

[54] **DIAGNOSTIC CONNECTOR**
[75] Inventor: **Roelof Johan Bakker**, Langen, Hesse, Germany
[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.
[22] Filed: **Feb. 24, 1971**
[21] Appl. No.: **118,267**

[30] **Foreign Application Priority Data**
Mar. 11, 1970 Germany.....P 20 11 622.7
[52] U.S. Cl.....**339/44 M**, 339/66 M, 339/91 R, 339/132 B, 339/176 M, 339/217 R
[51] Int. Cl.....**H01r 9/08**, H01r 13/44, H01r 13/54
[58] Field of Search.....339/36, 43, 44, 75, 339/91, 32, 33, 176, 65, 47-49, 132, 217

[56] **References Cited**

UNITED STATES PATENTS
3,239,791 3/1966 Fyrk.....339/44 M
3,407,378 10/1968 Siders et al.....339/176 P

3,588,784	6/1971	Kunkle et al.	339/65
3,188,600	6/1965	Woofter et al.	339/91 R X
3,137,535	6/1964	Collier et al.	339/91 R X
2,299,206	10/1942	Berg	339/44 M X
3,441,661	4/1969	Brummanns	339/217 S X

FOREIGN PATENTS OR APPLICATIONS

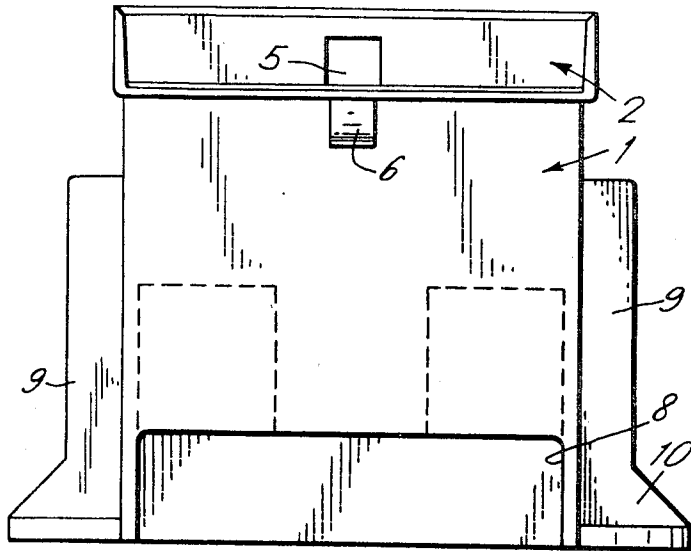
1,448,070	6/1966	France	339/91 R
1,403,666	5/1965	France	339/44 M
263,889	8/1968	Austria	339/44 M

Primary Examiner—Marvin A. Champion
Assistant Examiner—Terrell P. Lewis
Attorney—William J. Keating, Ronald D. Grefe, Gerald K. Kita, Frederick W. Raring, Jay L. Seitchik, John R. Flanagan and Allan B. Osborne

[57] **ABSTRACT**

An electrical socket housing for a vehicle, comprising a one-piece body moulded of insulating material having contact receiving through-passageways. The socket body has a mounting means for mounting the housing on a panel support of a vehicle.

