United States Patent

[11] **3,609,654**

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[54] **SNAP-IN ELECTRICAL CONNECTOR**
12 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **339/217 S,** 339/263 R, 339/270 R, 339/272 A
[51] **Int. Cl.** **H01r 9/12,** H01r 7/12
[50] **Field of Search** 339/214, 217, 219, 263, 268, 270, 273, 264, 265, 266, 267, 269, 272, 271, 242, 243, 244

[56] **References Cited**

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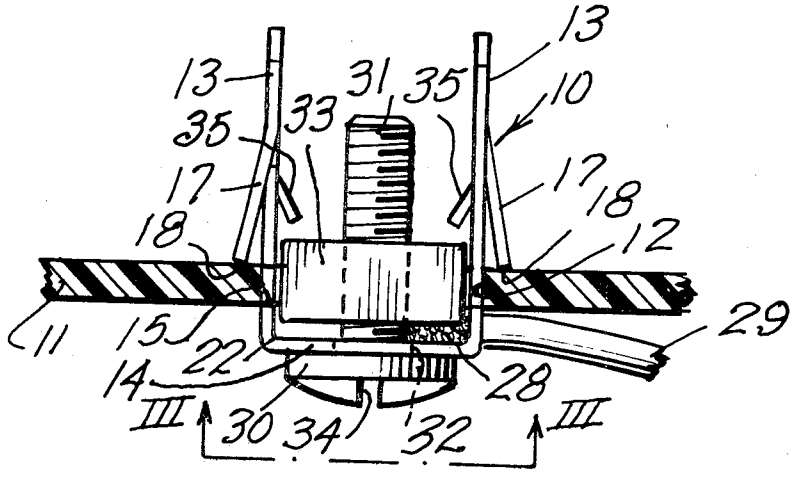
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Primary Examiner—Marvin A. Champion
Assistant Examiner—Robert A. Hafer
Attorney—Hill, Sherman, Meroni, Gross & Simpson

ABSTRACT: A generally U-shaped electrical connector is adapted to be mounted on a supporting panel by aligning it with a complementary aperture in the panel and then pressing the connector into position such that fixed shoulders adjacent a base of the connector engage one face of the panel and shear-formed resilient retaining lugs retainingly confront the opposite face of the panel. An electrical lead terminal clamp device comprises a headed screw with its shank freely extending through a hole in the base of the connector and a nut threaded on the screw shank whereby lead terminals may be clamped to either face of the connector base.



