32402/89

FOR 1

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952 602446

APPLICATION FOR A STANDARD PATENT

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THOMAS & BETTS CORPORATION

of 1001 FRONTIER ROAD
BRIDGEWATER
NEW JERSEY 08807
USA

APPLICATION ACCEPTED AND AMENDMENTS
19-7-90

hereby apply for the grant of a standard patent for an invention entitled:

PANEL MOUNTED ELECTRICAL CONNECTOR
INCLUDING MEANS FOR PROVIDING AN
INDICATION OF CORRECT CONDUCTOR TERMINATION

which is described in the accompanying complete specification

Details of basic application(s):

Number of basic application	Name of Convention country in which basic application was filed	Date of basic application
176830	US	04 APR 88

My/our address for service is care of GRIFFITH HACK & CO., Patent Attorneys, 601 St. Kilda Road, Melbourne 3004, Victoria, Australia.

DATED this 03rd day of April 1989

THOMAS & BETTS CORPORATION

GRIFFITH HACK & CO.

TO: The Commissioner of Patents.

MO07855 03/04/89

REPRINT OF RECEIPT

Australia Patent Declaration Form

Forms 7 and 8

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of Applicant(s)

In support of the application made by Thomas & Betts Corporation

Title

for a patent for an invention entitled PANEL MOUNTED ELECTRICAL CONNECTOR INCLUDING MEANS FOR PROVIDING AN INDICATION OF CORRECT CONDUCTOR TERMINATION

Name(s) and address(es) of person(s) making declaration

I/~~We~~, James D. Hay
Vice President-General Counsel
1001 Frontier Road
Bridgewater, New Jersey 08807
do solemnly and sincerely declare as follows:-

1. I am/~~we are the applicant(s) for the patent or are~~ authorised by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in U.S.A. on April 4, 1988
by Peter Noorily
in _____ on _____ 19__
by _____

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention is/are Peter Noorily, 732 Old Forge Road, Bridgewater 08807, Somerset, New Jersey, U.S.A.

See reverse side of this form for guidance in completing this part

5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-
Thomas & Betts Corporation is the assignee of applicant(s) identified in paragraph 2.

DECLARED at Bridgewater, NJ U.S.A. this 23 day of March 1989

THOMAS & BETTS CORPORATION

James D. Hay

(12) PATENT ABRIDGMENT (11) Document No. AU-B-32402/89
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(54) Title
PANEL MOUNTED ELECTRICAL CONNECTOR INCLUDING MEANS FOR PROVIDING AN INDICATION OF CORRECT CONDUCTOR TERMINATION

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(56) Prior Art Documents
US 4520193
US 4652536

(57) Claim

1. A conductor termination assembly comprising:

plural discrete insulated electrical conductors having distinguishing markings thereon;

an insulative termination housing having a first end accommodating said conductors and an open second end for cooperative electrical engagement with an electrical connector;

a plurality of electrical contacts supported in said housing each contact having an insulation displacing portion adjacent said first end of said housing and a terminal portion adjacent said second end of said housing;

an insulative conductor holding block including individual discrete support elements arranged in side-by-side relation each retentively supporting one of said plurality of said conductors, said holding block being supported in said housing to dispose said conductors in electrical engagement with said insulation displacing portions of said electrical contacts, said holding block further including identifying

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indicia adjacent each of said support elements, said identifying indicia corresponding to said distinguishing markings of said conductors; and

a cover supported on said housing over said holding block, said cover including visual accessing means for permitting visual inspection of said identifying indicia on said holding block to assure correspondence of each of said distinguishing markings of said conductors to said identifying indicia of said holding block.

6. In combination, a plurality of discrete electrical conductors, each conductor including color-coded insulation thereover thereby uniquely distinguishing one of said conductors from the others and an electrical connector which terminates ends of said discrete conductors, said connector further comprising:

a connector housing;

plural electrical contacts supported in said housing, each contact having a conductor termination end and an engagement end for making external electrical connection with another connector;

an electrically insulative conductor support block which is insertably accommodated in said housing adjacent said terminating ends of said contacts, said support block including plural side-by-side channels each of which individually supports one of said electrical conductors, said support block being insertable into said housing in a manner such that said conductors are placed in electrical connection with said terminating ends of said contacts, said support block further including plural color-coded markings adjacent each channel, each said color-coded marking corresponding in color to the color-coded insulation of the conductor inserted therein; and

a cover adapted for disposition on said housing enclosing said conductor support block and said contacts,

said cover including a visual access opening aligned with said color-coded markings on said support block to permit visual comparison between the color-coded insulation of said conductors and said color-coded markings.