2 Claims, 11 Drawing Figures



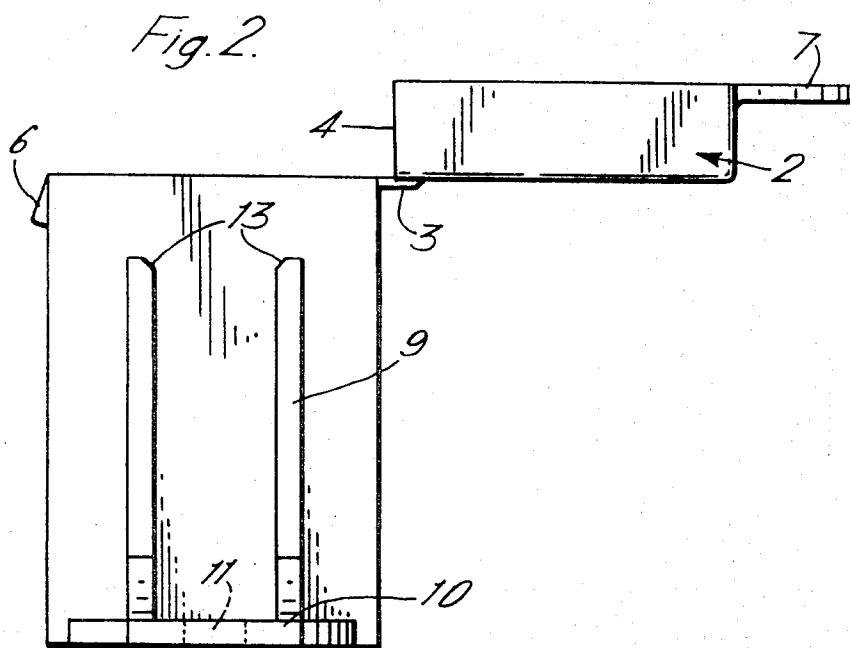
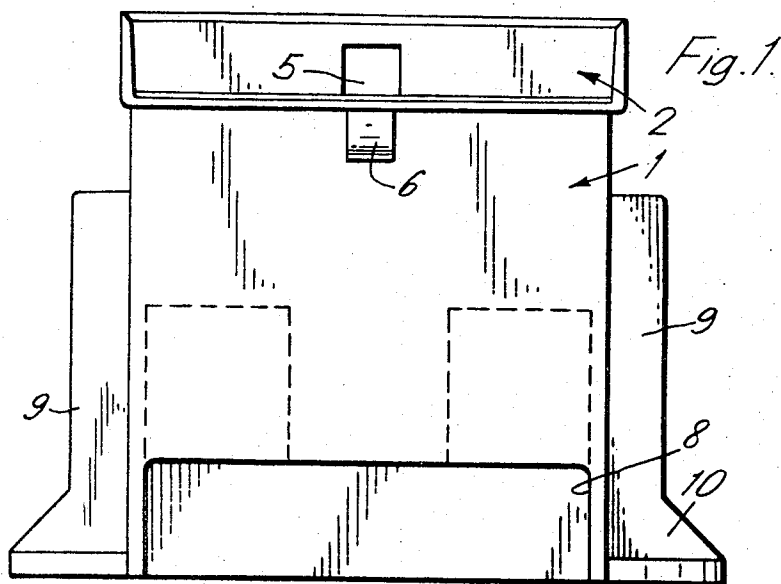


Fig. 3.

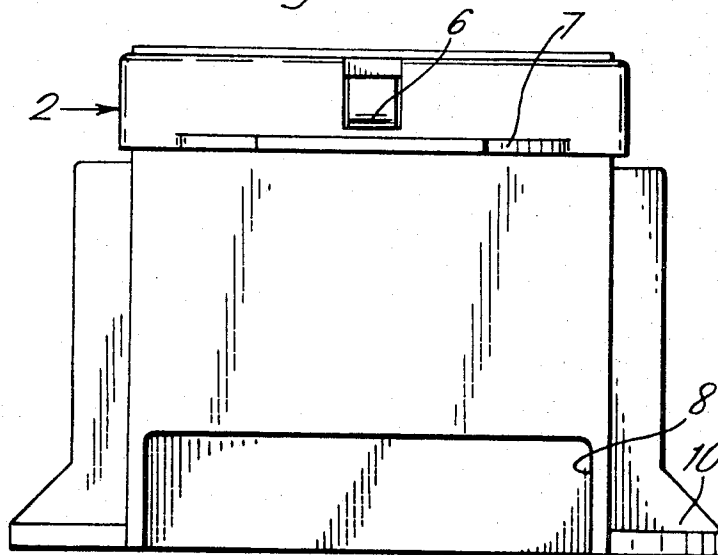


Fig. 4.

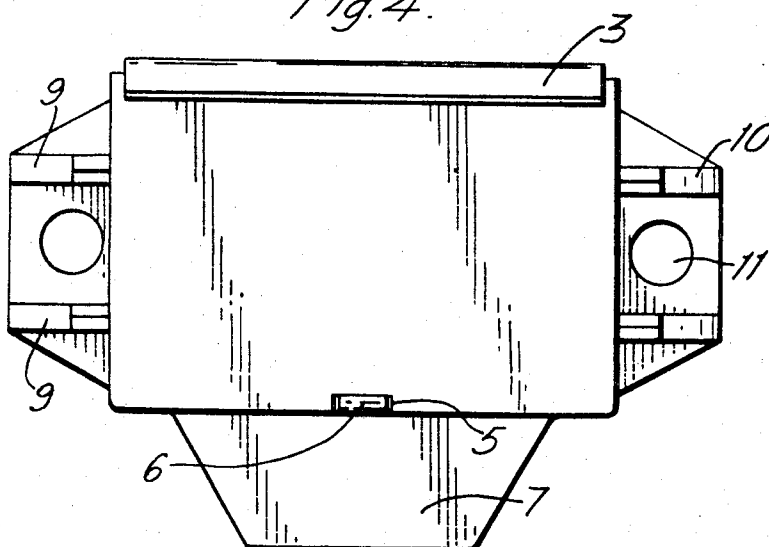


Fig. 5.

