United States Patent [19]

McHattie

[11] 3,786,399

[45] Jan. 15, 1974

[54] **AUTOMATIC GROUNDING CONNECTION FOR ELECTRICAL UNIT**

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[22] Filed: **Aug. 18, 1971**

[21] Appl. No.: **172,728**

[52] **U.S. Cl.** ..... **339/14 R**

[51] **Int. Cl.** **H01r 3/06**

[58] **Field of Search** ..... 339/14 R, 133 R; 85/36, 1 K

[56] **References Cited**

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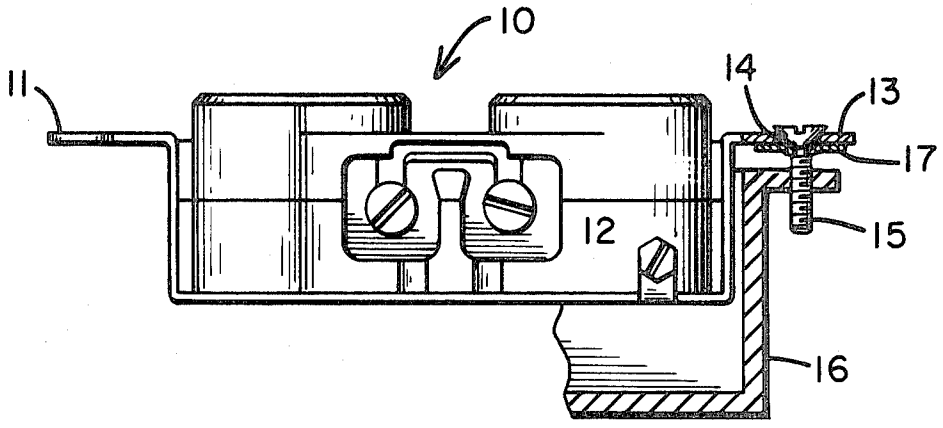
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Primary Examiner—Marvin A. Champion
Assistant Examiner—Robert A. Hafer
Attorney—Stryker and Jacobson

[57] **ABSTRACT**

The mounting screw for an electrical unit, such as a wall receptacle, is threaded through an electrically conductive tab and into the metal flush box so that as the screw is tightened, the tab is drawn toward the metal mounting strap or yoke to make an electrical conduction path between the screw and the mounting strap. In one embodiment, the screw is undercut so that when secured the tab is locked in place and cannot be unthreaded.

4 Claims, 5 Drawing Figures



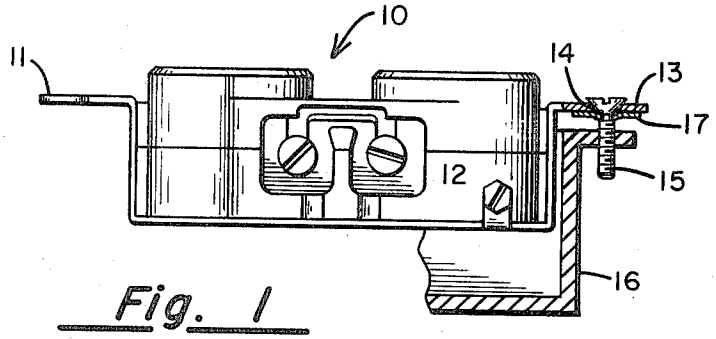


Fig. 1

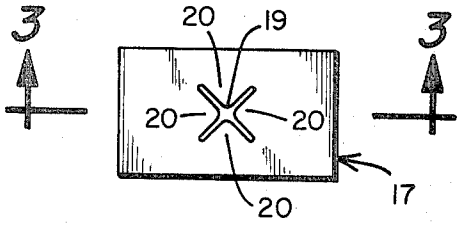


Fig. 2

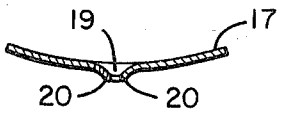


Fig. 3

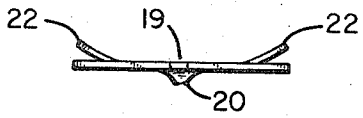


Fig. 4

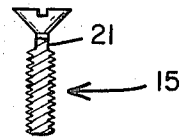


Fig. 5

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AUTOMATIC GROUNDING CONNECTION FOR ELECTRICAL UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed toward providing an automatic grounding path for a wall mounted electrical unit such as a receptacle which is attached to a metal flush box with suitable mounting screws.

