594025

SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA

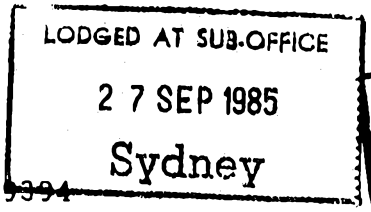
PATENTS ACT 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

We, YAZAKI CORPORATION, of 4-28, Mita 1 chome, Minato-ku, Tokyo 108, Japan hereby apply for the grant of a standard patent for an invention entitled:

"WIRE HARNESS FOR AUTOMOBILE"

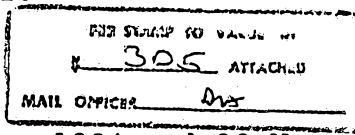
which is described in the accompanying complete specification.



DETAILS OF BASIC APPLICATION(S)

Number(s) of Basic Application(s):-
59-201979; 59-201980 and 60-07~~9394~~

Name of Convention Country in which Basic Application(s) were filed:-
Japan



Date(s) of Basic application(s):-
28 September, 1984; 28 September, 1984 and 29 May, 1985, respectively

Our address for service is:-

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DATED this TWENTY SEVENTH day of SEPTEMBER 1985

YAZAKI CORPORATION

By: M.J. Anderson

Registered Patent Attorney.

TO: THE COMMISSIONER OF PATENTS
AUSTRALIA

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 9.11.89

SBR/JS/0037F

Spruson & Ferguson

AUSTRALIA
CONVENTION
STANDARD
& PETTY PATENT
DECLARATION
SFP4

COMMONWEALTH OF AUSTRALIA
THE PATENTS ACT 1952
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a patent for an invention entitled:

Title of Invention: "WIRE HARNESS FOR AUTOMOBILE"

Full name(s) and address(es) of declarant(s): I/~~We~~ Yasuhiko Yazaki care of YAZAKI CORPORATION 4-28, Mita 1 chome, Minato-ku, Tokyo 108, Japan

do solemnly and sincerely declare as follows:–

Full name(s) of Applicant(s)

~~1. I am/We are the applicant(s) for the patent~~

(or, in the case of an application by a body corporate)

1. I am/~~We are~~ authorised by YAZAKI CORPORATION the applicant(~~s~~) for the patent to make this declaration on its/~~their~~ behalf.
2. The basic application(s) as defined by Section 141 of the Act ~~was~~/were made

Basic Country(ies): in Japan

Priority Date(s): on 28 September, 1984, 28 September 1984 and 29 May 1985

Basic Applicant(s): all by Yazaki Corporation

Full name(s) and address(es) of inventor(s)

~~3. I am/We are the actual inventor(s) of the invention referred to in the basic application(s)~~

(or where a person other than the inventor is the applicant)

3. SHINICHI UEDA, MICHIHIRO OHTAKA and YOSHIAKI NAKAYAMA all of 1500, Mishuku, Susono-shi, Shizuoka 410-11 Japan

~~(respectively)~~

~~is~~/are the actual inventor(s) of the invention and the facts upon which the applicant(~~s~~) is/~~are~~ entitled to make the application are as follows:

Set out how Applicant(s) derive title from actual inventor(s) e.g. The Applicant(s) is/are the assignee(s) of the invention from the inventor(s)

YAZAKI CORPORATION is entitled by Contract of Employment between the inventors as employees and YAZAKI CORPORATION as employer, as a person who would be entitled to have the patent assigned to it if a patent were granted upon an application made by the inventors.

4. The basic application(s) referred to in paragraph 2 of this Declaration ~~was~~/were the first application(s) made in a Convention country in respect of the invention(s) the subject of the application.

Declared at Tokyo this 26 day of September 19 85

Yazaki Corporation

.....

Signature of Declarant(s)
Yasuhiko YAZAKI

SFP4 To: The Commissioner of Patents 11/81

(12) PATENT ABRIDGMENT (11) Document No. AU-B-47957/85
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 594025

(54) Title
PRINTED WIRE HARNESS FOR AUTOMOBILE

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H05K 001/02 H05K 001/14

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(74) Attorney or Agent
SPRUSON & FERGUSON

(56) Prior Art Documents
GB 1193420
GB 1177275
GB 804772

(57) Claim

1. A circuit board construction to perform the function of an automobile vehicle wire harness, said circuit board construction comprising a first generally elongate insulative substrate; a plurality of second generally elongate insulative substrates overlapped on top of said first substrate with predetermined spacings between each other along said first substrate, wherein said plurality of second substrates extend perpendicularly to said first substrate; first conductive strip members applied on said first substrate therealong parallelly with each other; second conductive strip members applied on said respective second substrates therealong parallelly with each other and electrically connected to said first conductive strip members, said first substrate and said first conductive strip members thereon forming a trunk section, said second substrates and said second conductive strip members forming branch sections, said circuit board construction being disposed behind a dashboard, said conductive strip members of each branch section being connected to a connector which in turn is connected to controls, electric loads or the like disposed at the dashboard, wherein said second substrates overlapping said first substrate

are stacked on top said first substrate in such a manner that said substrates and said conductive strip members alternate, said circuit board construction further including means for connecting said first conductive strip members and said second conductive strip members, wherein said connecting means includes holes in said second substrate to provide communication between the conductive strip members of said second substrate and the conductive strip members of said first substrate; wherein said conductive strip members of said second substrate are dented through said holes toward and into engagement with the conductive strip members of the first substrate, connection of said first conductive strip members and said second conductive strip members being effected by welding or soldering at location where the former is engaged with the latter through said holes.

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FORM 10

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COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int. Class

Complete Specification Lodged:

Accepted:

Published:

Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

47957/85

Name of Applicant: YAZAKI CORPORATION

Address of Applicant: 4-28, Mita 1 chome, Minato-ku, Tokyo 108, Japan

Actual Inventor(s): SHINICHI UEDA, MICHIHIRO OHTAKA and YOSHIAKI NAKAYAMA

Address for Service: Spruson & Ferguson, Patent Attorneys, Level 33 St Martins Tower, 31 Market Street, Sydney, New South Wales, 2000, Australia

Complete Specification for the invention entitled:

"WIRE HARNESS FOR AUTOMOBILE"

The following statement is a full description of this invention, including the best method of performing it known to us

SBR/JS/0037F

ABSTRACT OF THE DISCLOSURE

A wire harness can be replaced partly or in its entirety with a circuit board which is composed of an insulator substrate and a plurality of conductive strip members provided thereon. The above mentioned conductive strip members are arranged on the insulator substrate parallel with each other. This parallel arrangement of the conductive strips corresponds to bundling of wires in a wire harness. By providing branch paths extending from the conductive strip members, the circuit board can replace a substantial part of the wire harness.

BACKGROUND OF THE INVENTION

This invention relates to a circuit board which is capable of serving the purpose of a wire harness for an automobile, and more particularly to a circuit board to replace at least part of a wire harness composed of a plurality of bundled wires, said wire harness having a design corresponding to a predetermined wiring pattern in an automobile structure so that the space taken by the wire harness may be made small, wiring thereof may be made with ease, and productivity may be increased.

A conventional wire harness is formed by determining the wiring path thereof in advance, and tying all electric wires passing therealong into a bundle. One such example is shown in Fig. 19, wherein a denotes an electric wire, b denotes a vinyl tape, and c denotes a connector. A wire harness A has a plurality of sub-harness e jointed (branch connection) to a main harness d. In this way, it has a complicated construction. Fig. 20 shows its wiring, wherein the wire harness A is fitted along a predetermined wiring path so that it lies along portions of various constructions, shapes, etc. in an automobile B, and fixed to a vehicle body by clips, clamps, etc. (not shown).

However, the prior art cannot stop the tendency that a wire harness becomes bulkier and bulkier due to ever increasing demand of electronic parts to be mounted to an automobile. Moreover, due to ever increasing various electric items themselves, the wire harness often interferes with various parts and the vehicle body, which makes it difficult to obtain a sufficient space for wiring.

Furthermore, as the wire harness becomes larger and its weight increases, manufacturing process, mounting process, etc. are increased, which results in the following probles.

(1) Electric wires constituting a wire harness have many different diameters and lengths, and branch electric wires (above mentioned joint portion) for connecting auxiliaries such as connectors, etc. are exposed from various portions. Accordingly, working processes are increased and automation is difficult to obtain.

(2) Different wire harnesses are required to be made according to different specifications and grades of an automobile, even if its kind and model are same. Accordingly, they are extremely complicated to manufacture and to control.