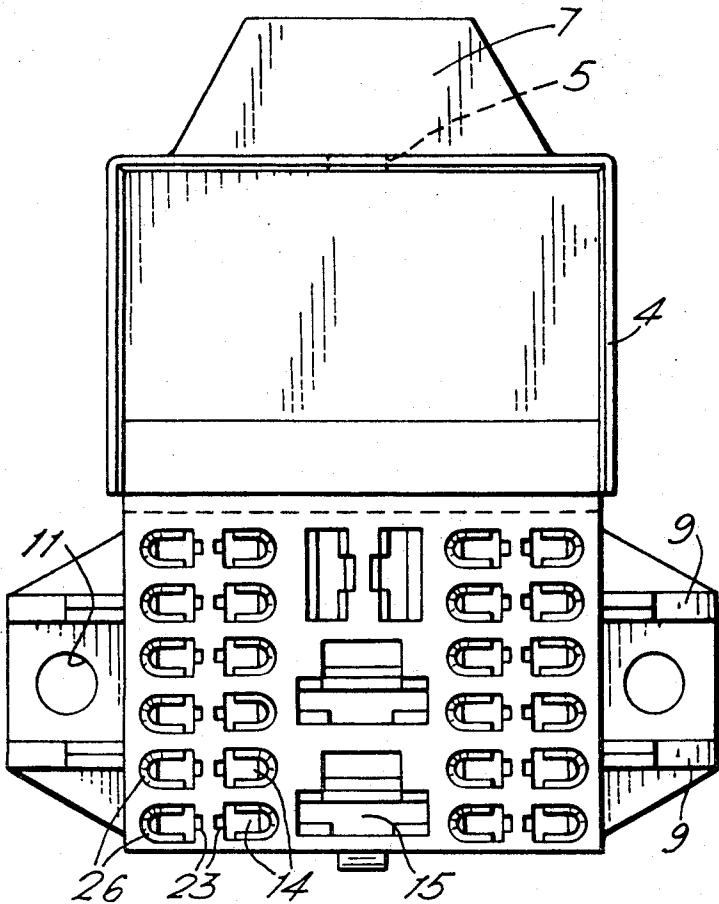
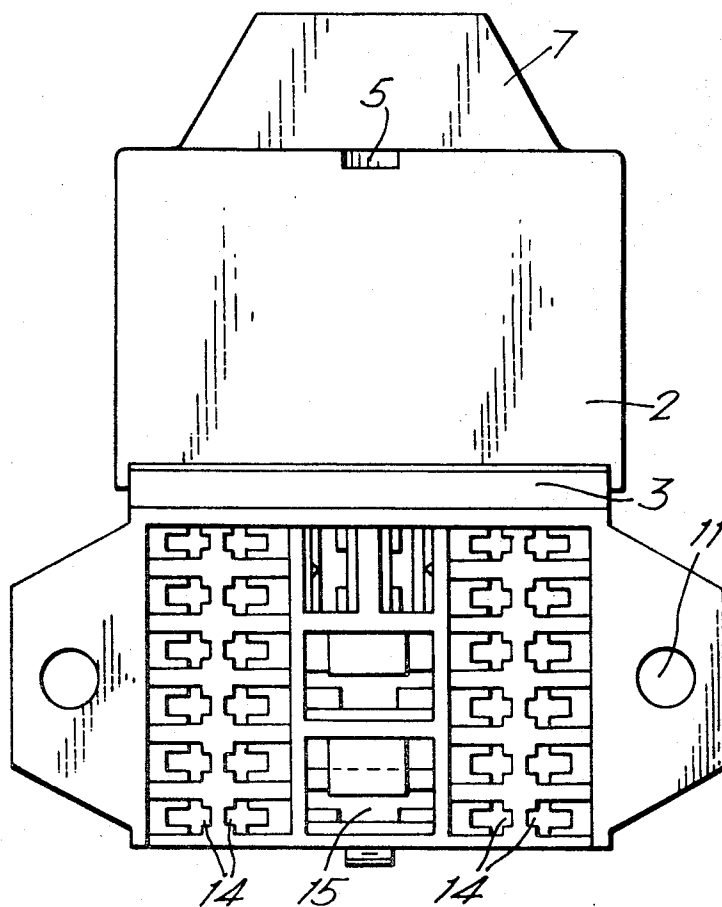
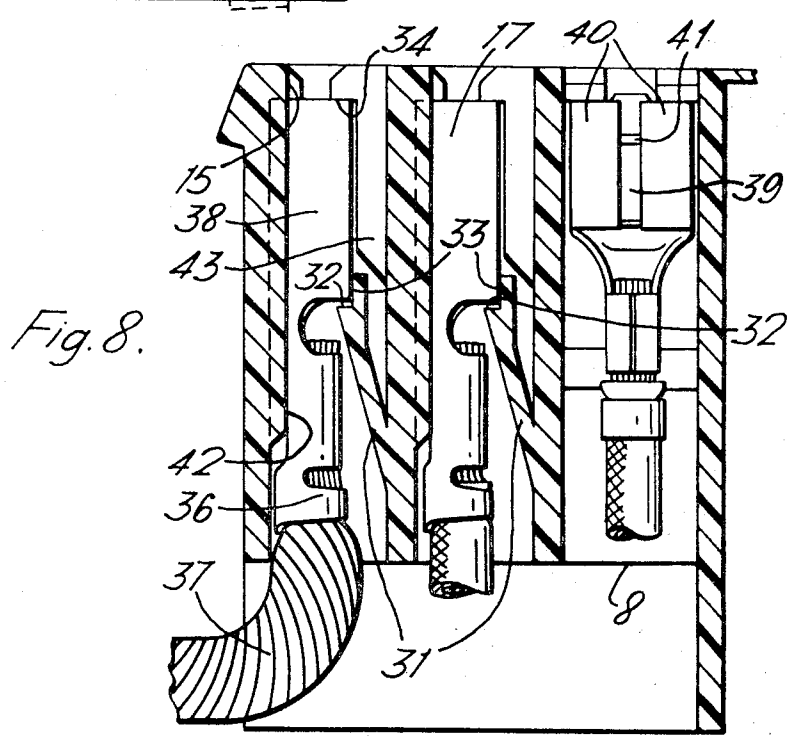