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Form 10

COMPLETE SPECIFICATION

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Complete Specification-Lodged:
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Lapsed:
Published:

Priority:

Related Art:

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

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TO BE COMPLETED BY APPLICANT

Name of Applicant:
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Actual Inventor:

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Australia.

Complete Specification for the invention entitled:
PANEL MOUNTED ELECTRICAL CONNECTOR
INCLUDING MEANS FOR PROVIDING AN
INDICATION OF CORRECT CONDUCTOR TERMINATION

The following statement is a full description of this invention including the best method of performing it known to me:-

T&B 1009

PANEL MOUNTED ELECTRICAL CONNECTOR INCLUDING MEANS FOR PROVIDING AN INDICATION OF CORRECT CONDUCTOR TERMINATION

FIELD OF THE INVENTION:

The present invention relates generally to electrical connectors of the type which terminate plural insulative electrical conductors. More particularly, the present invention relates to an electrical connector which terminates plural conductors in the connector and provides a visual indication of correct conductor termination.

BACKGROUND OF THE INVENTION:

It is known to provide electrical connectors which terminate plural discrete electrical conductors in a connector housing. Connectors of this type may be used in data/communications equipment where it is necessary to connect one component to another. It is also been found useful to employ electrical connectors of the hermaphroditic type where the connector is capable of mating to another identical connector. An example of this type connector is shown and described in U. S. Patent No. 4,682,836 issued July 28, 1987, and assigned to the assignee of the present invention.

Briefly, connectors of this type include an insulative housing supporting plural electrical contacts which individually electrically terminate one of the conductors of a multiconductor cable. Proper useage requires that each conductor of the multiconductor cable be properly terminated to the correct one of the contacts of the connector. Incorrect termination and subsequent connection to data/communications equipment would impede the function of the equipment and could cause damage to one or more of the components.

The uncertainty associated with incorrect termination is enhanced where the user does not terminate the multiconductor cable to the connector. Connectors,

especially those known as panel mount connectors, where the connector housing is designed to be secured to an electrical panel having plural such connectors disposed thereon, increase the risk of incorrect connection as the conductors are often terminated in the housing at the factory. The user in most cases is relying on factory automation to assure proper conductor termination. In many instances, the user would not know of a factory defect until connection is made and the data/communications components are used. Obviously, at that point, it may be too late to rectify any problems which may have occurred due to incorrect termination of the conductors to the contacts in the housing.

It is desirable to provide an electrical connector, especially those designed for panel mounting, which would provide an instant visual indication of correct connection of the individual conductors to the contacts supported in the housing.

SUMMARY OF THE INVENTION

The invention provides a conductor termination assembly comprising:

plural discrete insulated electrical conductors having distinguishing markings thereon;

an insulative termination housing having a first end accommodating said conductors and an open second end for cooperative electrical engagement with an electrical connector;

a plurality of electrical contacts supported in said housing each contact having an insulation displacing portion adjacent said first end of said housing and a terminal portion adjacent said second end of said housing;

an insulative conductor holding block including individual discrete support elements arranged in side-by-side relation each retentively supporting one of said plurality of said conductors, said holding block being supported in said housing to dispose said conductors in electrical engagement with said insulation displacing portions of said electrical contacts, said holding block further including identifying

indicia adjacent each of said support elements, said identifying indicia corresponding to said distinguishing markings of said conductors; and

a cover supported on said housing over said holding block, said cover including visual accessing means for permitting visual inspection of said identifying indicia on said holding block to assure correspondence of each of said distinguishing markings of said conductors to said indentifying indicia of said holding block.

The invention also provides in combination, a plurality of discrete electrical conductors, each conductor including color-coded insulation thereover thereby uniquely distinguishing one of said conductors from the others and an electrical connector which terminates ends of said discrete conductors, said connector further comprising:

a connector housing;

plural electrical contacts supported in said housing each contact having a conductor termination end and an engagement end for making external electrical connection with another connector;

an electrically insulative conductor support block which is insertably accommodated in said housing adjacent said terminating ends of said contacts, said support block including plural side-by-side channels each of which individually supports one of said electrical conductors, said support block being insertable into said housing in a manner such that said conductors are placed in electrical connection with said terminating ends of said contacts, said support block further including plural color-coded marking adjacent each channel, each said color-coded markings corresponding in color to the color-coded insulation of the conductor inserted therein; and

a cover adapted for disposition on said housing enclosing said conductor support block and said contacts, said cover including a visual access opening aligned with

said color-coded markings on said support block to permit visual comparison between the color-coded insulation of said conductors and said color-coded markings.