(3) When electric wires are jointed with respect to one another, such additional works as peeling of the jackets of electric wires, pressure welding of joint terminals, wrapping of insulated tapes to joint portions are required. Furthermore, the joint portions are swollen up due to the above mentioned terminals, insulated tapes, etc. Accordingly, shapes thereof become irregular.

(4) There is a tendency that wire harnesses are made even larger according to increase of the number of the above mentioned circuits. Accordingly, if the wire harnesses should remain in their present form, their wiring would become more and more difficult, which eventually results in a reduced room space of an automobile.

The present invention is accomplished in order to solve the abovementioned problems inherent in the prior art. Especially, in view of the swollen portions of the wire harness, for example, the portion where electric wires are concentrated (main harness d in Fig. 19) and joint portions (sub-harness in Fig. 19), the inventors of the present invention attempted to make these swollen portions flat just like a usual printed circuit board (P.C.B.) and a flexible printed circuit board (F.P.C.).

It is therefore a general object of the present invention to provide a circuit board which substantially overcomes or ameliorates the abovementioned disadvantages.

According to one aspect of the present invention there is disclosed a circuit board construction to perform the function of an automobile vehicle wire harness, said circuit board construction comprising a first generally elongate insulative substrate; a plurality of second generally elongate insulative substrates overlapped on top of said first substrate with predetermined spacings between each other along said first substrate, wherein said plurality of second substrates extend perpendicularly to said first substrate; first conductive strip members applied on said first substrate therealong parallelly with each other; second conductive strip members applied on said respective second substrates therealong parallelly with each other and electrically connected to said first conductive strip members, said first substrate and said first conductive strip members thereon forming a trunk section, said second substrates and said second conductive strip members forming branch sections, said circuit board construction being disposed behind a dashboard, said conductive strip members of each branch section being connected to a connector which in turn is connected to controls, electric loads or the like disposed at the dashboard, wherein said second substrates overlapping said first substrate are stacked on top said first substrate in such a manner that said substrates and said conductive strip members alternate, said circuit board construction further including means for connecting said first conductive strip members and said second conductive strip members, wherein said connecting means includes holes in said second substrate to provide communication between the conductive strip members of said second substrate and the conductive strip members of said first substrate; wherein said conductive strip members of said second substrate are dented through said holes toward and into engagement with the conductive strip members of the first substrate, connection of said first conductive strip members and said second conductive strip members being effected by welding or soldering at location where the former is engaged with the latter through said holes.

The above and other objects, novel features and advantages of the present invention will become more apparent from the description on an exemplary embodiment of the invention. The description makes reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an important portion of a laminated circuit board; of the prior art

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Fig. 2 is likewise a perspective view of interlayer connection boards;

Fig. 3 is a sectional view showing connection of the interlayer connection boards and the laminated circuit board;

Fig. 4 is a perspective view showing a laminated circuit board;

Fig. 5 is a plan view of a laminated circuit board according to a second preferred embodiment of the present invention;

Fig. 6 is a perspective view showing a piling up state of the laminated circuit board of Fig. 5;

Figs. 7 and 8 are schematic illustrations for explaining how to connect terminal portions of the laminated circuit board, respectively;

Fig. 9 is a perspective view showing an example of the wiring of a circuit board according to the present invention;

Fig. 10 is a sectional view showing a part of Fig. 9;

Figs. 11a and 11b are perspective views showing an important portion of modified embodiments of circuit boards, respectively;

Fig. 12 is a perspective view showing another example of a laminated circuit board according to the present invention;

Figs. 13 and 14 are sectional views showing how to connect the conductive strip members in the laminated circuit board of Fig. 12 respectively;

Fig. 15 is a further embodiment of the circuit board

according to the present invention, in which the circuit board is composed of two insulator substrates having conductive strip members extending perpendicularly to each other therein;

Fig. 16 is a sectional view showing how the conductive strip members on the two substrates are connected;

Fig. 17 is a perspective view of modified form of the embodiment;

Fig. 18 is an illustration showing how the circuit board of the embodiment is build-in in the instrument panel;

Fig. 19 is a schematic illustration for explaining a conventional wire harness;

Fig. 20 is a schematic perspective view showing wiring of the conventional wire harness; and

Fig. 21 is a perspective view showing wiring of the conventional wire harness particularly behind the instrument panel.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Preferred embodiments of the present invention will be described hereunder with reference to the accompanying drawings.

Fig. 1 is a plan view of a laminated circuit board according to the present invention, and Fig. 2 is a

perspective view showing a piling up state thereof.

A laminated circuit board 1 comprises insulated substrates 2 and a plurality of conductive strip members 3 arranged substantially parallel with each other thereon.

Each insulated substrate 2 is formed in a band shape using an insulator material such as, film such as polyester, polyimide resin, etc., paper phenol, glass epoxy, etc. which are used for a usual printed circuit board. Preferably, a film shaped insulator material should be employed in view of light weight and small size, and also for convenient purposes of wiring. The insulator substrate 2 has an L-shaped curved portion 2a and a T-shaped branch portion 2b corresponding to wiring paths of a wire harness.

The conductive strip member 3 is formed in a band shape having a uniform thickness but different narrow widths corresponding to current carrying capacities using a metallic conductor such as copper, aluminum, etc. The conductive strip member 3 is constituted to include a desired circuit pattern corresponding to the wiring path of a wire harness.

In Fig. 1, the conductive strip members 3_1, 3_2 and 3_3 have different widths, respectively. A linear path 3a is provided at its end portion with an L-shaped curved circuit 3b. At the same time, the member 3_3 is formed in a branch shape having a branch path 3c. In this way, even in the case one path is required to connect to many auxiliaries, switches, etc., a simple alternation of the circuit pattern can meet with all these requirements with ease.

Accordingly, the circuit patterns of the conductive strip member 3 arranged in the circuit board 1 are classified in the following three kinds. That is, (i) function of the circuits, (ii) actuation of loads, and (iii) combination of the foregoing. And, a most suitable pattern is selected among them so that the maximum effect can be obtained.

The "function of the circuits" means that in view of functions of circuits such as power circuits for various kinds of electric items (loads) mounted on an automobile, earth circuit, signal control circuit, meter circuit, etc., a sheet of circuit board which covers respective functions of the circuits is formed. The "actuation of loads" means that a sheet of circuit board is formed using all of such circuits as power circuits for actuating loads such as, for example, a wiper, etc., and earth circuit, signal circuit, switch circuits, etc. The "combination of the foregoing" means that a multifunction circuit board is formed by suitably combining the foregoing circuits, and a most effective circuit pattern such as light weight and small size is designed in view of the whole wiring paths of the wire harness.

Fig. 2 is a perspective view of interlayer connection boards. One of the interlayer connection boards 4 is provided with conductive interlayer connection strip member 6 extending in the lateral direction from a plurality of through holes 5 formed in the central portion of the insulation substrate 2, and a conductive strip member 7 having no through hole. The other interlayer connection board 4' comprises the insulator substrate 2 and a plurality of conductive interlayer connection strip members 6' having the

through holes each at its both ends. These boards 4, 4' may be of either a single faced board or a double faced board, and can be used for connecting the upper and lower interlayers of the laminated circuit boards and for connecting the adjacent circuit boards. The interlayer connection circuits 6, 6' and 7 are formed of the same members as those of the conductive strip member 3.

Fig. 3 is a sectional view showing an upper and lower interlayer connection state when the circuit boards are piled up. That is, end portions of the conductive strip members 3, 3 of the upper and lower cirucit boards 1, 1' are directly connected with the cirucits 6, 6 of the interlayer connection board 4, 4 by soldering 8, and a grommet 9 is inserted in the through hole 5 for fixture. Instead of the grommet 9, a rivet, pin, soldering, etc. may be used. Likewise, instead of soldering 8 for connecting the conductive strip member 8 and the circuit 6, they may be directly connected by screw means, anisotropic conductive rubber, welding, conductive adhesive agent, etc., or otherwise indirectly connected by connectors, etc. as will be described.

Fig. 4 illustrates layers of the laminated circuit board 1, 1', 1" which were formed as shown in Fig. 1. The respective circuit board are classified in view of the above mentioned "function of the circuits", "actuation of the loads", etc., and are connected between the upper and lower layers or adjacent circuit boards by the interlayer connection boards 4, 4'.