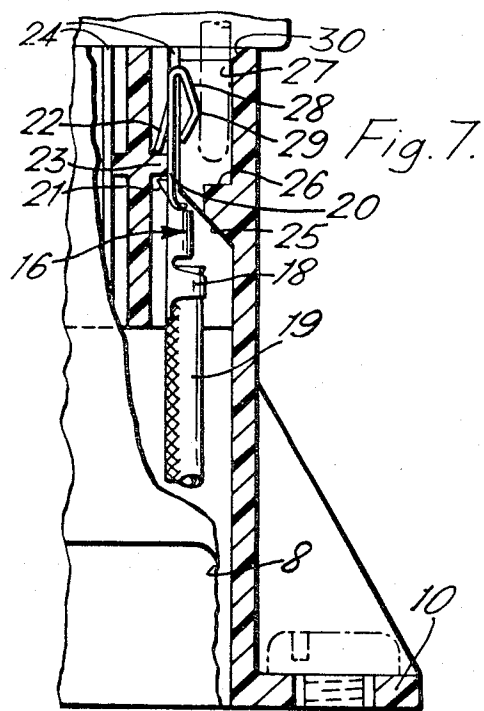
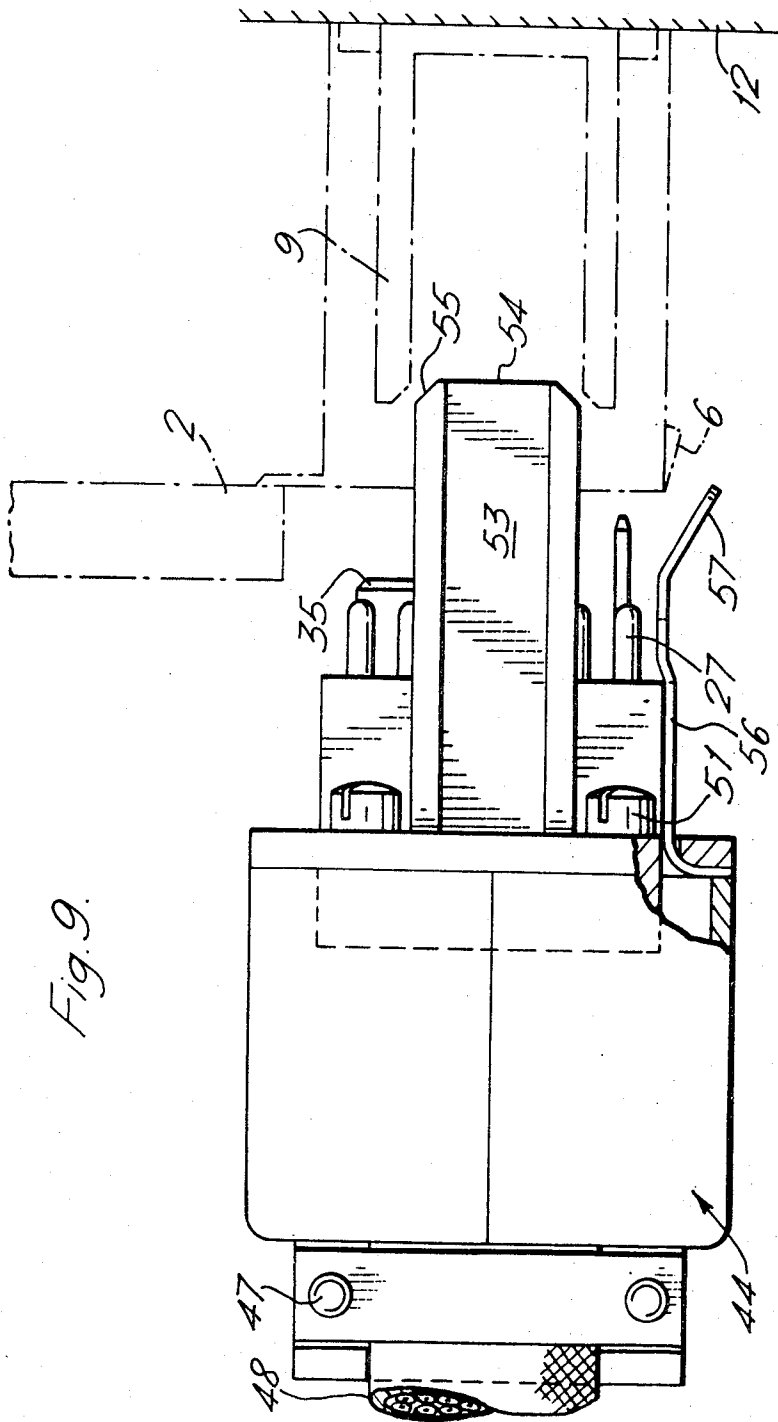