2. Description of the Prior Art

In U. S. Pat. No. 3,432,793, patented Mar. 11, 1969, titled "Grounding Connection for Electrical Unit" there is briefly described the reason for having a ground connection. As described briefly therein, the combination of a three-wire cord, a three-prong plug and three socket receptacle protects the user of an electrical apparatus, such as a household appliance, in the event one of the hot leads should short to the casing which is held by or in contact with the user. Before the advent of the automatic grounding connection which is described in the aforementioned patent, the usual way of grounding the third wire was to run a short piece of wire from the grounding terminal on the electrical unit, such as a receptacle or switch, to the metal flush box to which the unit was mounted. This was not only time consuming and costly, especially when one considers the large number of receptacles ordinarily found in residences and business establishments, but also it was sometimes overlooked by the tradesman in his hurry to get his work done. By providing a connection of the nature described in the Muska et al patent, supra, the grounding of the third wire is made automatically when the unit is mounted to the flush box with its mounting screws in the normal fashion. The present invention serves the same function as that described in the aforementioned patent.

SUMMARY

A small piece or tab of sheet metal contains a hole or opening through which it is threadably engaged with the mounting screw which passes through the metal mounting strap and is threaded into the metal flush box for mounting the electrical unit. The tab is arranged so that when the unit is securely mounted, it makes electrical connection between the screw and the mounting strap thereby insuring a good electrical connection between the ground wire of the unit, which is connected through the receptacle to the mounting strap, and the flush box. Preferably the tab is not attached to the mounting strap and is located under the mounting strap so that when the screw is threaded into the flush box, the tab is drawn into pressure contact with the mounting strap. In that case, the screw is preferably undercut at its upper end to prevent the tab from unthreading if the screw is unthreaded from the flush box.

DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates in general the usual manner of mounting a wall unit to its flush box to illustrate an embodiment of the present invention as used to complete the grounding circuit between the unit and the flush box;

FIG. 2 is a view of a preferred embodiment of the automatic grounding member;

FIG. 3 is a sectional view of the embodiment illustrated in FIG. 2;

FIG. 4 is another embodiment of the automatic grounding member; and

FIG. 5 is a view of the mounting screw used in the preferred embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will now be described as it is used in conjunction with an ordinary double, three-socket wall receptacle. It should be understood that the invention is not so necessarily limited and can be used effectively with other electrical units such as wall switches and the like. An ordinary double wall receptacle **10** contains three sockets (not shown) in each half for mating with corresponding male prongs of an electrical plug which is at the end of a three-wire cable which is normally attached to a piece of electrical equipment such as a household appliance. Two of the prongs and their mating sockets are used to provide the energizing current to the appliance through the attached wires while the third prong provides a precautionary grounding path for the third wire. The receptacle **10** has the usual rigid mounting strap or yoke **11** which is connected electrically to a grounding terminal **12** which is electrically connected internal of the receptacle, by means not shown, to the ground sockets in each half of the receptacle. In the usual fashion, the strap **11** has mounting ears **13** at each end which contain elongated slots **14** through which mounting screws **15** are inserted to attach the receptacle **10** to a metal flush box **16** which is located in the wall. The flush box **16** is ordinarily electrically grounded so that it provides a convenient place to which to connect the grounding terminal **12.** Various electrical codes and specifications require that resistance in the ground circuit path be very low so that in the event a short should occur which would ground one of the power lines, a large current would be drawn almost instantaneously to blow the protective fuse or circuit breaker or the like. Furthermore, as a precaution against fire, it is generally required that no sparking or arcing occur. It can be visualized that because the metal strap **11** is made of relatively heavy metal and is solidly connected to the grounding terminal **12,** it introduces negligible resistance in the grounding path.