In this way, various connecting means of the circuit

boards are made available by using the interlayer connection boards 4, 4'. Accordingly, for example, in the case the respective layers are separately disposed, electric power source wires, earth wires, signal wires, etc. may be collected in one layer, or on the contrary, they may be separately disposed according to necessity. Moreover, since the respective conductive strip members 3 arranged in the circuit boards can be divided in several circuit patterns, only circuit pattern of each of such dividied portion can be designed and manufactured.

Fig. 5 is a plan view of a circuit board according to a second embodiment of the present invention, and Fig. 6 is a perspective view showing a piling up state thereof.

The circuit board 1 comprises an insulator substrate 2 and a plurality of conductive strip members 3 arranged thereon.

The insulator substrate 2 is formed in a band shape using an insulator material such as, film such as polyester, polyimide resin, etc., paper phenol, glass epoxy, etc. which are used for a usual printed circuit board. Preferably, a film shaped insulator material should be employed in view of light weight and small size, and also for convenient purposes of wiring thereof. The insulator board 2 has T-shaped branch portions 2b corresponding to wiring paths of a wire harness.

The conductive strip member 3 is formed in a band shape having a uniform thickness but different narrow widths corresponding to current carrying capacities using a

metallic conductor such as copper, aluminum, etc. The conductive strip member 3 is constituted to include a desired circuit pattern corresponding to the wiring path of a wire harness. In the figure, the conductive strip members 3_1 through 3_2 are formed in a linear shape having different widths, 3_3 are formed in a branch shape having one branch path 3c, and 3_4 through 3_8 are formed in a L-shaped or yoke-shape having bent path 3b respectively. Also, the conductive strip members 3_7, 3_8 are formed with branch paths 3c as same as in the case already described. Accordingly, even in the case one circuit is required to connect to many auxiliaries, switches, etc., a simple alternation of the circuit pattern can meet with all these requirements with ease.

In Fig. 6, the plurality of circuit boards 1, 1', 1"... which were formed as mentioned above are piled up in several layers. The respective circuit boards are formed per respective circuits such as, for eaxample, electric power source circuit, earth circuit, wiper circuit, meter circuit, etc. in a wire harness, and each of the respective layers is independent from one another in spite of multi-layers.

Figs. 7 and 8 are schematic illustrations showing how to connect the terminal portions of the respective circuit boards.

That is, terminals of the conductive strip members 3 are connected with terminal elements (not shown) in the circuit board 1, so that they can be directly connected to auxiliaries 11 such as switches, various electronic devices by a connector 10 corresponding to terminal

elements. On the other hand, in the circuit board shown in Fig. 8, electric wires 12 are in permanent connection with the respective conductive strip members 3 by spot welding, soldering, etc. By providing a pair of female and male connectors 10, 10' at the end portion of these wires 12, they can be connected to a sub-harness 13, or a circuit signal can be taken out.

In Fig. 9, a wire harness 14 formed of the plurality of circuit boards 1, 1', 1" ... shown in Figs. 4 and 6 is wired within a pad of an instrument panel 15. Fig. 10 is a sectional view of Fig. 9, wherein 15a denotes a wall surface of the instrument panel 15, 16 denotes an insulating foam material covering the wire harness 16. In this way, the flat-shaped circuit boards and/or the wire harness formed thereof can be integrally wired with a vehicle body of an automobile and articles mounted thereon by molding.

Figs. 11a and 11b illustrate modified embodiments of interlayer connection means of the circuit board, respectively. In Fig. 11a, the conductive strip member 3 or its extension is directly formed with through holes 5. In Fig. 11b, the conductive member 3 projects from the insulator substrate 2, and a grommet 17 projects from the conductive strip member 3. In this case, the afore-mentioned interlayer connection boards 4, 4' are not required, or at least, the number of them can be reduced extensively.

Fig. 12 illustrates another example of the circuit board according to the present invention. Different from those of Fig. 1 and Fig. 5, this circuit board 18 is separately formed in a vertical pattern circuit board and

a horizontal pattern circuit board, so that multilayer effects thereof can be increased. And, the vertical and horizontal pattern circuit boards are connected each other only at portions from where signals are required to take out. Figs. 13 and 14 illustrate connecting means thereof, respectively. In Fig. 13, upper and lower circuit boards 18a, 18b are formed with a through hole 19 and connected each other by soldering, screw means, rivets, grommets, pins, etc. Alternatively, in Fig. 14, the insulator substrate 2 of the vertical pattern circuit board 18a to be connected is formed with a hole 20 of a suitable size, and the upper and lower conductive strip members 3 are connected each other by spot welding, etc.

Referring to Figs. 15 through 18, a still further embodiment of the invention is explained. A first circuit board 1 is composed of a first insulator substrate 2 and a plurality of condutive strip members 3 which are linear and arranged parallel with each other on said first insulator substrate 2. Similarly, a second circuit board 1' is composed of a second insulator substrate 2' and a plurality of conductive strip members 3' which are linear and arranged parallel with each other on said second insulator substrate 2'. Said second circuit board 1' is piled up on said first circuit board 1 such that the conductive strip members 3 of the first circuit board 1 is oriented perpendicular to the conductive strip members 3' of the second circuit board 1'.

Referring to Fig. 16, the second insulator substrate 2' is formed with a through hole 20 at a predetermined position thereof such that a selected one of the conductive

strip members 3 of the first circuit board 1 is exposed.

Through this hole, one of the conductive strip members 3' is connected to said exposed conductive strip member 3 by welding or soldering. For ease of welding or soldering, the conductive strip member 3 to be exposed of the first circuit board 1 may be struck out upward or the conductive strip member 3' of the second circuit board 1' may be dented downward beforehand.

Conductive strip members 3 are of a narrow band shaped plate. The conductive strip members 3 are formed differently in cross sectional dimension according to current carrying capacites such as, for example, one with an equal thickness and a different width, or one with an equal width and a different thickness. Connection of the conductive strip members 3 with an outside portion, that is, connection thereof with other portions of a wire harness, switches, electronic equipment, and other electric articles thereof may be directly made at, for example, terminal portions formed in the electric articles, or as shown in Fig. 15, made through electric wires 12 by fixing (permanent connection) the electric wires 12 by welding, soldering, etc.

Fig. 17 illustrates another mode of connection of the conductive strip members 3. The conductive strip member 3 is continuously formed at its end portion with a male terminal t which is protected and rested in a connector housing c. Instead of the male terminals 5, a female terminal for receiving a male terminal may be continuously formed to the member 3. In this case, since an outside, since an outside terminal portion of the conductive strip

member 3 is protected by the connector housing c, its maintenance is improved. At the same time, the above-mentioned electric articles and other connectors can be interconnected by one touch.

Fig. 18 illustrates one example of application of this embodiment. In the figure, circuit boards 1 and 1' are wired within a pad of an instrument panel P, and connector-connected to switches and branch wire portion (usual electric wires) e using the connector housing 6. As seen from the drawing, the first circuit board 1 may be used in replace of the main stream section of a wire harness which is conventionally used whereas the second circuit board 1' may be used for the branch section thereof.

Although two circuit patterns A and B are piled up in a check striped-shape in the this embodiment, it will be easily understood that these patterns 1 and 1' may be piled up in three layers or more at desired position.

Since the present invention is such constituted as described in the foregoing, the following effects are obtained.

(1) A wire harness so far formed of a number of electric wires bundled together is replaced with a conductive strip member of a narrow band shape and an insulator substrate for supporting thereof. Accordingly, the insulator substrate can be made thin, and no vinyl tapes, clamps, etc. for binding are required any more. Thus, the wire harness as a whole can be made light in weight and small in size extensively.

(2) Since the circuit board is a thin board similar to a printed circuit board, it can be integrally built in the floor, wall, articles of a vehicle body. Thus, a space so far required for wiring can be either totally eliminated or reduced extensively.

(3) The circuit board can be built therein with a circuit pattern corresponding to a desired wiring path of the wire harness. Accordingly, working processes required for jointing, etc. heretofore, and mounting processes of the wire harness in production line can be reduced extensively. Thus, productivity is rapidly increased.

(4) Various connecting means are applicable to the circuit boards by interlayer connection boards. Accordingly, additional connection of a sub-harness to a main harness, and design and manufacture per each circuit pattern are easily obtained.

(5) By installing the circuit boards piled up in layers at every important portion, the wire harness can be assembled in a cassette type.

Although the present invention has been described in a form of preferred embodiments, it will be appreciated that many modifications will readily occur to those skilled in the art without departing from the spirit and scope of the present invention.