As described by way of a preferred embodiment herein the present invention includes an insulative housing which provides for entry of plural electrical conductors. Each of the conductors has color-coded insulation therearound. Ends of the conductors are supported in a support block which is insertably accommodated in the housing in a manner such that the ends of the conductors are terminated to plural electrical contacts also supported by the housing. The support block includes plural channels which individually accommodate different ones of the conductors. Adjacent each channel are color-coded markings which correspond to the color coding of the insulation of the conductors. A cover is supportable over the support block to enclose the connector. The cover includes openings therethrough which permit visual access to the color-coded markings on the support clock. Thus, proper orientation of the conductors with respect to the

contacts may be assured by visually inspecting the correspondence between the color markings on the support block and the color-coded insulation of the conductors.

The preferred embodiment of the present invention further includes a metallic member surrounding the contacts. This metallic member shields the connector from electromagnetic interference and radio frequency interference. The support block of the present invention may also support conductive shorting elements which place pairs of the contacts of the housing in electrical continuity.

BRIEF DESCRIPTION OF THE DRAWINGS:

Figure 1 shows an exploded perspective view of the electrical connector and assembly of the present invention including plural conductors supported in a support assembly.

Figure 2 is a side elevational showing of the electrical connector of Figure 1.

Figure 3 is a front plan view of the electrical connector of Figure 1 where the cover is shown raised above the connector housing.

Figure 4 is a top plan view of the assembled connector shown in Figure 1.

Figure 5 is a bottom plan view of the support assembly shown in Figure 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

Referring now to the drawings especially Figure 1, an electrical connector 10 and assembly of the present invention is shown. Connector 10 is generally of the hermaphroditic type having male and female interlocking features where the connector may be electrically connected to another connector having substantially similar interlocking features. Connector 10 generally includes an

insulative housing having a cover 12 and a base 14. An electrically conductive shield 16 is disposed on the base 14. A conductor support assembly 20 is shown terminating plural discrete conductors 21a through 21d (generally denoted as 21). Conductors 21 are conventional copper wire elements having insulative plastic therearound. In the present invention, conductors 21 include color-coded insulation therearound, where each conductor 21a - 21d is uniquely identified by a different color. For illustrative purposes conductors 21a - 21d are shown as having red, green, orange and black insulation respectively. Base 14 further supports plural electrical contacts 18 which are provided in one-to-one correspondence with the number of conductors 21. Electrical connector 10 is substantially similar to an electrical connector shown and described in U. S. Patent No. 4,682,836 issued on July 28, 1987, and entitled "Electrical Connector and Cable Termination Apparatus Therefor" which is assigned to the assignee of the present invention.

Referring additionally to Figures 2 and 3, cover 12 includes an elongate generally planar first portion 24 and a stepped upper portion 26. Stepped upper portion 26 includes a centrally disposed recessed 28 which provides for removable locking interconnection of another hermaphroditic connector, especially that of the type shown in the above-identified '836 patent where the use and operation of such locking device is more fully described. Stepped upper portion 26 further includes a pair of spaced, depending latches 27 which are positioned to secure cover 12 to base 14. Planar portion 24 further includes a plurality of transversely spaced circular openings 29a through 29d (generally denoted as 29). The function of each of these openings 29 will be described in further detail hereinbelow. Planar portion 24 also includes a centrally located depending rear latch 25 (Fig. 2) which also helps to support and secure cover 12 to base 14. A post 25a, which is accommodated in hole 25b of base 14 also properly

positions cover 12 with respect to base 14.

Base 14 is generally a rectangularly shaped member having a front face 30 for accommodating another hermaphroditic type electrical connector, a rear face 32 for permitting receipt of conductors 21 through a passage 32a and an open central section 34 for terminating conductors 21. Central section 34 opens to the upper surface 35 of base 14. A horizontal central ledge 36 extends from central section 34 toward the front face 30 of base 14. Horizontal ledge 36 provides support for the side-by-side disposition of electrical contacts 18 in base 14.

Contacts 18 are electrically conductive members formed of a suitable material such as a copper alloy. Each contact includes an elongate base portion 19a, an insulation displacement contact (IDC) portion 19b, a folded over tongue portion 19c and a flat portion 19d extending from folded over tongue 19c.

As shown in detail in Figure 3, IDC portion 19b is of conventional flat, blade type construction which makes electrical contact with conductor 21 inserted between the tines thereof. Folded over tongue portion 19c is designed to make hermaphroditic electrical connection with similar contacts supported in another hermaphroditic connector.