Fig. 6.







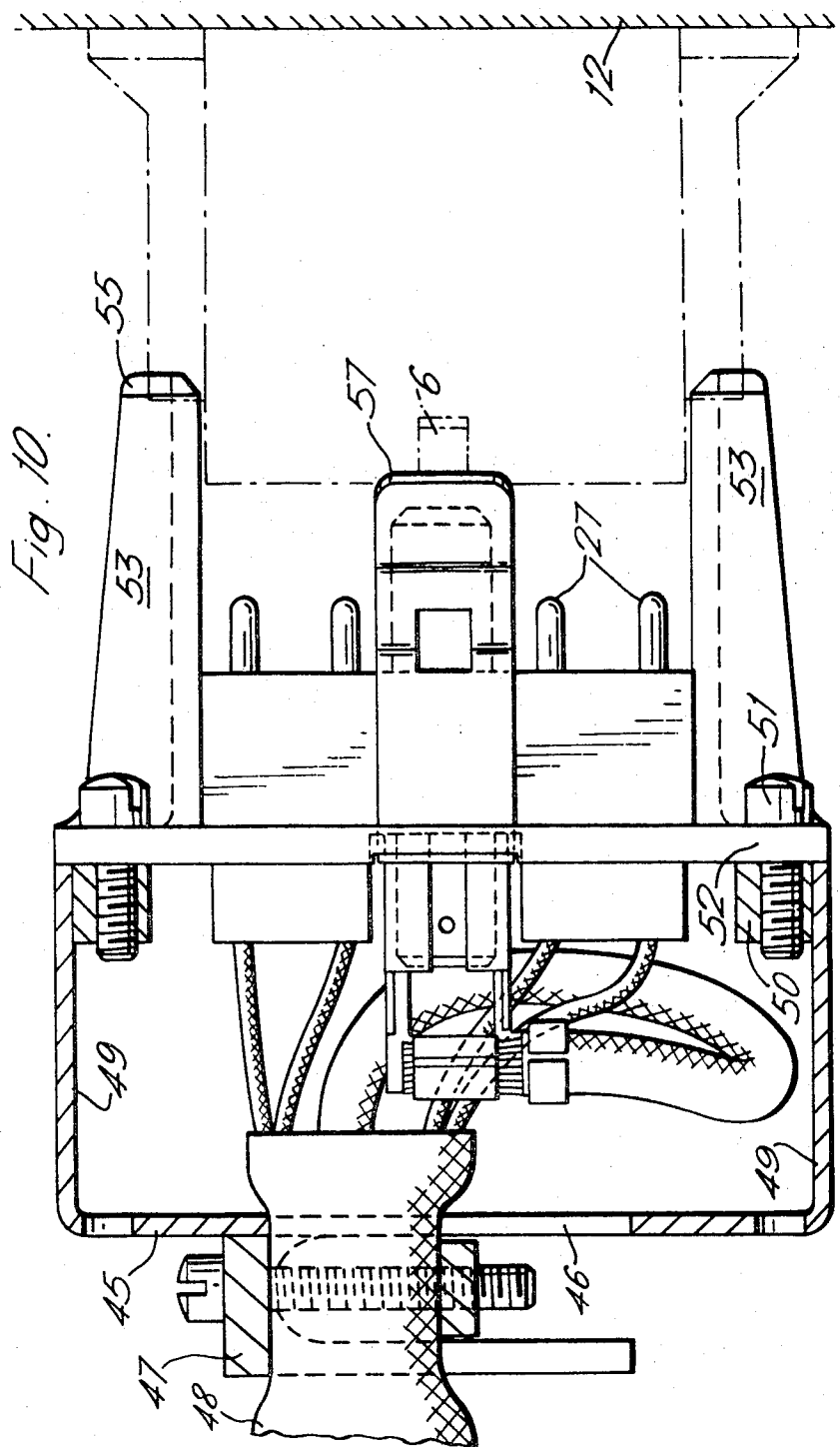
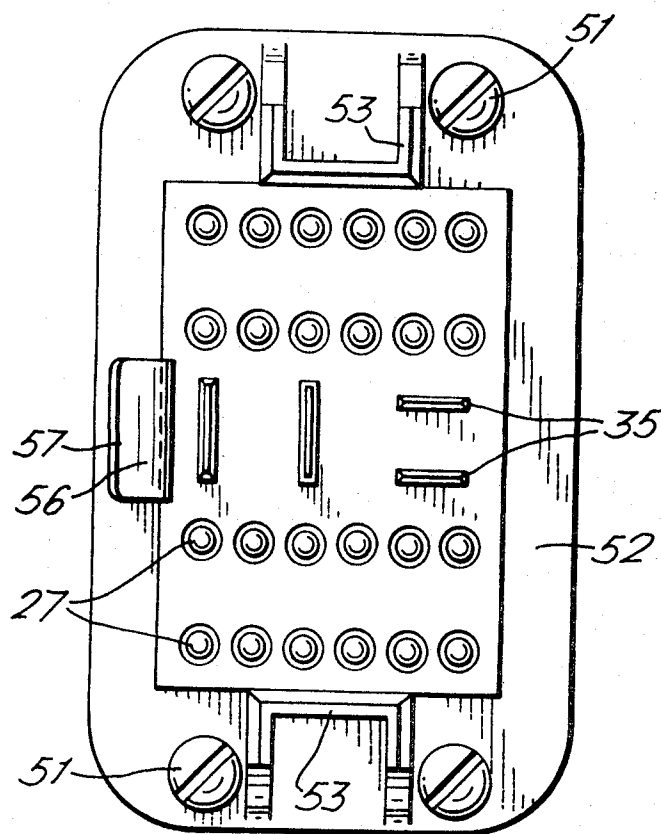