The claims defining the invention are as follows:

1. A circuit board construction to perform the function of an automobile vehicle wire harness, said circuit board construction comprising a first generally elongate insulative substrate; a plurality of second generally elongate insulative substrates overlapped on top of said first substrate with predetermined spacings between each other along said first substrate, wherein said plurality of second substrates extend perpendicularly to said first substrate; first conductive strip members applied on said first substrate therealong parallelly with each other; second conductive strip members applied on said respective second substrates therealong parallelly with each other and electrically connected to said first conductive strip members, said first substrate and said first conductive strip members thereon forming a trunk section, said second substrates and said second conductive strip members forming branch sections, said circuit board construction being disposed behind a dashboard, said conductive strip members of each branch section being connected to a connector which in turn is connected to controls, electric loads or the like disposed at the dashboard, wherein said second substrates overlapping said first substrate are stacked on top said first substrate in such a manner that said substrates and said conductive strip members alternate, said circuit board construction further including means for connecting said first conductive strip members and said second conductive strip members, wherein said connecting means includes holes in said second substrate to provide communication between the conductive strip members of said second substrate and the conductive strip members of said first substrate; wherein said conductive strip members of said second substrate are dented through said holes toward and into engagement with the conductive strip members of the first substrate, connection of said first conductive strip members and said second conductive strip members being effected by welding or soldering at location where the former is engaged with the latter through said holes.

2. A circuit board construction according to claim 1, wherein said conductive strip members of the first substrate and the second substrate are formed differently in cross sectional dimension according to current carrying capacities.

3. A circuit board construction according to claim 1, wherein said conductive strip members of the second substrate are connected to electric wires through welding, soldering or the like.

4. A circuit board construction according to claim 1, wherein said conductive strip members of the second substrate are formed at end portions thereof with terminals.

5. A circuit board construction according to claim 4, further including connector housings to accommodate said terminals.

