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MOISTURE PROOF BALLAST CONSTRUCTION FOR PLASTIC SIGNS AND THE LIKE

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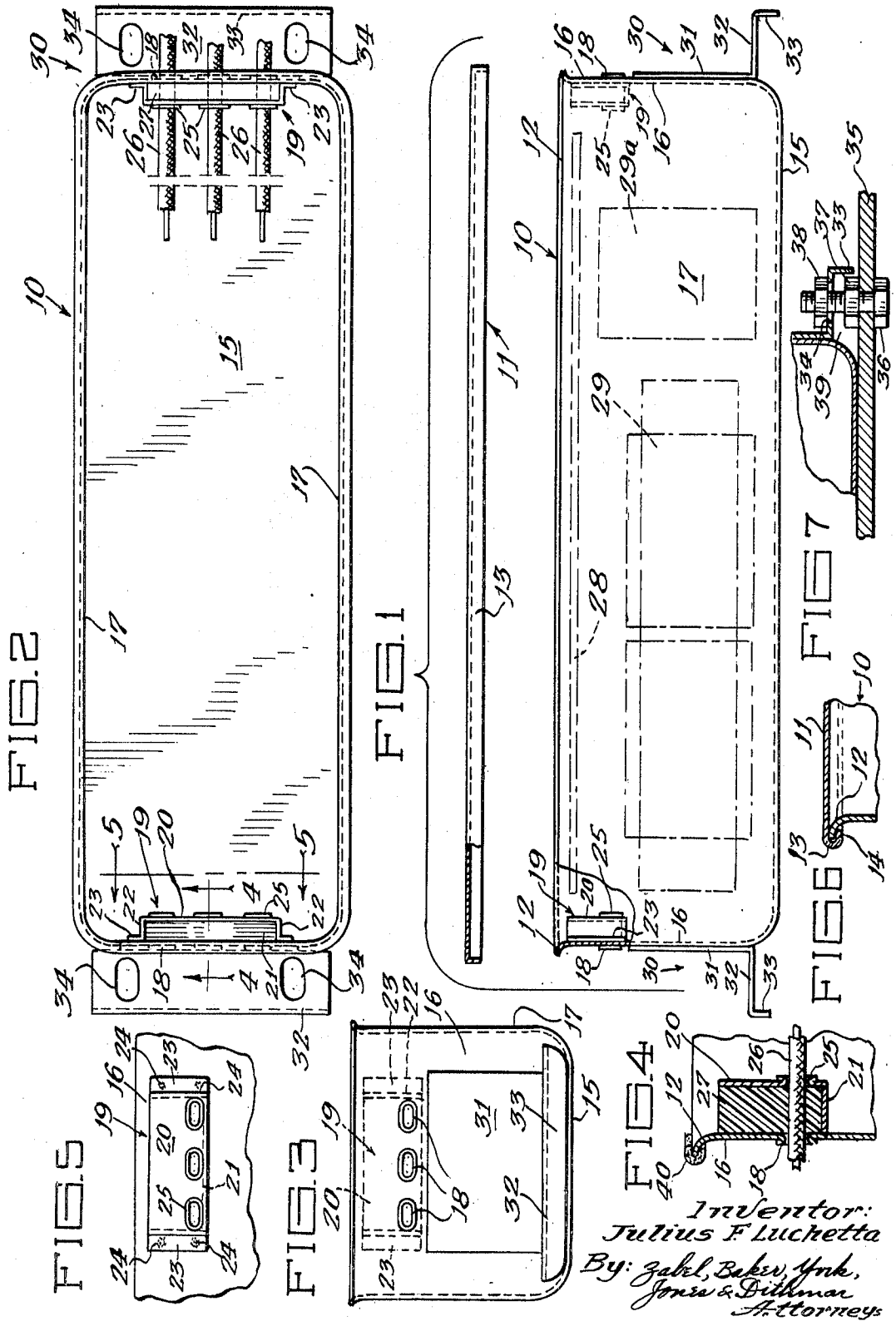

FIG. 2

FIG. 1

FIG. 7

FIG. 6

FIG. 5

FIG. 3

FIG. 4

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# MOISTURE PROOF BALLAST CONSTRUCTION FOR PLASTIC SIGNS AND THE LIKE

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## ABSTRACT OF THE DISCLOSURE

A ballast for mounting on the upper surface of a supporting member has a casing which comprises a seamless drawn sheet metal container with flared upper edges and a flanged cover with the flanges rolled under the flared upper edges. The container is preassembled with the ballast leads. A receptacle at the upper edge of each end wall of the container is filled with a thermosetting resin which forms a moisture-proof seal with the insulation of the ballast leads, the leads extending through openings in the container and wall and the opposite wall of the receptacle. Mounting brackets are secured to the end walls of the container and have bolt receiving flanges spaced above the bottom wall to accommodate a bolt locating nut so that the bottom wall can be maintained in heat conducting contact with the supporting surface.

This invention relates to an improved ballast construction which is particularly suitable for use in plastic signs. A plastic sign is a display sign having one or two translucent faces which are back lighted by fluorescent lamps powered by a fluorescent lamp ballast.

Plastic sign ballasts have a much higher failure rate than ballasts used for indoor lighting due to presence of water, and excessive heating. Due to inaccessibility of the ballast, particularly in large elevated sign installations, the labor cost of ballast replacement is many times that of replacement of indoor ballasts. The problem of long ballast life has not entirely been solved because previous attempts to overcome the water probelm aggravate the overheating problem.