Fig. 11.



DIAGNOSTIC CONNECTOR

The invention relates to electrical socket housings and assemblies formed of such housings with matable electrical plug housings for use in the testing of electric circuitry of vehicles.

The testing of electrical circuitry in land or other vehicles is a time-consuming operation and there is a need for testing apparatus which can be used reliably and rapidly. This need is most acute in relation to mass-produced vehicles, especially motor cars, the electrical circuitry of which may be tested perhaps annually or at 6-month intervals when the vehicle is serviced.

The invention provides socket housings for permanent installation in mass-produced vehicles and for use in periodic testing of the electrical circuitry with the necessary accuracy and speed.

An electrical socket housing for a vehicle, comprising a one-piece body moulded of insulating material having contact-receiving through-passageways, a lid at one end of the body integrally joined laterally to the body by a web hinge for pivotal movement relative to the body to cover or expose the one end, the lid having latching means for engagement with complementary means on the side of the body opposite the hinge, according to the invention, the other end of the body has a lateral recess for reception of leads for contacts to be received in the through-passageways and mounting means located at that other end of the body for mounting the socket housing on a panel support of a vehicle.

Preferably, the body is of rectangular or circular cross-section and longitudinally extending guide rails are formed intermediate the ends on at least one side of the body other than that on which is formed the hinge, for guiding a guide of a plug housing into engagement with the socket housing. Preferably there are two spaced guide rails formed on each of opposite sides of the body normal to that on which is formed the hinge and the plug housing has a complementary guide to be received between each pair of rails.

The latching connection should be such as to hold the lid tight to the body to prevent dust and moisture reaching contacts in the passageways yet be releasable readily at intervals. Preferably, the lid is formed with walls on three sides to shield the end portion of the body when latched to the body and the lid preferably seats on the body below the free edge at the one end.

The contact-receiving passageways should be adapted to accept contacts for testing both power and signal circuits of the vehicle. Preferably, there is one row of power circuit testing contacts. Preferably, the contact-receiving passageways for power circuits are according to our patent application Ser. No. 572,589 and have tab receptacles to receive tab contacts of the plug. The passageways for the signal circuits are preferably of generally rectangular cross-section having one arcuate wall for reception of a pin of the male plug and each formed with a shoulder securely to hold signal circuit contact. The contact preferably comprises a ferrule for crimping connection to a lead and having a forwardly extending blade from which lances are struck for holding the contact against a shoulder formed in the passageway wall, the free end of the blade having an integral spring tongue overlying the blade and acutely bowed between the tongue ends. Preferably, the passageway is formed with recesses to receive the sides of the blade.