DATED this TENTH day of JULY 1989
Yazaki Corporation

Patent Attorneys for the Applicants
SPRUSON & FERGUSON

FIG. 1

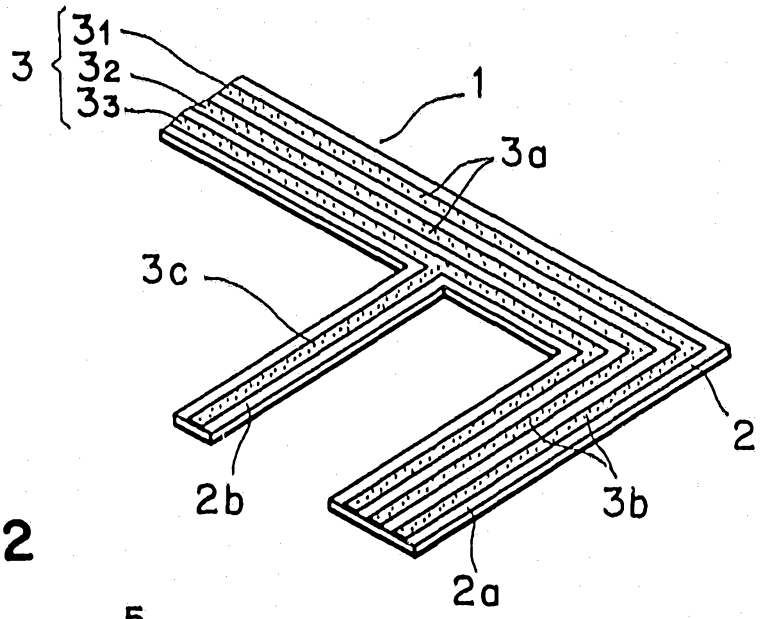


FIG. 2

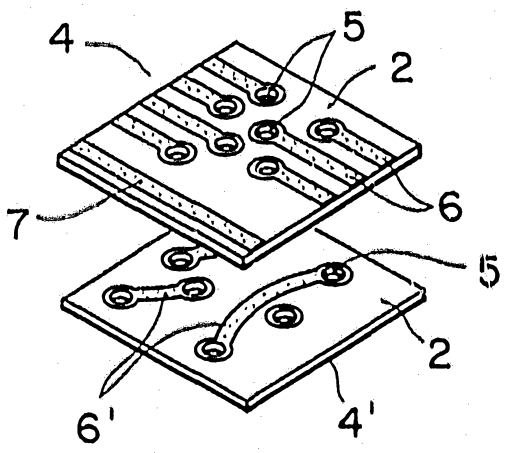


FIG. 3

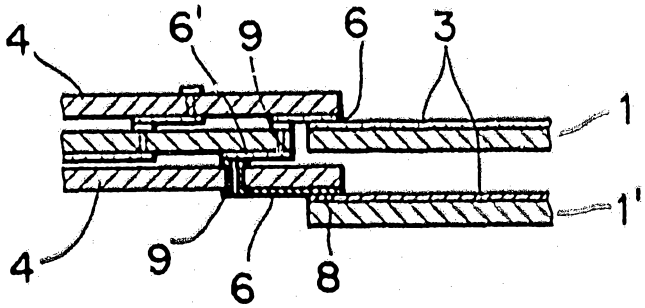


FIG. 4

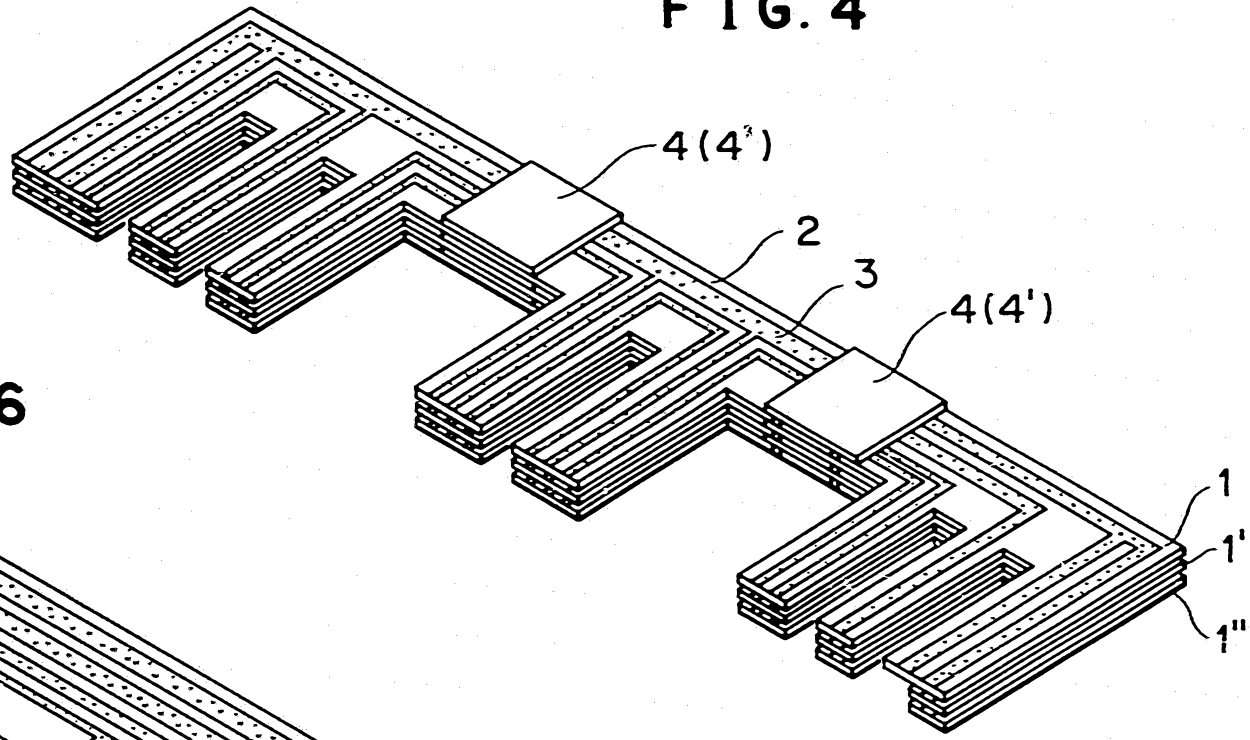


FIG. 6

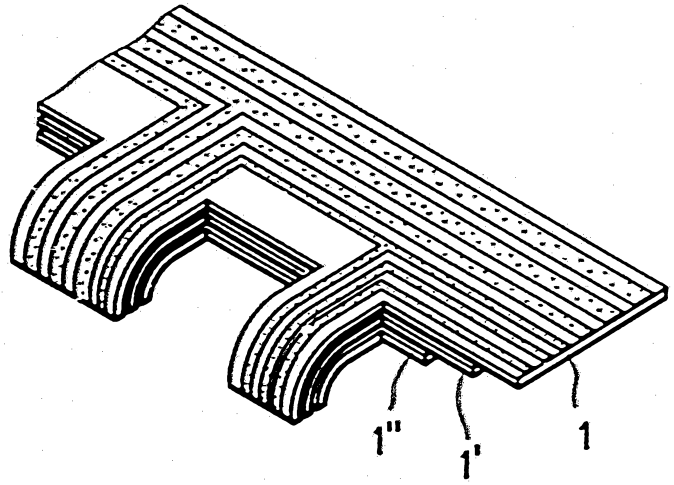


FIG.5

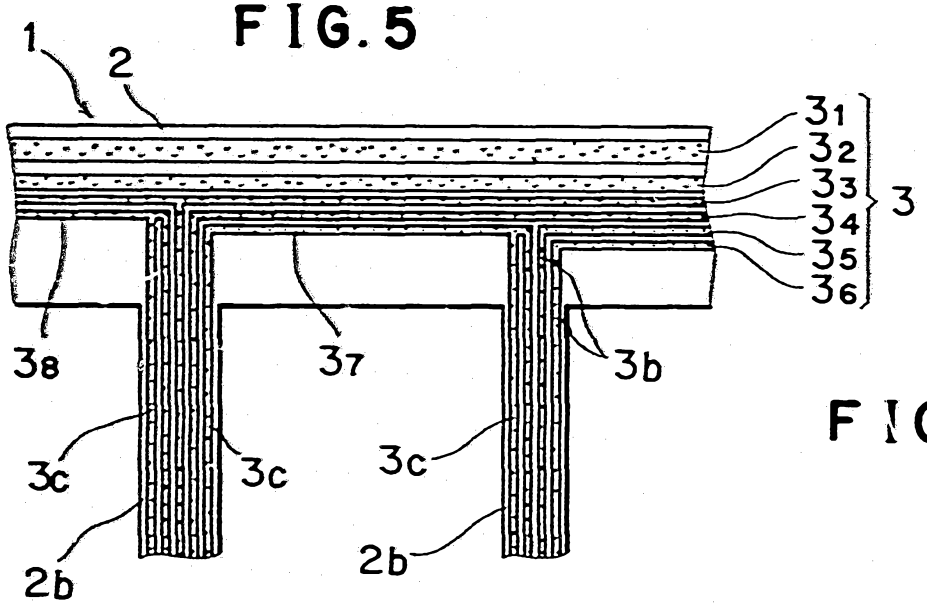
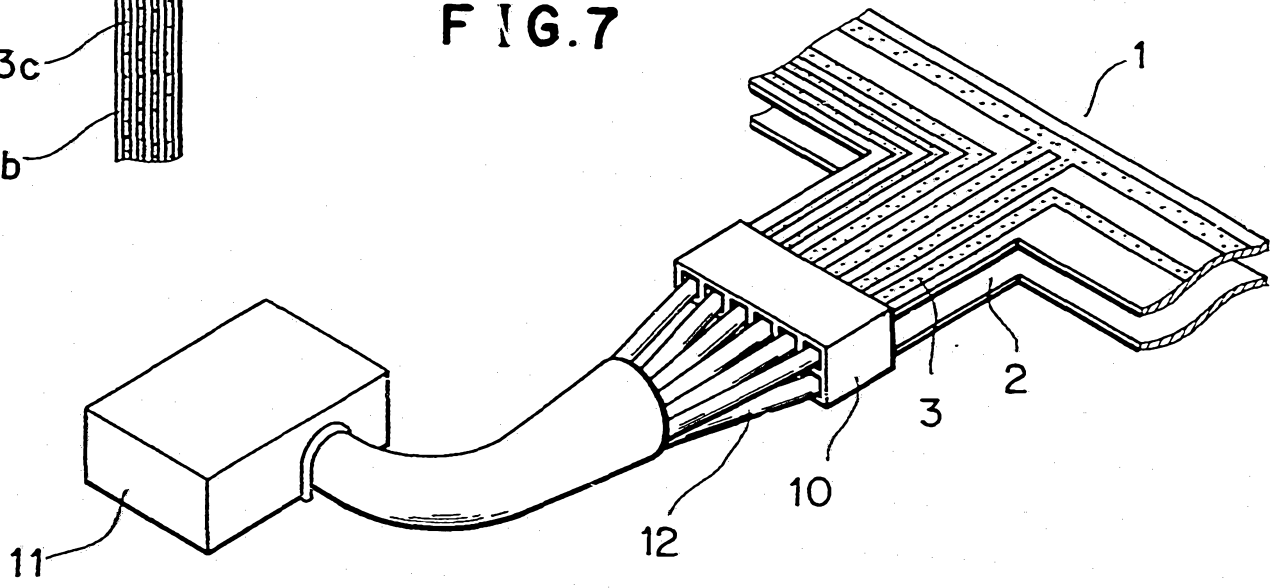