The present invention provides a member **17** to automatically complete a low resistance electrical circuit connection from the strap **11** to the flush box **16** through the mounting screw **15** when the receptacle is mounted or attached to the flush box but not making good electrical contact with it. The tab member **17** is a thin piece of electrically conductive material, preferably made from a sheet of metal, and, as will be shown subsequently, more preferably a resilient metal such as spring bronze. Except for certain requirements such as are set forth below, the size and shape of the tab **17** is of no great consequence. The embodiment illustrated in FIG. **2** and **3** shows the tab **17** to be rectangular in plan but as viewed from an edge is bowed upward at two opposite ends. The tab contains an opening **19** which is defined by four finger-like extensions **20.** Preferably the opening and the associated fingers are formed by punching with a suitable die. When punched out of a piece of spring metal, the fingers **20** would appear in cross section substantially as illustrated in FIG. **3.** The principal requirement as to the dimension of opening **19** as defined by fingers **20** is that the opening be large enough to accommodate the mounting screw

15 but with fingers 20 threadably engaged with the screw threads. In order to ensure a good electrical contact between the fingers and the screw threads, it is also preferable that the dimensions be such that as the screw is threaded into the opening 19, the fingers 20 are in pressure contact with the screw threads. In effect then, this means that it is preferred that the dimension of the opening between opposite fingers be less than the minor diameter of the mounting screw.

In practice, the tab 17 is located so that the mounting screw 15 passes through the slot opening 14 in the mounting strap 11 and is threaded through opening 19 and into a suitably threaded hole in the flush box 16. As the mounting screw advances until the unit or receptacle is apparently secured firmly to the flush box, the tab 17 is brought into pressure contact with strap 11 and through the fingers 20 makes a low resistance electrical path between the strap 11 and the mounting screw 15. Tab 17 may be located on the top side of the mounting strap 11 and, if so, the configuration of the fingers and the curvature of the tab would of necessity be different from that illustrated in the drawing. However, it is preferred that the tab be located on the underside of strap 11 for the reason that it can then serve as a retainer for the mounting screws. The former practice of packaging receptacles has been to have a cardboard washer under the strap and the screw inserted through the slot and through the washer which would then keep it in place. This additional function would now be effectively served by tab 17 being located under the mounting strap. The tab could be fixedly attached to the top or bottom side of strap 11 in a manner to constitute a virtual duplicate of the invention in the aforementioned Muska et al patent. However, using a tab of the fashion described hereinabove and attaching it to the mounting strap 11 has some drawbacks. First off, the slots 14 in the mounting strap 11 provide the tradesman flexibility in trying to align the mounting screws with the threaded openings in the flush box. A permanently fixed tab with a small opening 19 would somewhat limit that flexibility. Secondly, if an attached tab were used to hold the mounting screws in place before the unit is attached, as described previously, the screws would have to be threaded substantially all the way in so they would not extend above the body of the receptacle so the receptacle would fit into its container. This, then, might also interfere with the freedom that the tradesman presently has in mounting the unit and attaching it with the mounting screws to the flush box.

In the preferred embodiment where the tab is not attached to the strap, it is preferred that the shape and size of the tab be such that after the screw has been initially threaded into the opening 19, tab 17 need no longer be manually held in place to prevent it from rotating as the screw is threaded into the flush box. This would be the case if the tab were, for example, rectangular and dimensioned so that it would strike the side of the receptacle body or the mounting strap when the screw is rotated and therefore be held in place and prevented from rotating so that it will then be drawn down to the strap as the mounting screw is threaded into the flush box. Also, in the preferred case where the tab is located on the underside of the mounting screw and is not attached permanently to the mounting strap, the mounting screw 15 should preferably have a configuration as illustrated in FIG. 5. Just below the head of the screw the shaft is undercut at 21. The undercut is to a degree that the remaining shaft has a diameter slightly less than the minor diameter of the screw. Constructed in this fashion, as the screw is threaded into the flush box and draws tab 17 until it makes pressure contact with the underside of the mounting strap, when the fingers 20 reach the undercut area 21, they are then located so that the tab 17 cannot be unthreaded from the screw. Of course, in that situation the fingers should still be in pressure contact with the upper part of the topmost thread to make a good electrical connection to the screw. This can be achieved by the proper curvature or bow of the tab combined with the degree to which the fingers extend downward from the underside of the tab. The reason for this is that if the receptacle is once mounted in place and then must be removed for some reason, it is preferred that the tab 17 not be unthreaded as the mounting screw is unthreaded from the flush box as would likely be the case if the undercut area in the screw were not provided. Naturally, the length of the undercut area must be such that, as stated before, there is still pressure contact between the fingers 20 and the screw thread.