Base 14 also includes a pair of oppositely extending mounting ears 42. As connector 10 is typically mounted to an electrical panel, ears 42 provide a mounting surface for screw mounting of connector 10 thereto. Centrally located screw appertures 42a are included for such purposes.

Base 14 further includes a conductive shield 16 positioned adjacent the front face 30 thereof. Shield 16 is formed preferrably from a flat stamping of metal and generally surrounds contacts 18. As is well known in the electrical connection art, shield 16 shields the contacts from radio frequency interferences (RFI) and electromagnetic interferences (EMI). A pair of lower lances 39 which

extend from shield 16, secure the shield 16 to base 14. The lances 39 are embedded into the plastic material forming base 14. Shield 16 also includes a pair of outwardly extending shield ears 17 which are positioned adjacent mounting ears 42 of base 14. In many instances, the electrical panel (not shown) to which connector 10 is mounted is a metallic member. In this instance, shield ears 17 are placed in direct contact with the panel thereby placing the shield 16 and the panel at the same electrical potential (usually ground potential).

Base 14 further includes a centrally disposed locking element 40 which extends outwardly from the front face 30 thereof. Locking element 40 of one connector 10 is insertable, in locking fashion, into centrally disposed recess 28 of a similar hermaphroditic connector especially those of the type shown in the above-identified '836 patent.

As shown particularly in Figures 1 and 5, conductors 21a through 21d are supported in spaced side-by-side fashion in conductor support assembly 20 for disposition over contact 18.

Support assembly 20 is an electrically insulative member preferrably formed of transparent molded plastic. Support assembly 20 includes an upper surface 45 and spaced, depending sidewalls 46. Upper surface 45 and depending walls 46 define an interior conductor accommodating region 48 shown more particularly in Figure 5. A plurality of spaced, parallel support channels 49a through 49d (generally denoted as 49) are provided in the interior region 48 to accommodate in frictionally retaining fashion, the ends of conductors 21a through 21d. A pair of keys 50 are included on either side of support assembly 20 adjacent sidewalls 46 for insertion into corresponding key ways 51 on either side of base 14. A detent 51a on each sidewall 46 lockingly secures conductor support assembly in base 14. When properly positioned in base 14, side-by-side channels 49a through 49d will align with each of the IDC portions

19b of contacts 18 to place the ends of conductors 21a through 21d into insulation displacement connection with contacts 18.

As illustrated in Figure 1, conductor support assembly 20 supports a pair of shorting bars 55 and 57 retentively therein. The shorting bars 55 and 57 are more fully described in the above-identified '836 patent. Briefly, these shorting bars 55 and 57 serve to contact flat portions 19d of contacts 18 to electrically common certain ones of the contacts when connector 10 is an unmated position.

Referring now to Figures 1 and 4, conductor support assembly 20 further includes a plurality of color indicative markings 61a through 61d (generally denoted as 61). Markings 61 are disposed on upper surface 45 of support assembly 20. Each of the markings 61a through 61d are respectively supported above adjacent conductor support channels 49a through 49d. Color indicative markings 61 correspond in direct relation to the color-coded insulation on conductors 21a through 21d. Thus, a visual indication of the correct positioning of conductors 21 in support channels 49 may be seen by comparing the appropriate color indicative markings 61 with the color-coded insulation of conductors 21.

Figure 4 shows the assembled connector 10. Cover 12 is disposed over base 14 and encloses conductor support assembly 20. Color indicative markings 61 are aligned with cover openings 29 so that the color indication may be visually accessed through openings 29. It is readily apparent that a user employing connector 10, as shown in Figure 4, can determine that the proper conductor 21 has been terminated with the proper electrical contact 18 by noting the correct alignment between color-coded insulation and the color indicative marking 61. Incorrect termination, such as by terminating green conductor 21b in conductor support channel 49a would be readily apparent as the green conductor 21b would be aligned with the red color

indicative marking 61a.

It can be appreciated that other color combinations may be employed in a manner consistent with the present invention. Further, coding techniques other than color may be employed to provide proper identification.