FIG.7



15 10 85 47867

FIG. 8

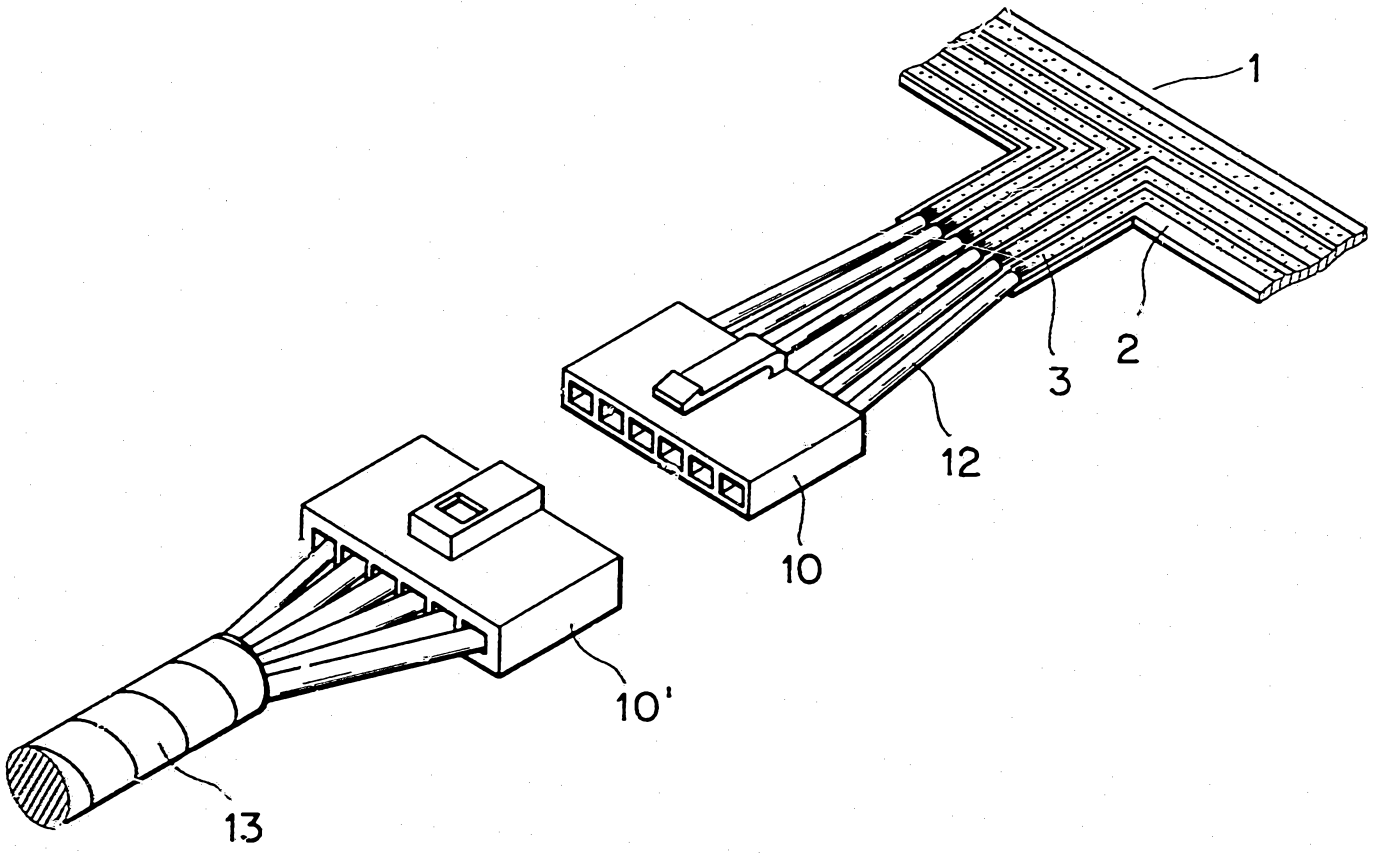


FIG.9

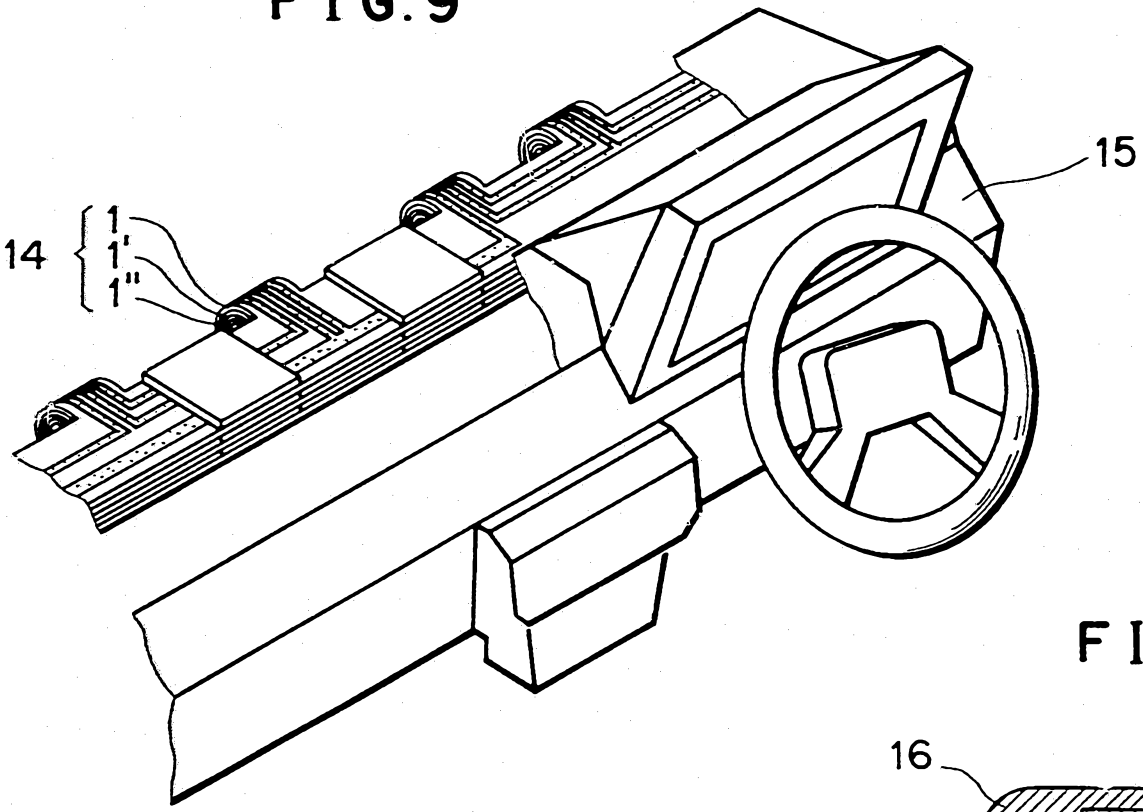


FIG.10

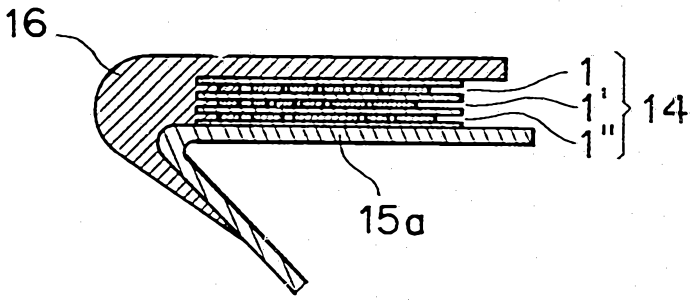


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FIG.11a

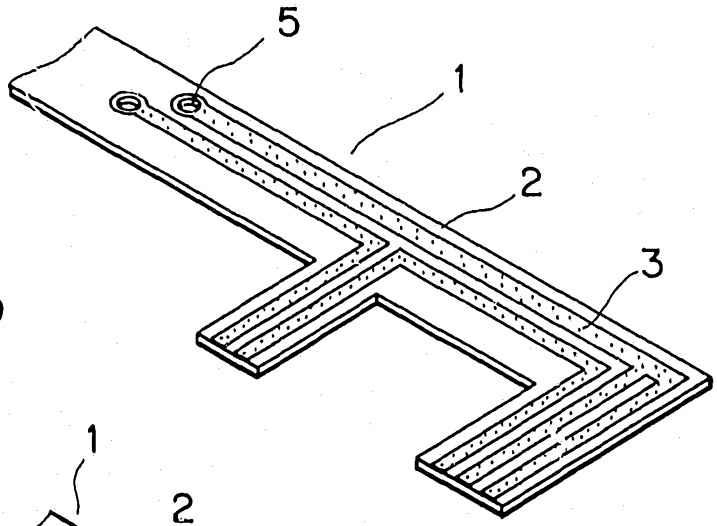

