United States Patent

[11] 3,627,900

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[21] Appl. No. **883,121**
[22] Filed **Dec. 8, 1969**
[45] Patented **Dec. 14, 1971**
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[54] **GROUND CLAMP**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **174/51,**
339/14 R, 339/95 R
[51] **Int. Cl.** **H05k 5/02**
[50] **Field of Search** 174/51,
40.1; 339/14 R, 95 R, 95 A, 95 D; 317/256, 242

[56] **References Cited**
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ABSTRACT: Connection is made to a metal container having a bead, by means of a resilient clamp that embraces the bead, and surface-penetrating tines, and a terminal part to which a wire connection may be made.

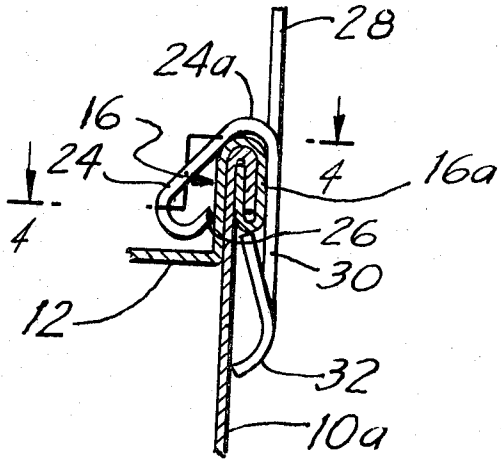


FIG. 1

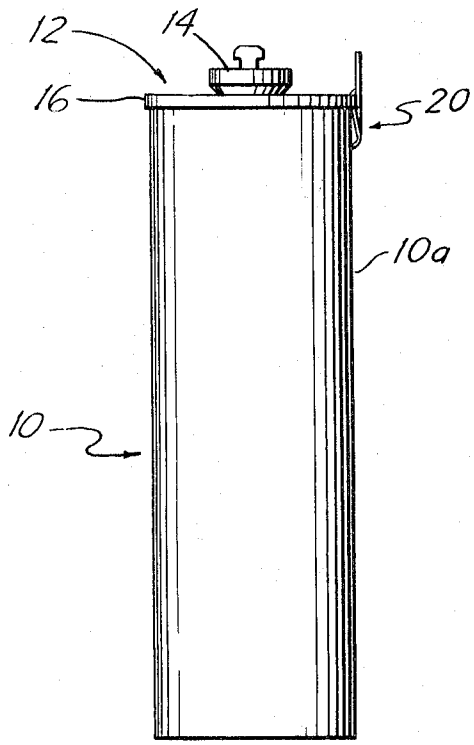


FIG. 2

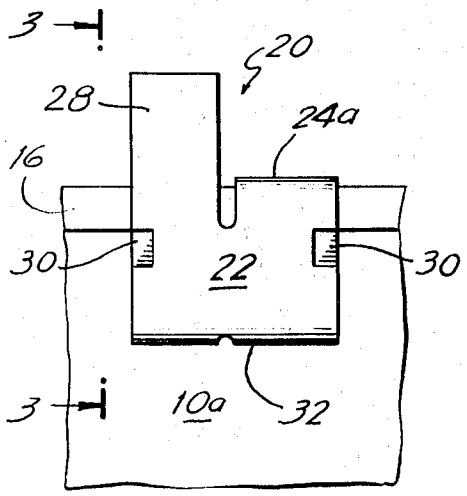


FIG. 4

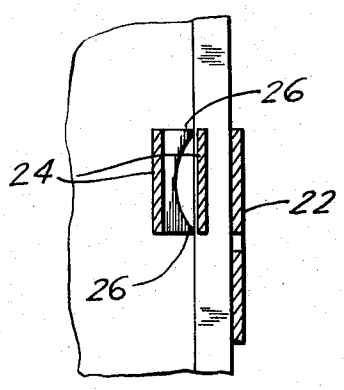
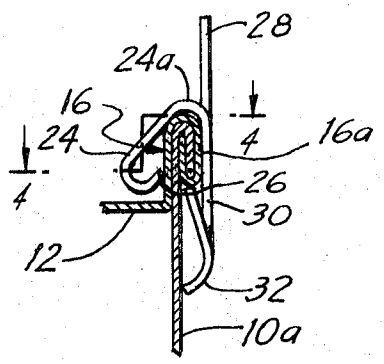


FIG. 3



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GROUND CLAMP

The present invention relates to an electrical ground clamp, forming an electrical connector to the container of an electrical component, for making a ground connection thereto.