Various changes to the foregoing described and shown structures would now be evident to those skilled in the art. Accordingly, the scope of the invention is set forth in the following claim.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A conductor termination assembly comprising:

plural discrete insulated electrical conductors having distinguishing markings thereon;

an insulative termination housing having a first end accommodating said conductors and an open second end for cooperative electrical engagement with an electrical connector;

a plurality of electrical contacts supported in said housing each contact having an insulation displacing portion adjacent said first end of said housing and a terminal portion adjacent said second end of said housing;

an insulative conductor holding block including individual discrete support elements arranged in side-by-side relation each retentively supporting one of said plurality of said conductors, said holding block being supported in said housing to dispose said conductors in electrical engagement with said insulation displacing portions of said electrical contacts, said holding block further including identifying indicia adjacent each of said support elements, said identifying indicia corresponding to said distinguishing markings of said conductors; and

a cover supported on said housing over said holding block, said cover including visual accessing means for permitting visual inspection of said identifying indicia on said holding block to assure correspondence of each of said distinguishing markings of said conductors to said identifying indicia of said holding block.

2. A termination assembly of claim 1 wherein said distinguishing markings of said conductors include color coded insulation.

3. A termination assembly of claim 2 wherein said identifying indicia of said holding block includes color-coded marks corresponding to said color-coded insulation of said conductors.

4. A termination assembly of claim 3 wherein said visual accessing means includes said cover having a cover surface including at least one opening therethrough for providing visual access to said color-coded marks on said holding block.

5. A termination assembly of claim 3 wherein said visual accessing means includes said cover having a cover surface including plural discrete openings therethrough for providing individual visual access to said color-coded marks on said holding block.

6. In combination, a plurality of discrete electrical conductors, each conductor including color-coded insulation thereover thereby uniquely distinguishing one of said conductors from the others and an electrical connector which terminates ends of said discrete conductors, said connector further comprising:

a connector housing;

plural electrical contacts supported in said housing, each contact having a conductor termination end and an engagement end for making external electrical connection with another connector;

an electrically insulative conductor support block which is insertably accommodated in said housing adjacent said terminating ends of said contacts, said support block including plural side-by-side channels each of which individually supports one of said electrical conductors, said support block being insertable into said housing in a manner such that said conductors are placed in electrical connection with said terminating ends of said contacts, said support block further including plural color-coded markings adjacent each channel, each said color-coded marking corresponding in color to the color-coded insulation of the conductor inserted therein; and

a cover adapted for disposition on said housing enclosing said conductor support block and said contacts,

said cover including a visual access opening aligned with said color-coded markings on said support block to permit visual comparison between the color-coded insulation of said conductors and said color-coded markings.

7. A combination in accordance with claim 6 wherein said conductor support block includes an upper surface including said color-coded marking and an opposed lower surface including said side-by-side channels, said markings being in alignment with said channels.

8. A combination in accordance with claim 7 wherein said side-by-side channels are open ended to accommodate ends of said conductors.

9. A combination in accordance with claim 8 wherein said cover including said visual access opening includes plural apertures corresponding in number to said conductors, each of said apertures being in alignment with said markings to provide individual visual access to said markings.

10. A combination in accordance with claim 9 wherein said housing includes passage means to permit passage of said insulative conductors thereinto.

DATED THIS 3RD DAY OF APRIL 1989
THOMAS & BETTS CORPORATION
By its Patent Attorneys:
GRIFFITH HACK & CO.
Fellows Institute of Patent
Attorneys of Australia