FIG.11b

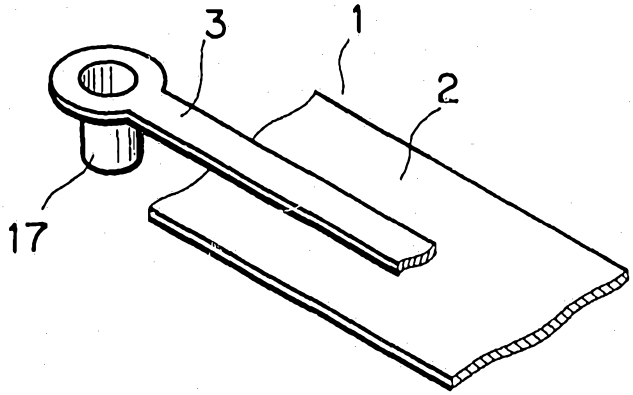

FIG.12

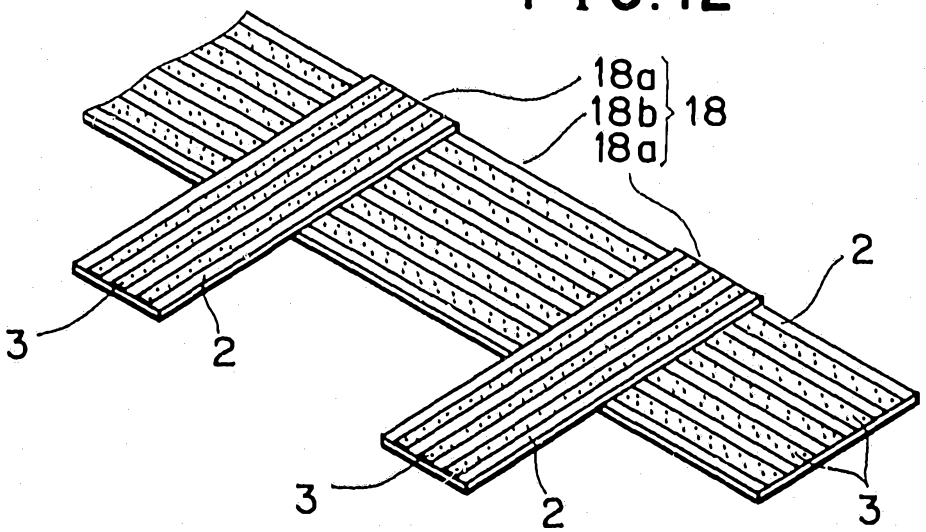

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FIG.13

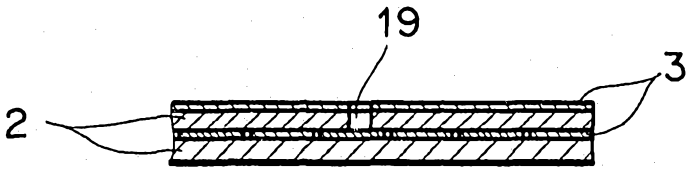

FIG.14

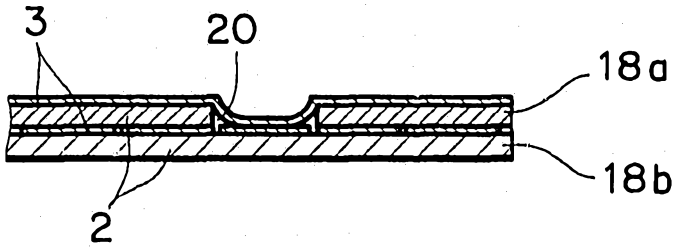

FIG.16