The plug is formed of a body having contact-receiving through-passageways and an external guide extending forwardly of one end face of the body for reception between the guide rails on a respective side of the socket body. The contacts preferably comprise pins and tabs arranged to complement the contacts of the socket housing and are of high quality for robustness in repeated use in testing the electrical circuitry of different vehicles. Preferably a leaf spring extends forwardly of the one end face for latching engagement with the latching means formed on the housing body to enhance the engagement of the two housings.

These and other objects, features, and advantages of the present invention will be understood in greater detail from the following description and accompanying drawings.

As shown in the drawings:

FIG. 1 is a front elevation of a socket housing with the lid open;

FIG. 2 is a side elevation of the housing of FIG. 1;

FIG. 3 is a front elevation of the housing of FIG. 1 with the lid closed;

FIG. 4 is a top plan view of the housing of FIG. 3;

FIG. 5 is a plan view of the housing of FIG. 1 with the lid open showing the contact-received passageways;

FIG. 6 is a plan view as FIG. 5 but from below;

FIG. 7 is a partial sectional view showing a signal circuit contact;

FIG. 8 is a sectional view showing power circuit contacts;

FIG. 9 is a side elevation of a plug housing and the socket housing in pre-mated condition;

FIG. 10 is a view as FIG. 9 taken from the front, parts of the plug housing wall being cut away; and

FIG. 11 is an end view of the plug housing.

The socket housing comprises a body 1 of generally rectangular cross-section moulded of insulating material, for example, nylon. The body 1 has at one end, the top as shown, a lid 2 integrally connected to the body by a web hinge 3, best seen in FIG. 2. The lid 2 comprises a flat member having upstanding walls 4 on the three sides other than the hinge 3. The front wall 4 has an aperture 5 latchingly to engage a peg 6 formed on the front wall of the body 1. As best seen in FIG. 2, the peg 6 slopes outwardly away from the free edge of the top of the housing and the hole 5 is so dimensioned that the edge of the hole adjacent the hinge 3 can latchingly engage the widest part of the peg 6. A finger-gripping surface 7, FIG. 2, extends forwardly of the front wall 4 to assist in making and breaking the latching engagement of the lid 2 and the body 1. The front wall of the end of the body 1 remote from the lid 2, the bottom end as shown, is recessed at 8 for reception of leads to contacts located in the body 1.

Spaced guide rails 9 are formed on opposite sides of the body 1 and extend from the bottom of the body towards the top. At their lower ends, the rails 9 emerge to form a basal part 10 of channel shape cross-section having a bolt hole 11 for holding the body 1 to a wall 12, FIG. 9, of an engine compartment of a vehicle, not shown. The free edges at the top of the rails 9 are chamfered at 13 for guiding guides of a plug housing inwardly of the rails, as explained below.

The hinge 3 is dimensioned so that the lid 2 can seat on the body 1 below the free edge of the top end of the body 1, FIG. 3.

The body 1 is formed with axially extending contact-receiving through passageways 14, 15, FIG. 5. As shown in the plan view of FIG. 5, there is one row of passageways 15, and two rows of passageways 14, one on each side of the row of passageways 15. The passageways 14 receive socket contacts 16, one of which is shown in FIG. 7, and the passageways 15 receive tab receptacles 17, shown in FIG. 8.

Each socket contact 16 comprises a ferrule 18 for crimping connection to an end of a lead 19 received in the recess 8. An integral generally flat blade portion 20 extends forwardly of the ferrule 18 and is formed with longitudinally spaced projections 21, 22 arranged to engage opposite sides of an annular shoulder 23 extending inwardly of the passageway 14 between the passageway ends. The forward projection 22 is resilient so that when the contact 16 is inserted axially into the passageway 14, it can be depressed into the plane of the blade portion 20 to ride over the shoulder 23 and then spring out again to engage the forward face of the shoulder. This engagement stabilizes the contact 16 against movement longitudinally of the passageway 14. A channel 24 extends longitudinally inwardly of the passageway 14 at right angles to the shoulder 23 to receive the sides of the blade portion 20 which are guided inwardly of the channels 24 by ramp portions 25. A shoulder 26 is formed on the wall opposite the shoulder 24 just rearwardly of that shoulder to limit the extent to which a mating plug pin 27, shown in ghost outline, may be received in the passageway. The wall of the passageway 14 having the shoulder 26 is relieved at 30 to facilitate reception of the mating pin 27.