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Fig. 1

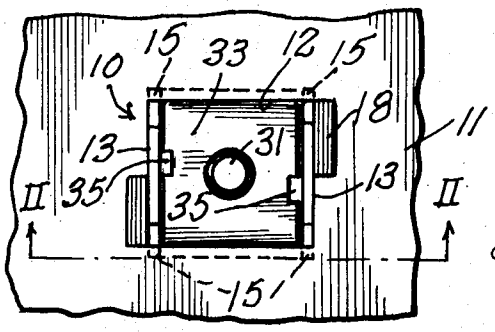


Fig. 2

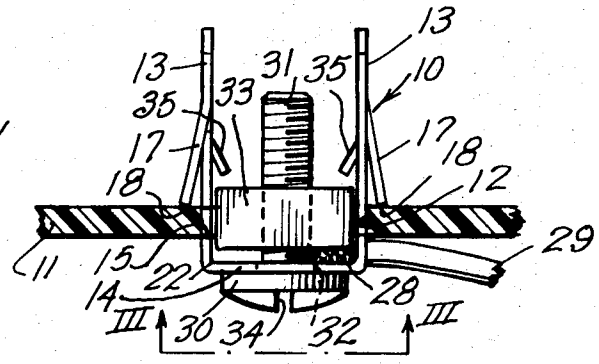


Fig. 3

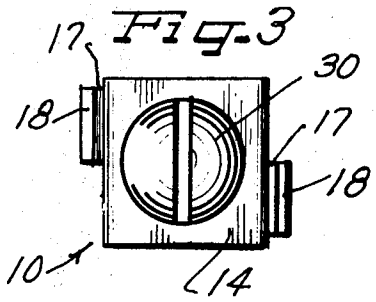


Fig. 4

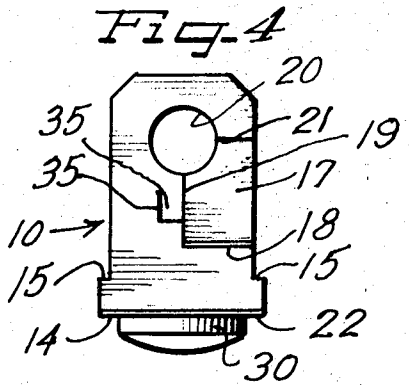
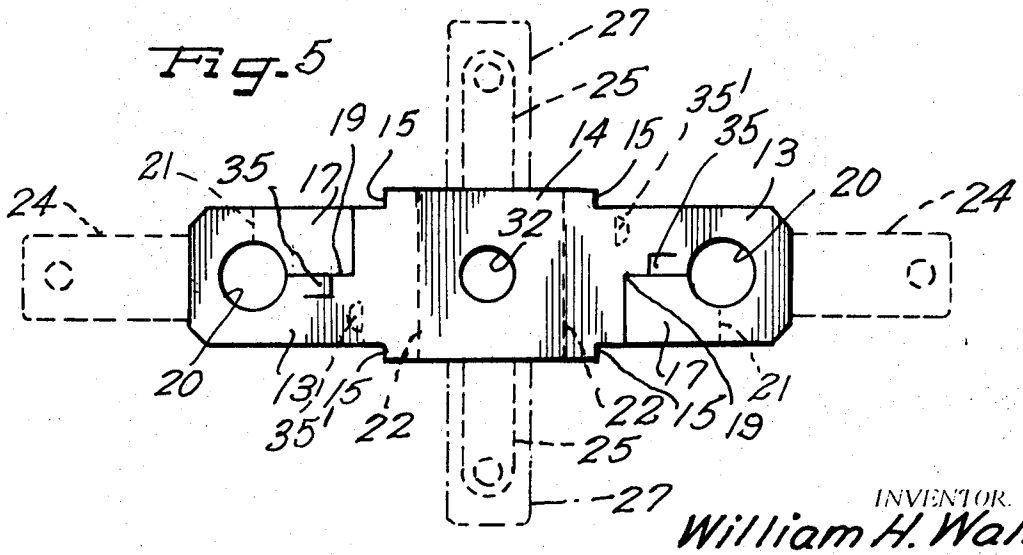


Fig. 5



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SNAP-IN ELECTRICAL CONNECTOR

This invention relates to electrical connectors and is more particularly concerned with such connectors of a type adapted to be mounted on dielectric panels such as binding post boards of the kind employed, for example, for connecting aerial leads in ratio and television sets.

Prior electrical connectors of this general type have had several disadvantages. Where the clamping means has comprised a screw head, difficulty has been experienced in maintaining the electrical lead terminal against escaping from the screw head as the frictional turning thrusting pressure is applied, especially where the terminal comprises a skinned or exposed end portion of the lead wire or wires, and even when the wire terminal has been turned about the screw shank such that the end of the terminal extends in the general direction of turning movement of the screw. Thus there has been liability of inadequate retention of the lead terminal, fraying of the terminal where it comprises a multiplicity of small wires, and the like.

Another disadvantage has resided in that it has heretofore been deemed necessary to provide the clamping base of the terminal with a tapped screw hole to receive the threaded shank of the clamping screw. Sometimes the tapped thread or the thread-engaging means in the hole strip easily and result in loose connections. Since connectors of this type are generally made from relatively thin sheet metal, extremely limited area within the hole is available for tapping and thus aggravates the hazard of stripping and looseness.

Further, prior thin sheet metal connectors of this type have permitted terminal clamping only between the head of the screw and the connector.

An important object of the present invention is to overcome the foregoing and other disadvantages, shortcomings, inefficiencies and problems inherent in prior structures and to provide a new and improved electrical connector for the intended purpose.

Another object of the invention is to provide a new and improved electrical connector which can be readily snapped into position on a mounting panel.

A further object of the invention is to provide a new and improved electrical connector of the character indicated having novel means for clamping an electrical lead terminal in place.

Still another object of the invention is to provide an electrical terminal having new and improved means for attaching the same to a supporting panel. Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts embodied in the disclosure, and in which:

FIG. 1 is a plan view of a mounting panel having a connector embodying features of the invention mounted thereon;

FIG. 2 is a sectional elevational view taken substantially along the line II—II of FIG. 1;

FIG. 3 is a plan view of the connector looking in the direction of the line III—III in FIG. 2 but showing the connector before it is mounted.

FIG. 4 is a side elevational view of the connector before it is mounted and looking generally toward the left of the connector as it appears in FIG. 2; and

FIG. 5 is a plan view of the body of the connector as it appears in the blank before it is formed up. An electrical connector **10** embodying features of the invention is constructed and arranged to be attached to a dielectric panel **11** having there in a rectangular mounting hole **12** receptive of the connector. By way of example, the panel **11** may be a so-called circuit board, a switch board, binding post board, antenna terminal panel or board, or the like. By way of example, the connector **10** may be provided on the panel **11** for detachable connection of an antenna lead terminal at one face of the panel while one or more circuit wires may be soldered to the terminal at least at one face of the panel.