An object of the present invention resides in providing a new form of ground clamp wherein a paint- and surface-penetrating barb is forced against one side of a bead of a sheet-metal container and wherein the ground clamp engages the lateral surface of the container and abuts widely spaced edge portions of a bead of the container, for effectively resisting stresses applied to a projecting electrical terminal of the ground clamp, for maintaining a stable contact of the barb to the container.

The nature of the invention and its various objects and features of novelty, and their advantages, will be best appreciated from the following description in detail of an illustrative embodiment of the invention which is shown in the accompanying drawings. In the drawings:

FIG. 1 is a side elevation of an electrical capacitor bearing a ground clamp, as an illustrative embodiment of the invention;

FIG. 2 is an enlarged view of the illustrative ground clamp and a fragment of the container as viewed from the right of FIG. 1;

FIG. 3 is an enlarged side elevation of the ground clamp, including a fragmentary portion of the container in cross section as viewed at the plane 3–3 of FIG. 2; and

FIG. 4 is a cross-sectional view of the clamp of FIGS. 2 and 3 as viewed from the section line 4–4 of FIG. 3 including a portion of the container.

In the drawings, a capacitor is shown having a sheet-metal enclosure comprising a drawn "can" or body 10 and a cover 12 having various capacitor terminals 14 thereon. Body 10 and cover 12 are joined to each other by a bead 16 that is sealed hermetically, optionally with solder, resistance-welding, a gasket or the like. In a common form of container, the horizontal cross section is generally oval so as to have semicircular portions (one of which is shown in FIG. 1) and a pair of flat sidewalls 10*a* perpendicular to the plane of FIG. 1.

A novel embodiment of a highly successful clamp 20 that provides a stable and dependable grounding connection to the metal enclosure appears in FIG. 1 and, drawn to larger scale, in FIGS. 2, 3 and 4.

Ground clamp 20 includes a body part 22. A barb 24 extends integrally from body part 22 and includes two tines 26 that have sharp and hard edges for penetrating into cover 12 and through any paint and phosphatizing or other protective surface treatment on such sheet metal containers. Ground clamp 20 is formed of hard resilient sheet-metal. Tines 26 have adequate pressure so that, being hard r and sharp, they penetrate into the metal of the enclosure. The space between tines 26 and body part 22 is originally somewhat smaller than the thickness of the bead 16 to which the ground clamp is applied so that after the ground clamp is applied the tines bear against the bead with sustained resilient pressure.

The reverse-bent barb portion 24 of the ground clamp extends integrally from body part 22 as already indicated, extending around the upper edge of bead 16; but (see FIG. 2) barb portion 24 takes up only about half of the width of body portion 22. The other half of body portion 22 is extended to provide an electrical terminal part 28 projecting upward from the container to a position of clearance to be accessible for making terminal connection thereto. Terminal part 28 can be used either for a spring-clip connector of approved design or for a soldered connection or in any other manner. Because of the fact that terminal part 28 projects from the enclosure, it is subjected to stress both when a connection is being made to it, and accidentally after the capacitor has been installed. The danger is that the ground clamp might shift around and even become dislodged entirely, leading to possible deterioration of the electrical connection made by the barb part of the ground clamp. Once tines 26 have assumed their installed contact positions, those contact portions should be stable and should remain in position.