An illustration of a possible variation in construction of the tab 17 is shown in FIG. 4. A relatively flat piece of metal or tab has upward extending legs 22 pierced or otherwise formed out of the tab body. Again, screw 15 would be threadably engaged in an opening 20 so that as the screw is threaded into the flush box, the tab is drawn toward the mounting strap until the legs 22 make pressure contact therewith. In this embodiment, it is again preferred that the opening be defined by fingers in the same manner as described hereinbefore.

In a typical case, a satisfactory grounding connection was made mounting a double wall socket to the flush box using a rectangular tab made out of spring bronze of approximately 0.015 thickness with the opening 19 stamped out of the tab material so that the fingers define an opening having a maximum dimension between opposite fingers in the order of 0.092 – 0.093 inch. The mounting screw was a six thirty-second which has a minor diameter of 0.0974 and the length of the undercut extended about 0.030 inch from below the screw head and the diameter of the screw shaft in the undercut area was in the order of 0.091 – 0.092 inch. The radius of curvature of the tab was not determined but was sufficient so that as the tab was drawn down into pressure contact with the underside of the mounting strap and the fingers of the tab slipped into the undercut area of the mounting screw the fingers maintained good pressure contact with the screw body.

I claim:

1. For an electrical unit such as a wall receptacle which has a metal mounting strap for attaching the unit to a metal flush box, apparatus for making electrical connection between the mounting screw and the strap, comprising:

a resilient tab of electrically conductive material separate from the metal strap and located under the metal strap having an opening defined by inwardly extending resilient fingers for receiving a threaded member; said tab being bent so at least one edge curves upward toward the strap, the mounting screw passing through the strap and threadably engaging said resilient fingers and biasing said fingers in the direction of advance of the screw so that as the screw is threaded into the box the tab is drawn upward to make pressing low resistance electrical

contact with the strap, the shank of said mounting screw containing a circumferential unthreaded relief section just below the screw head somewhat deeper than to the minor diameter of the threaded section whereby when the screw is threaded through the opening in the tab beyond the end of the threads, the fingers come to rest in the relief section while still making electrical contact with the screw.

2. The invention as set forth in claim 1 wherein the width of said tab is such that as the screw is threaded through the opening in the tab, an edge of the tab strikes the mounting strap or the receptacle body to prevent the tab from rotating.

3. In combination:

an electrical unit such as a wall receptacle having a metal mounting strap;

a mounting screw passing through an opening in said strap;

a resilient electrically conductive tab separate from said strap and located under the strap having an opening defined by inwardly extending fingers threadably engaging the screw threads, said fingers being biased downward by said screw threads;

said tab being bent so at least one edge curves upward toward the strap whereby when the unit is mounted with said mounting screw the tab makes pressure contact with the strap to establish low electrical resistance connection between the strap and the screw;

the shank of said mounting screw containing a circumferential unthreaded relief section just below the screw head somewhat deeper than to the minor diameter of the threaded section whereby when the screw is threaded through the opening in the tab beyond the end of the threads the fingers come to rest in the relief section while still making electrical contact with the screw.

4. The invention as set forth in claim 3 wherein the width of the tab is such that as the screw is threaded through the opening in the tab an edge of the tab strikes the mounting strap or the receptacle body to prevent the tab from rotating.

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