In a desirable construction, the connector **10** is constructed from relatively thin sheet metal which is sufficiently stiff to be self-sustaining under the conditions of intended use, but is possessed of substantial resilience. To enable reception of the connector **10** in the rectangular aperture **12**, it is provided with a pair of spaced parallel preferably coextensive similar arms **13** integrally connected together in one piece by a connecting or base web **14** at one of their ends and dimensioned to be received in complementary relation within the hole **12** with the outer faces of the legs in close slidable relation to opposite sides of the hole while the respective opposite edges of each of the legs fit in close slidable relation to the remaining edges of the hole. Thereby mounting of the connector **10** in the hole **12** is readily effected by inserting the free ends of the legs **13** into the hole **12** and pushing the connector into place.

Means are provided on the connector **10** for maintaining it in position against unintentional displacement from the aperture or hole **12**. To this end, each of the legs **13** has at each edge thereof adjacent to the base **14** a mounting stop shoulder **15** which faces in the direction of the major longitudinal extent of the edge, that is toward the free end of the leg. All of the shoulders **15** are in the same plane so that they will make substantially uniform contact with the surface of the panel **11** from which the legs are inserted into the hole **12**. Shoulder means engageable with the opposite surface of the panel comprise an automatically acting resilient locking tab or lug **17** normally flaring obliquely outwardly from the outer face of each leg **13** toward the plane of the shoulders **15**. Each shoulder lug **17** is provided with a locking edge **18** spaced from the plane of the shoulders **15** equal to the thickness of the panel **11** and located to confront the panel surface closely with just sufficient clearance to enable resilient splay biasing of the lugs into the panel engaging interlocking relation from coplanar disposition within the main body portions of the legs while the legs are in movement through the hole **12**.

Desirably, the lugs **17** are located at respective opposite sides of the legs **13** and are of sufficient size and flexibility to facilitate pressing them in opposition to their bias from their splayed locking disposition into the respective planes of their legs, enabling backing the connector out of the hole **12** when desired. Each of the lugs **17** is partially separated from its leg **13** as by shear-forming in such a manner that one of its side edges coincides with the adjacent side edge of the leg while its opposite edge and the locking edge **18** thereof is separated from the leg along an angular line **19** which runs out at one end at the adjacent side edge of the leg and runs out at its opposite end in a solder lug opening **20** in the outer end portion of the leg. Through this arrangement, a relatively narrow connecting neck between the aperture **20** and the adjacent side edge of the leg provides a short bend line **21** or resilient hinge for the respective locking lug **17**. For efficient stability in the locking engagement with the panel **11**, the effective width of the locking tip, i.e., the length of the locking edge **18**, may be about one-half the width of the associated leg. **13**. On the other hand, the length of the hinge **21** may be about one-quarter to one-third the width of the leg, thus facilitating resilient flexing of the lug **17** between the locking and non-locking positions thereof.

In making the sheet metal portion of the connector, it is formed up from a strip blank as shown in FIG. **5**, with the legs **13** bent up along parallel juncture lines **22** into right angular relation to the base web **14** and into parallel relation to one another. Although the legs **13** may themselves serve as solder lugs, optionally they may be provided either or both with solder lug tab extensions **24** at their free ends. Optionally either or both free edges of the base web **14** may be provided with either of the forms of short solder lug tabs **25** shown in dash outline or the longer and larger tabs **27** indicated in dot-dash outline in FIG. **5**.

Means are provided for clamping a terminal end **28** of an electrical lead **29** (FIG. **2**) to the base **14**, herein comprising a screw having a head **30** and a shank **31** which passes freely through a central clearance hole **32** in the base **14** and is

threaded through a nut 33. By having the nut 33 of square form and dimensioned to be received in reasonably close relation at its sides between the inner sides of the legs 13, the nut is held by the legs against turning when the screw head and shank are turned. Through this arrangement, turning of the screw head by means of a suitable tool such as a screwdriver applied to a conventional screw slot 34 in the head enables opening and closing a clamping gap between the nut 33 and the base 14 to receive the terminal 28 when the gap is sufficiently opened and to clamp the terminal tightly in place by closing the gap through tightening of the nut 33 toward the base 14. By holding the nut 33 against turning relative to the clamping flange or base 14, clamping action is performed along a linear axis without transverse movement, thereby avoiding any frictional, twisting, ejecting force on the terminal 28 as would be experienced if such terminal were to be engaged between the turning head 30 of the screw and the base 14. In addition, the terminal 28 is efficiently maintained between the two clamping surfaces and any tendency to crowd out as pressure is applied is prevented by the adjacent wall surface of the leg. 13. Instead of a bared terminal end of the lead from which the insulation has been skinned, the lead 29 may be provided with a conventional spade terminal which may be engaged between the nut 33 and the base 14, or may be engaged between the screw head 30 and the base 14.