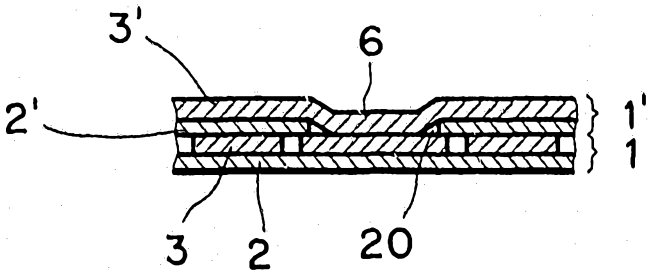

FIG.15

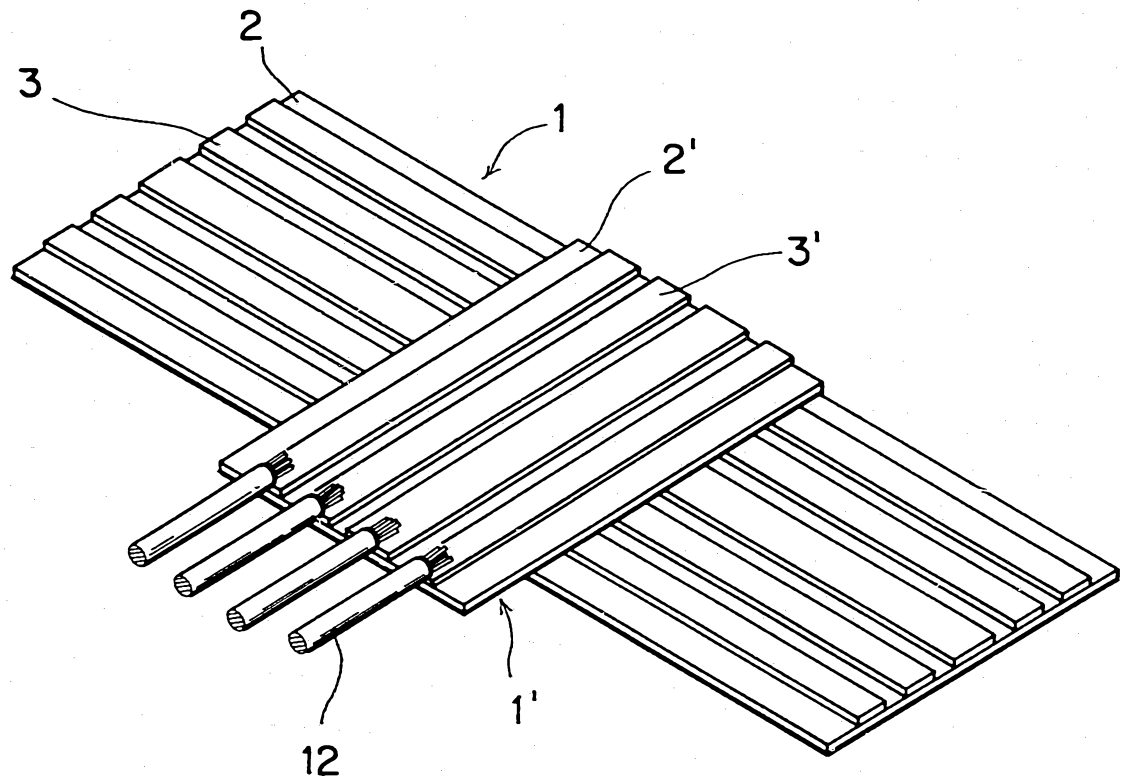

FIG.17

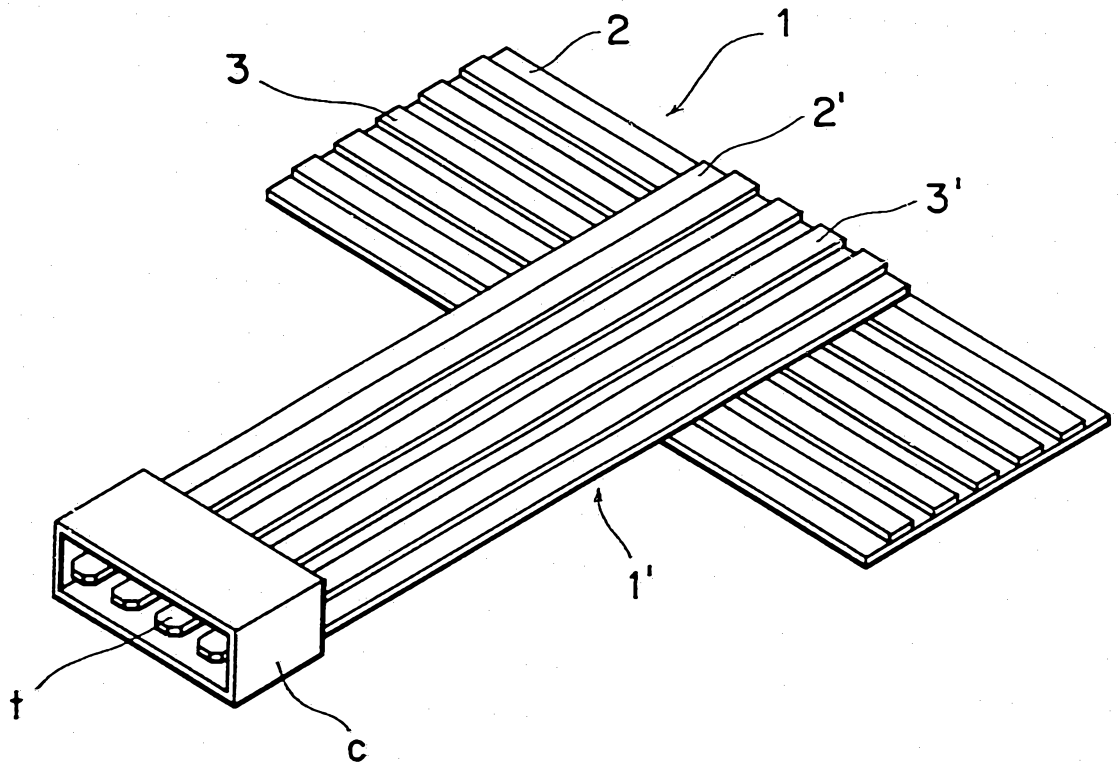

FIG. 18

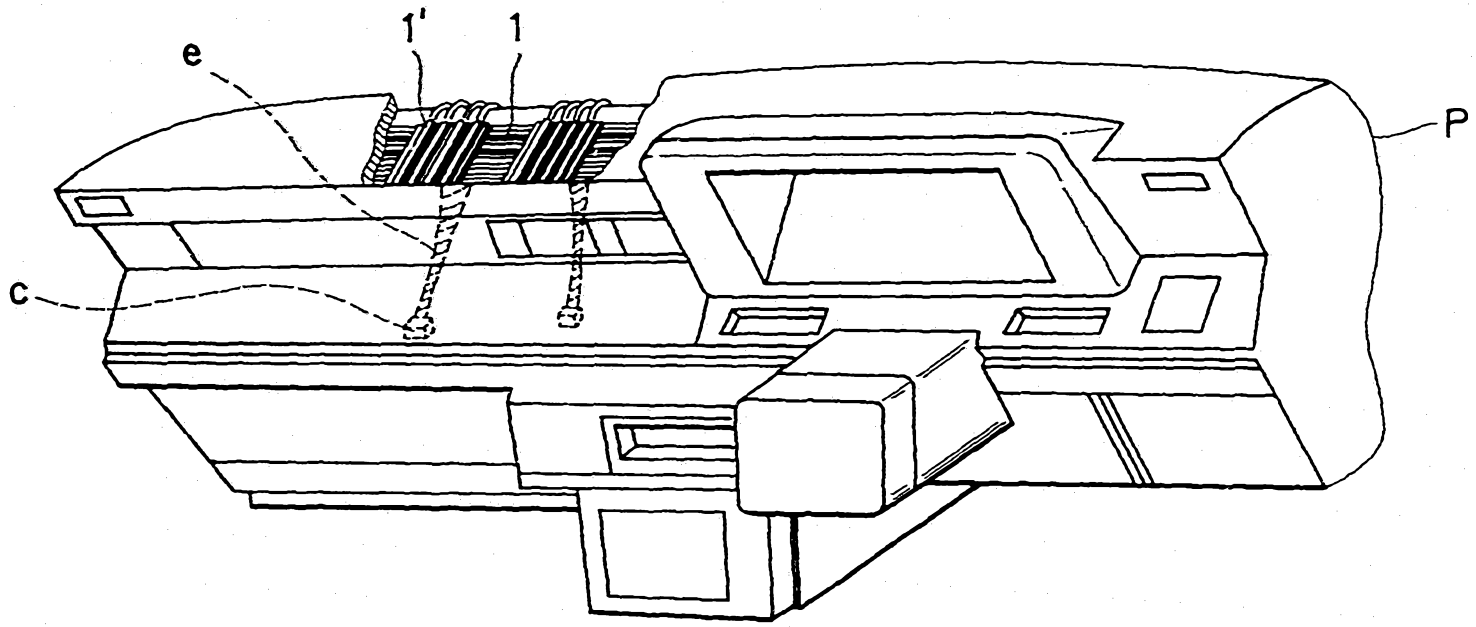

FIG. 19

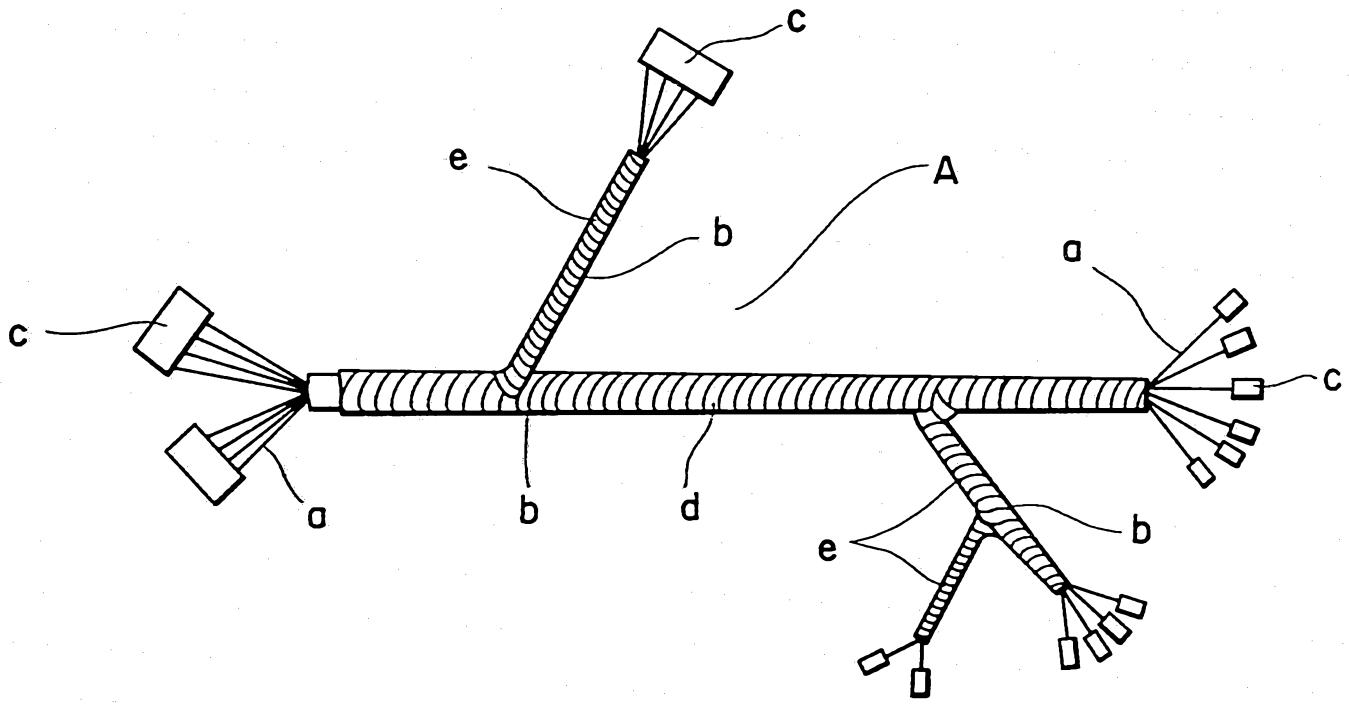

FIG. 20

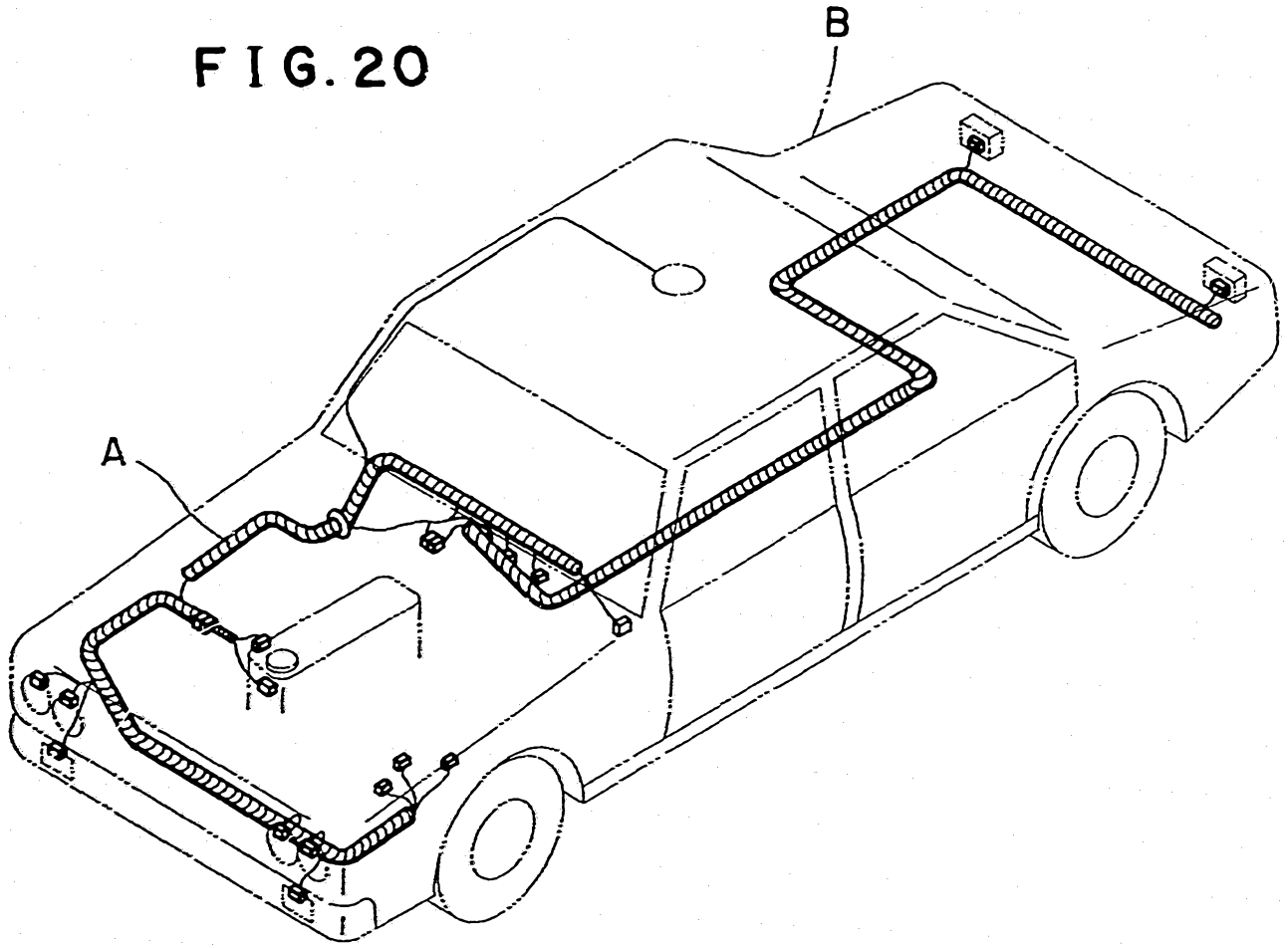

FIG. 21