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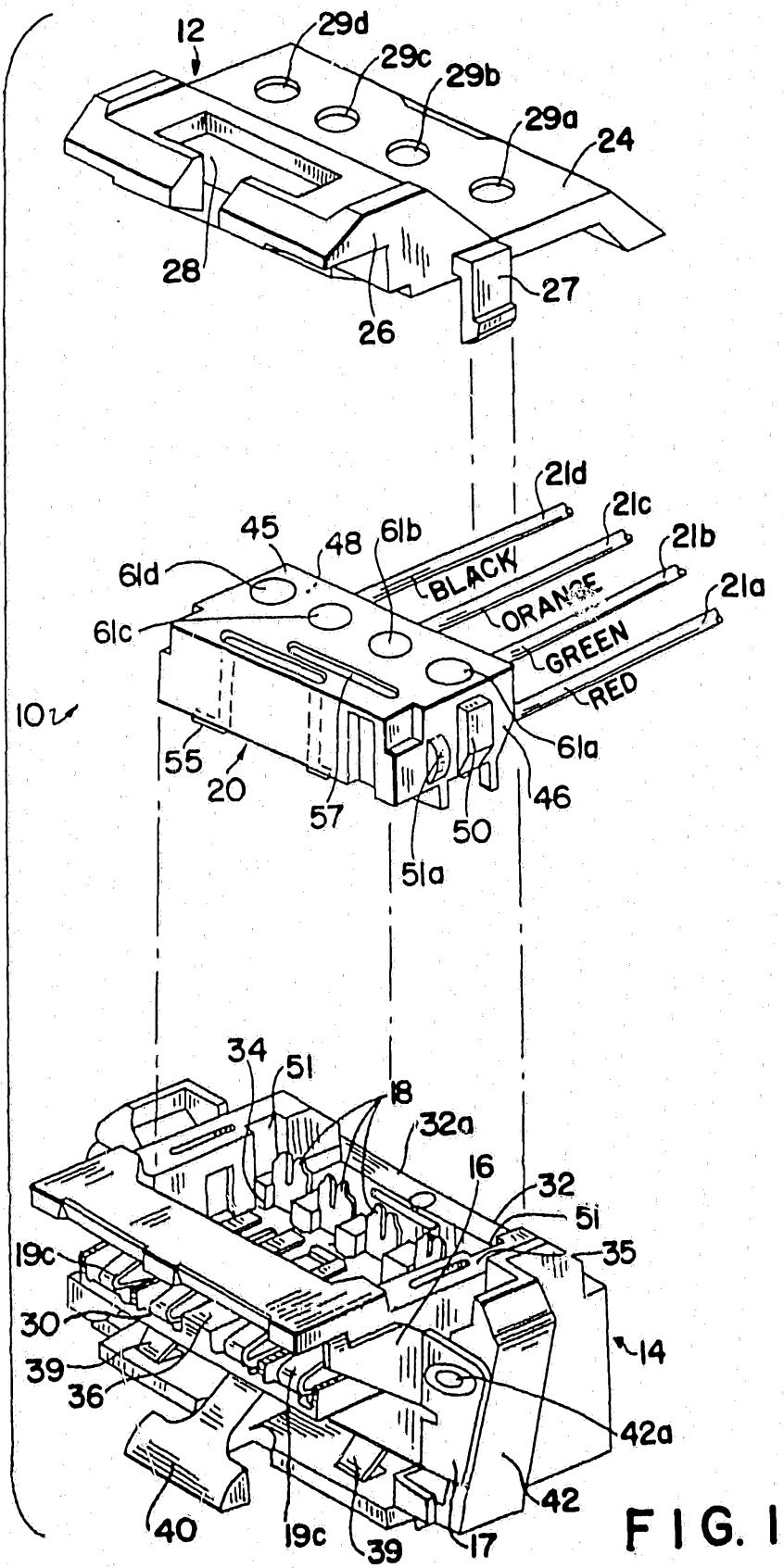