In order to afford ample clearance between the base 14 and the adjacent face of the panel 11 to receive the lead terminal 28, the shoulders 15 are spaced from the inner face of the base 14 a predetermined distance to provide the desired clearance when the nut 33 is backed away from the base 14. Backoff gauging of the nut 33 to a spacing from the base 14 sufficient to provide full clearance to receive the terminal 28 is facilitated by one or more, herein two, relatively stiff small stop lugs 35, respectively partially severed from the legs 13 as by shear-forming or striking them inwardly along the shear line 19 in each instance to confront the nut 33 at the desired gauging distance from the base 14. Thereby, when the screwhead 30 is turned by a screwdriver inserted in the slot 34, with the normal pressure toward the base 14 while backing the nut 33 away from the base striking of the lugs 35 by the nut will be apparent to the manipulator by feel, signaling that full clearance has been attained. At this point, the clamping face of the nut may be about parallel with the face of the panel 11 nearest the clamping base 14. When it is desired to provide a gap between the screwhead 30 and the base 14 to receive a terminal therebetween, continued unscrewing of the shank 31 while the lugs 35 hold the nut 33 in longitudinal position causes the screwhead 30 to back off from the base 14.

It will be observed that the hole 12 in the panel 11 provides full clearance for the nut 33. This is advantageous in that it enables the base 14 to be spaced only a limited distance from the adjacent face of the panel 11 sufficient to permit easy access of the lead terminal 28 between the base and the nut for clamping in the connector.

Another advantage attained with the stop lugs 35 is that they serve as nut retainers in cooperation with legs 13 and the opposite edges defining the hole 12 extending between the legs. Should the screw shank 31 be inadvertently or intentionally entirely disengaged from the nut 33 after the connector 10 has been assembled with the panel 11, the nut is positively retained against falling away even though the assembly may be upside down from the showing in FIG. 2. This desirable relationship is attained by having the spacing of the stop ends of the lugs 35 spaced from the adjacent surface of the panel 11 less than the thickness of the nut and preferably not over one half the thickness of the nut so that the nut cannot tilt out of the retained relationship. Retention is also enchanced by having the lugs 35 relatively offset to opposite sides of a plane through the screw axis and extending between the lugs. It will be observed that both the spacing between the base 14 and the face of the panel 11 adjacent thereto is also less than the thickness of the nut 33 such as about one-half the thickness of the nut.

Instead of shear-forming the stop lugs along the shear line 19, they may be shear-formed along stop edges and pressed inwardly from the material of the legs 13 as indicated at 35' (FIG. 5). Either of the forms of shear lug 35 or 35' should have the stop edges thereof located relative to the base 14 with regard to the thickness of the panel with which the connector is to be assembled and the thickness of the clamping nut to attain the desirable retention of the nut against escape when it is free from the screw shank after assembly of the connector with the panel.

It may be further noted that whether or not the nut 33 is alongside those portions of the legs 13 which are sheared along the line 19 for partial separation of the resilient retaining lugs 17, the retaining lugs can flex from their normal outwardly biased splayed condition into coplanar relation with the respective legs for mounting the connector 10 by pushing it through the hole 12 until the lugs 17 have cleared through the hole and then snap into the interlocking splayed relation to the legs. The lugs 17 can also be readily pushed back against their splay bias into the planes of the respective legs to push the connector out of the hole 12 when it is desired to remove the same from the panel 11 for any reason.

To prevent the screw and nut assembly from being inadvertently separated, the free tip of the shank 31 may be deformed after assembly to prevent such an occurrence, unless done deliberately.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. An assembly comprising a mounting panel having a rectangular hole therethrough and a connector assembled in said hole:

said connector being of generally U-shape with spaced legs extending in the same direction and projecting through said hole and connected at one of their ends by a base web flange having a central hole therethrough:

shoulder means on said legs retaining the connector against displacement from said panel hole and maintaining a spaced relation of said base from the adjacent surface of the panel; and

a clamping screw having a threaded shank extending freely through said base hole with a screw head opposing the face of the base which faces away from said adjacent surface of the base which faces away from said adjacent surface of the panel and a nut threadedly engaged on said shank and held against rotation by confrontation of edges of the nut with said legs and freely clearing through said panel hole, whereby the nut can be backed away from said base through said panel hole by turning the screw shank and an electrical lead terminal adapted to be inserted between the base and the nut as facilitated by the spaced relation of the base from said adjacent surface of the panel and the nut tightened toward the base by manipulation of the screw to clamp the terminal between the nut and the base.