The blade portion 20 has a spring tongue 28 integral with its free end. The tongue 28 is of slightly less relative width and overlies the blade portion 20 being bowed between its ends away from the portion to form an upstanding contact part 29. At rest, the spring tongue 27 extends across the width of the passageway 14 but, on mating of the plug and socket housings as explained below, the pin 27 deflects the spring tongue 28 towards the blade portion 20 and contacts the contact part 29 to make the desired electrical connection.

As shown in FIG. 8, the passageways 15 are of generally rectangular cross-section and each has an integral resilient projection 31 extending forwardly from a location intermediate the passageway ends. The free end of the projection 31 has a stepped portion defining shoulders 32, 33. The mouth of the passageway 15 is formed with corner shoulders 34 which taper inwardly of the passageway 15 for reception of a tab contact 35, FIG. 9.

The tab receptacle 17 comprises a ferrule 36 crimped to a lead 37 received in the recess 8 and a contact section 38 comprising a floor portion 39 having curved side portions 40 bent over the floor portion 39 with the free ends of side portions 40 spaced from the floor portion 39 for reception of the tab contact 35. The floor portion 39 has a slot 41.

The tab receptacle 37 is inserted into the passageway 15 from the rear and as the receptacle is moved along the passageway 15, the tops of side portions 40 engage projection 31 and bend it towards its parent wall. The receptacle is then moved further along the passageway 15 until the forward end of the contact section 38 engages the corner shoulders 34 when integral projection

31 reverts to its original position with surface 32 engaging the side portions 40 and surface 33 the rear end of contact section 38. The resilient projection 31 thus biases the tab receptacle 17 towards wall surface 42 to align the gap between the free ends of the bent over portions 40 and the floor portion 39 with the mouth of the passageway 15. To stabilize the tab receptacle 17 in the passageway 15, a ridge 43 is formed in the wall opposite wall surface 42.

The plug housing 44 of FIG. 9 comprises a generally shell-like body formed of an end wall 45 (FIG. 10) having a lead-receiving aperture 46 and an integral clamp 47 for the lead 48, and integral side walls 49. Corner bolt-hole extensions 50 extend inwardly of the free edge of the walls 49 for reception of bolts 51 to hold a front panel 52 to the body 44. The front panel 52 has a forwardly extending guide 53 adjacent each shorter end, the guides being of generally channel cross-section and dimensioned for reception between the guide rails 9 of the socket housing body 1. Each guide 53 tapers towards its free end 54 which is chamfered at 55 to facilitate reception between the respective guide rails 9. Between the guides 53 there are banks of electrical pins 27 and tabs 35 arranged to complement the sockets of the socket housing body 1. A leaf spring blade 56, FIG. 9, extends forward of the front panel 52 and is bent so that the free end portion 57 is directed outwardly of the plug housing 44 latchingly to engage the peg 6 of the socket body 1 on engagement of the housings.

To engage the housings, the lid 2 is moved away from the end of the body 1 and the plug 44 advanced to the body 1 with guides 53 in alignment with guide rails 9. The leading ends 54 of the guides 53 enter the rails 9 and the free end portion 57 of the spring blade 56 rides over and then latches behind the peg 6 when the guides 53 bottom in the rails 9. The housings are thus securely latched together. The housings may be separated by lifting the free end portion 57 of the spring blade 56 off the peg 6 and then withdrawing the guides 53 from the rails 9.

Electrical connection is made between pins 27 and contact blades 29 in the signal circuits and tabs 35 and tab receptacle contact parts 38 in the power circuits.

I claim:

1. An electrical socket housing for a vehicle, comprising a unitary one-piece body molded of insulated material having contact-receiving passageways extending therethrough, a lid at one end of the body integrally joined laterally to the body by a web hinge for pivotal movement relative to the body to cover or expose the one end, the lid having latching means for engagement with complimentary means on the side of the body opposite the hinge, the other end of the body having an enlarged recess portion, said recess portion having walls extending along three sides thereof and being open at a fourth side, said contact-receiving passageways being divided into groups of relatively large cavities and relatively small cavities, said relatively large cavities having electrical contacts therein of high current-carrying capacity, said relatively small cavities having electrical contacts therein of low current-carrying capacity, each of said electrical contacts being secured to an electrical conductor, said conductors being disposed within said enlarged recess portion,

5

mounting means located at the said other end of the body for mounting the housing on a panel support of a vehicle, said mounting means being disposed at each of opposite sides of said recess portion adjacent the walls thereof, said conductors being bent at approximately right angles within said recess portion and extending out said open fourth side thereof when said housing is

6

mounted on a vehicle panel support.

2. An electrical socket housing as set forth in claim 1 further comprising a pair of guide rails extending longitudinally of the housing body for guiding a mating electrical housing.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65