FIG. 1

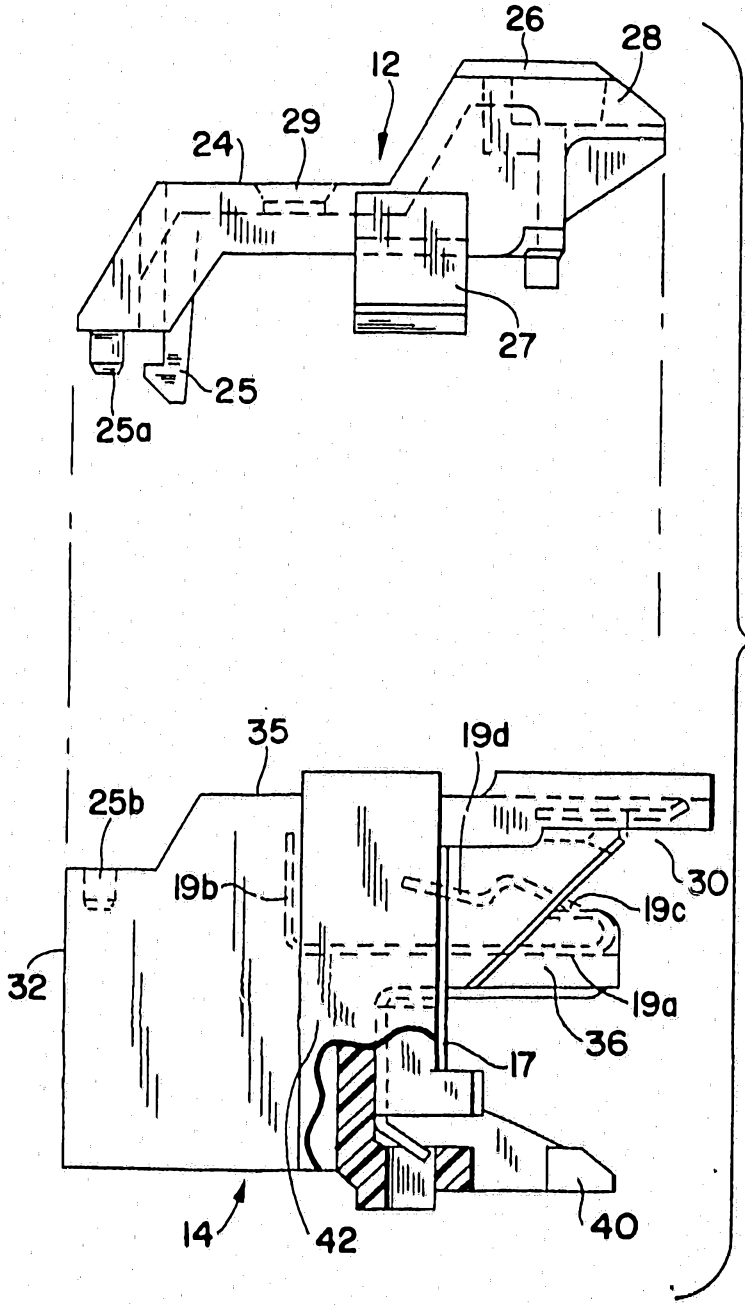

FIG. 2

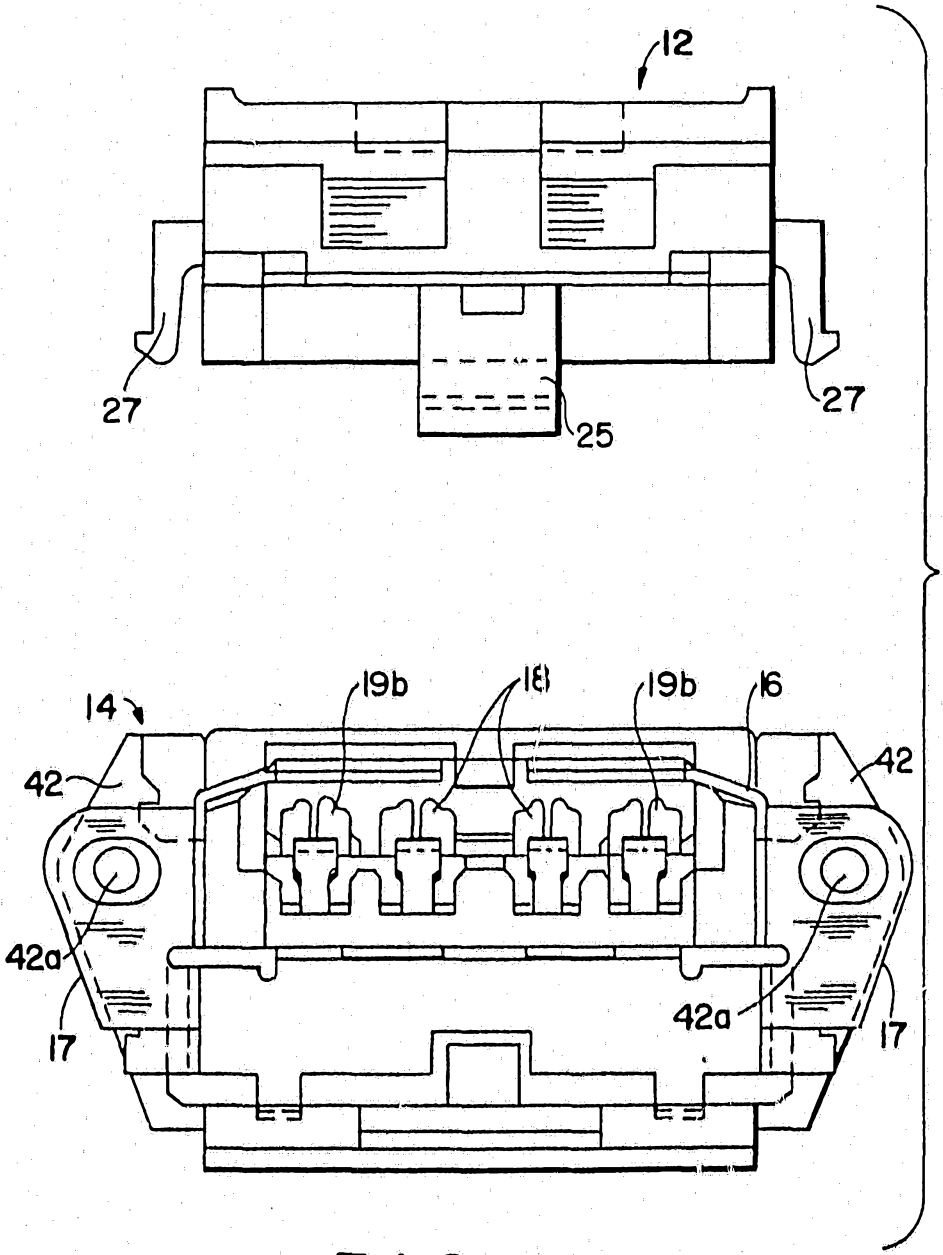

FIG. 3