2. An assembly according to claim 1, said shoulder means comprising respective fixed shoulders on said legs engaging said adjacent surface of the panel, and resiliently flexible normally splayed shoulder tab lugs on the legs engaging with the opposite surface of the panel and being resiliently flexibly movable into the plane of the respective leg in each instance to enable clearance of the legs through the panel hole when mounting the connector or for removing the connector with respect to the panel.

3. An assembly according to claim 2, said shoulders engaging said adjacent surface of the panel comprising stepped shoulders at the respective opposite edges of the legs adjacent to but spaced from the base.

4. An assembly according to claim 1, including stop shoulder means on at least one of said legs confronting said nut in such spaced relation to said base as to limit the distance the nut can back off from said base.

5. An assembly according to claim 4, wherein said shoulder means are spaced from said base a distance related to the thickness of the nut to stop backing off of the nut at a position wherein the face of the nut which opposes said base is about in a plane with said adjacent surface of said panel.

6. An electrical connector assembly comprising:

a U-shaped member having spaced legs extending in the same direction connected at one of their ends by a web flange base having a hole therethrough;

a screw having a head opposing the outer face of said base and provided with a shank extending freely through said hole with a nut threaded on said shank and having opposite edges opposing said legs whereby to be held against turning when the screw is manipulated to back the nut away from said base to receive an electrical terminal therebetween and when the nut is drawn toward said base by manipulation of the screw to clamp the terminal between the nut an the base;

shoulders on said legs adjacent to but space from said base to engage an adjacent surface of a mounting panel having rectangular mounting hole through which the legs are projected until said shoulders engage said surface to orient said base in spaced relation relative to the plane of said surface to afford free access of the electrical terminal into a gap between the base and the nut when the nut is backed away from the base after the connector has been mounted on the base with said legs through said rectangular hole; and

shoulder means on said legs projecting from the outer faces of said legs to engage the opposite surface of the panel for retaining the connector in place on the panel in cooperation with said first-mentioned shoulders.

7. An assembly according to claim 6, said first-mentioned shoulders comprising stepped portions at side edges of the legs adjacent to said base.

8. An assembly according to claim 6, said shoulders which project from said outer faces of the legs comprising shear-formed tab lugs which are normally resiliently biased into splayed relation to said legs and are adapted to be pressed inwardly toward one another in opposition to their bias into the planes of the respective legs to enable insertion of the legs into the panel hole with the lugs thus clearing through the hole and then automatically snapping into interlocking relation to said opposite surface of the panel.

9 An assembly according to claim 8, said legs having holes therethrough adjacent to their free ends, said lugs being sheared from the legs along lines which run out at respective side edges of the legs and said holes, and the lugs being resiliently connected to the legs and said holes, and the lugs being resiliently connected to the legs along resilient hinge bends extending between said edges and said holes.

10. An assembly according to claim 6, including a gauging stop shoulder on one of said legs opposing said nut in such spaced relation to said base as to permit a predetermined but limited backing off of said nut relative to said base by manipulation of said screw.

11. An assembly according to claim 6, including stop shoulder means on each of said legs projecting inwardly and spaced form said base to limit the distance the nut can move from said base.

12. An assembly according to claim 1, said legs having stop shoulder means confronting said nut in spaced relation to said base and related to the panel such that the nut can be backed away from the base sufficiently to receive a terminal to be clamped between the nut and the base, but should the nut be freed from the shank, the shoulder means in cooperation with said legs and side edges defining said hole will retain the nut against escape.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,609,654 Dated Sept. 28, 1971

Inventor(s) William H. Wallo

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 6, for "ratio", read --radio--;
line 46, "Other" should start a new paragraph;
line 65, "An" should start a new paragraph.

Column 3, line 41, after "base", insert --,--;
line 58, before "legs", insert --the--;
line 69, "enchanced" should read --enhanced--.

Column 4, line 45, delete the entire line as a repetition.

Column 5, line 18, for "an", read --and--;
line 19, for "space", read --spaced--.

Column 6, line 25, for "form", read --from--.

Signed and sealed this 1st day of August 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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