A pair of tongues 30 are lanced or struck up out of the body portion 22 at widely spaced points, at the edges as shown, and in position to abut the lower edge of bead 16. This abutment is along a line almost directly opposite to the tines 26. Abutments 30 are separated laterally far from each other and for this reason they provide a great deal of stability in case of a side-to-side force that might be applied to projecting terminal 28, applied right-to-left or left-to-right as viewed in FIG. 2. The fact that the portion 24*a* of barb portion 24 that extends over the bead bears against the bead when abutments 30 engage the edge of the bead, means that virtually no rocking of the ground clamp can occur when force is applied to terminal 28 in a right-to-left direction or left-to-right as viewed in FIG. 2. The lower edge portion 32 of the ground clamp is curled inward somewhat, and provides a bearing point that is located at a substantial distance from bead 16. This avoids any leverage or force-multiplication when a deflecting force is applied to terminal part 28, from left-to-right as viewed in FIG. 3. In case of right-to-left force applied to terminal portion 28 (FIG. 3) the tines tend to remain in their established positions against bead 16. The gripping force of the reverse-bent tine 24 and body 22 is great enough to prevent abutments 30 from shifting out of locking engagement with the edges of bead 16.

In its manufactured condition, before being applied to the container, the space between tines 26 and body portion 22 of the ground clamp 28 is substantially less than the thickness of bead 16 on which the ground clamp is to be used. The ground clamp is driven downward into the position shown. Tines 26 create shallow grooves in the surface of bead 16 and thus are effective to make good electrical contact to the metal of the container. The distance between the abutment edges of lanced abutments 30 and the part 24*a* of the barb 24 that loops over the upper edge of bead 16 is such that resilient abutments 30 snap into place under the edge of bead 16 when portion 24*a* is driven against the upper edge of the bead. Bead 16 is tightly received between abutments 30 and portion 24*a* of the reverse-bent barb. The whole ground clamp is formed of hard, prominently resilient stock as has already been indicated, and advantageously it is of noncorrosive materials. Beryllium-copper is one suitable material. Stainless steel is also suitable and in some cases it may be found practical to use spring steel that has been given stable surface-oxidizing treatment. In any case the gauge of the sheet-metal used in making the ground clamp is chosen in relation to the dimensions of the clamp and the required resiliency so that tines 26 are forced against bead 16 and penetrate through the surface protection that normally covers the container including bead 16. Once installed, ground clamp 20 is remarkably immune to stresses that may be applied to terminal 28, both when connections are being made to terminal 28 and in handling thereafter.

It is evident that the novel concepts in the illustrative embodiment of the invention are subject to a latitude of change and may be utilized in various applications and therefore the invention should be construed broadly in accordance with its full spirit and scope.

I claim:

1. In combination a metal container having an electrical ground clamp, said container including a sidewall and a projecting bead extending along an edge of the sidewall and having an outer portion disposed against said sidewall as a projection thereon, said ground clamp comprising a resilient sheet-metal member having a body part disposed against a side of said container adjacent a bead thereof, a barb portion extending integrally from said body part around and closely adjacent to an end portion of the bead and extending as a reverse bend to at least one terminating tine in firm surface-penetrating engagement with an inside lateral surface of the bead at a point approximately aligned with an edge of the outer portion of the bead, said body portion also having an edge portion engaging said sidewall of the container at a point substantially spaced from said bead, and an electrical terminal part projecting integrally from said body portion and projecting from the container to an accessible space whereby the position of the

ground clamp on the container is relatively immune to stresses imposed externally on said electrical terminal.

2. The combination of a metal container and an electrical ground clamp in accordance with claim 1, further including a pair of lanced abutments disposed opposite said sidewall and substantially in abutment with the edge of said outer portion of the bead, said abutments being spaced relatively far apart.

3. The combination of a metal container and an electrical ground clamp in accordance with claim 2, wherein said bead is tightly received between the part of said body portion that extends across the end of said bead and said lanced abutments.

4. The combination of a metal container and an electrical ground clamp in accordance with claim 2, wherein at least one tine of said barb portion is disposed opposite the space delimited by said lanced abutments.

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