of said wire said identifying code comprises at least one colored marking extending transversely across the insulation layer of said wire, said at least one colored marking being in at least one of a plurality of selected locations positioned in abutting relationship inwardly from and near the respective wire end.

7. A wire harness subassembly as recited in claim 6 wherein the insulation layer of all wires of said plurality of wires is of a same first color.

5 8. A wire harness subassembly as recited in claim 7 wherein for each of said wires, the presence or absence of at least one second color in at least one preselected location of said selected locations uniquely identifies each of said wires from all other of said wires, the at least one second color being selected from a plurality of second colors, each of the second colors being different from the first color and all other second colors.

5 9. A wire harness subassembly as recited in claim 8 wherein for each of said wires, the presence a second color in a preselected second location of said selected locations conveys nonidentification information, the second color being selected from a plurality of second colors, each of the second colors being different from the first color and all other second colors.



**INTERNATIONAL SEARCH REPORT**

International Application No  
**PCT/US 94/08749**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 6 B60R16/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC 6 B60R H01B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
<b>Category *</b>	<b>Citation of document, with indication, where appropriate, of the relevant passages</b>	<b>Relevant to claim No.</b>
Y	EP,A,0 334 343 (YAZAKI) 27 September 1989 see column 2, line 51 - column 3, line 30; figures 1,6 ---	1-9
Y	DE,A,14 90 282 (SIEMENS) 9 January 1969 see page 4, line 8 - page 7, line 15 see page 10, line 3 - page 12, line 24; figures 2,3 ---	1-9
Y	EP,A,0 235 924 (YAZAKI) 9 September 1987 see page 1, line 1 - page 4, line 8; figures 1-3,6,7 ---	1-6
Y	GB,A,974 792 (HONEYWELL) 11 November 1964 see the whole document ---	1-7
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
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Date of the actual completion of the international search  <b>11 November 1994</b>		Date of mailing of the international search report  <b>23. 11. 94</b>
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016		Authorized officer  <b>Geyer, J-L</b>

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB,A,1 229 009 (BRITISH INSULATED CALLENDER'S CABLES) 21 April 1971 see the whole document ---	1-3,6,7
A	DE,A,42 18 985 (GRÜNAU) 17 December 1992 see column 1, line 1 - line 29 see column 2, line 32 - column 3, line 11; figures 1-3 -----	1-3

**INTERNATIONAL SEARCH REPORT**

...ormation on patent family members

Intern al Application No

PCT/US 94/08749

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----- DE-A-1490282	09-01-69	NONE	-----
----- EP-A-0235924	09-09-87	NONE	-----
----- GB-A-974792		NONE	-----
----- GB-A-1229009	21-04-71	NONE	-----
----- DE-A-4218985	17-12-92	NONE	-----