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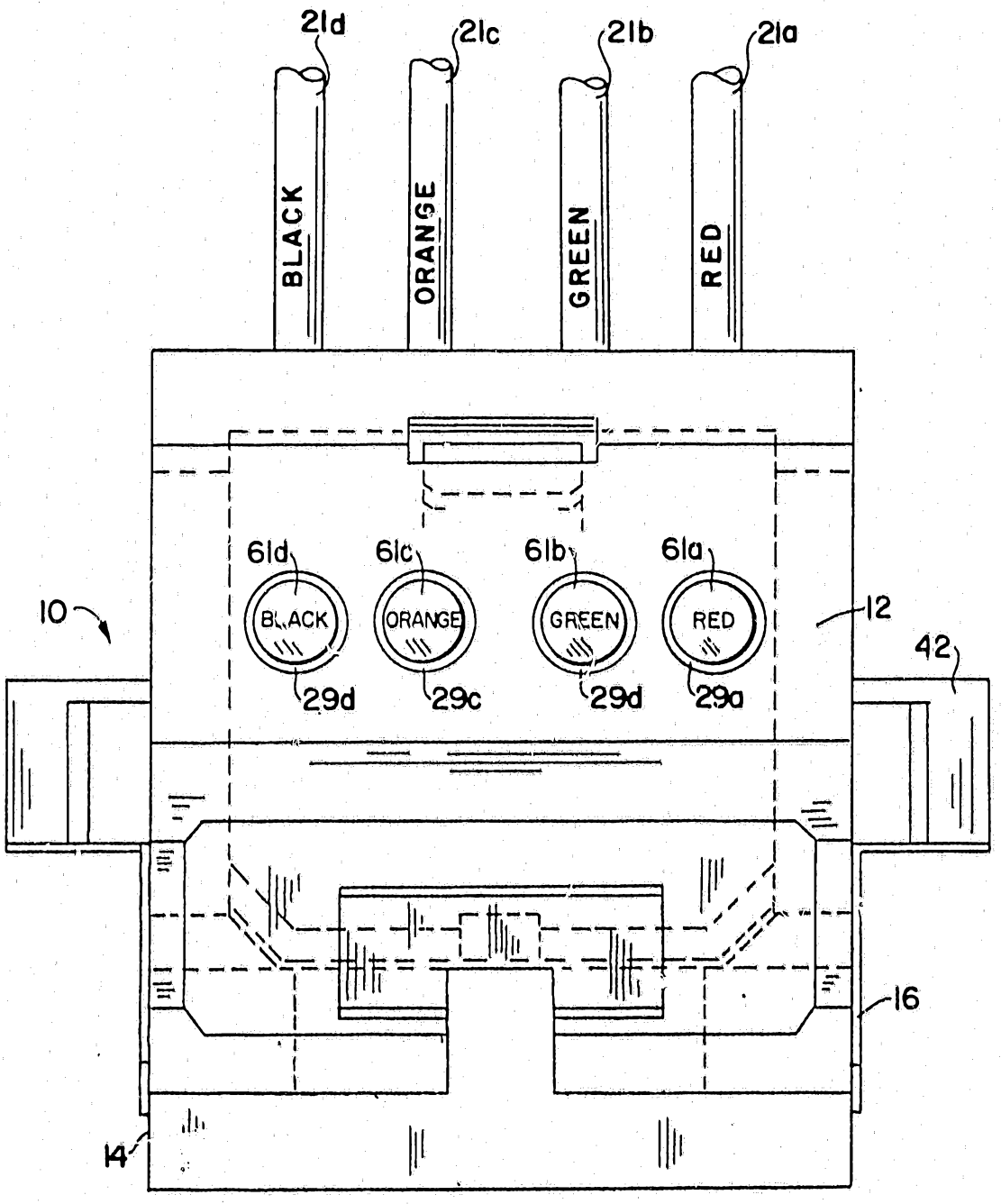

FIG. 4

FIG. 5