Ballasts are customarily enclosed in a casing comprising an open top container called a can, and a cover. The ballast components are first placed in the can, with the terminal panel facing upwardly; then the soldered connections are made between the various leads and the lugs of the terminal panel; the ballast is then potted, which is to say, filled with an insulating material, such as an asphaltic compound or a resin; and then a dielectric insulating liner is placed over the terminal panel and submerged below the level of the potting compound. Then the potting compound is permitted to cool and solidify after which the cover is applied. In some instances, the cover is applied first, and the potting compound injected through a hole in the cover.

The ends of the cover are extended beyond the end walls of the can and provided with holes or notches to serve as mounting flanges for the fully assembled ballast. In indoor lighting, the ballast is customarily mounted on the under surface of a supporting member, but in plastic signs the ballast is more frequently mounted on the upper surface of the supporting member, with the result that the cover constitutes the base of the ballast. In both instances, however, the cover is referred to as the "base" and the two types of mounting can be referred to as the "base-up" or upright mounting, and the "base-down" or inverted mounting, respectively.

The top edges of the end wall are notched to accommodate the ballast leads. Thus, in the base-down mounting, the leads extend from the lower edge of the casing.



In indoor lighting with "base-up" mounting the ballast is generally secured to the supporting member by bolts, the bolts extending downwardly through the support and flange, and the nuts holding the base securely against the lower surface of the supporting member so that the heat developed by the ballast will be conducted into the supporting member and dissipated. The cooling effect of the supporting member is often included in the design calculations to meet temperature specifications.

In a plastic sign, however, a practice known as "double nutting" is employed, as shown in FIG. 7. Here the removal of the top nut in order to remove the ballast will not permit the bolt to drop down through the supporting member where it would be hard to retrieve.

Condensation within the sign, and rain which penetrates the supporting structure will wet the supporting surface. This water works its way into the ballast through the abutting joint between the end wall and the base, and it also penetrates the joint between the insulation of the lead wires and the potting compound. The double nutting practice serves to elevate the ballast above the supporting surface by a ⅛-inch or a ¼-inch with the result that moisture penetration is avoided in many instances. However, the elimination of surface contact between the base and the supporting member reduces the heat dissipating characteristics of the ballast with the result that the heat failure probability is increased although the moisture failure probability is decreased.

Furthermore, in a heavy rainstorm, the water may accumulate on the supporting surface at a greater rate than it runs off, with the result that the ⅛ to ¼ inch spacing provided by double nutting is insufficient to avoid moisture penetration. This is particularly true where the supporting member is flanged or otherwise confined.

The usual can is a structure provided with seams, as illustrated in Koke Patent No. 3,299,201. The end wall seams are also a source of moisture penetration.

According to my invention I provide a drawn seamless can, and provide mounting brackets at the lower portions of the end walls thereof so that when the ballast is mounted on the upper surface of a supporting structure, the cover will be located at the top of the ballast. According to this arrangement the ballast is entirely waterproof unless the accumulated water is deep enough to cover the ballast. At the same time, I provide mounting brackets such that the bottom of the can will be maintained in heat conducting contact in the upper surface of the supporting member even though double nutting is employed. Thus, I greatly reduce the probability of failure due to both the major causes, water penetration and overheating.

Furthermore, I provide an improved arrangement for bringing the leads through the end walls of the ballast which provides a waterproof seal. This eliminate creepage of moisture along the joint between the wire insulation and the potting compound, which creepage occurs under moist or humid conditions even though there is no standing water on the supporting surface. My lead seal construction also permits the ballast to be mounted in a vertical position without danger of having water run down the leads and into the ballast. Furthermore, my improved construction which permits upright mounting of the ballast has the advantage that the dielectric insulating liner is not disposed between the heat generating components and that surface of the casing which is in heat conducting contact with the supporting member. This dielectric insulating liner has lower heat conduction than the poting compound, and hence low temperature operation is improved when it is located above the core and coil assembly as provided in my invention.

A further object of my invention is to provide a con-

tainer and sealed lead combination in the form of a preassembled unit to facilitate ballast assembly.

To summarize the foregoing, my invention reduces the probability of failure due to overheating and moisture penetration, and still permits a double nut mounting. Furthermore, by sealing the leads to the container, the ballast may be handled by the leads without damage to the soldered connections.

Other objects, features, and advantages will become apparent as the description proceeds.

With reference now to the drawings in which like reference numerals designate like parts:

FIG. 1 is an exploded elevation of a ballast casing embodying my invention;

FIG. 2 is a plan view of the container portion of the FIG. 1 casing, with some leads preassembled thereto;

FIG. 3 is an end view of FIG. 2;

FIG. 4 is a vertical section along line **4**—**4** of FIG. 2, and showing a preassembled lead;

FIG. 5 is a fragmentary elevation along line **5**—**5** of FIG. 2;

FIG. 6 is a detail of the interlocking edges of the container and the cover; and

FIG. 7 is a fragmentary section showing the manner of mounting.

The casing comprises a container **10** and a cover **11**. The container has a flared edge **12** and the cover has a flange **13**. After final assembly and potting, the flange **13** is rolled over the flared edge **12** to provide a rolled seam **14**, as shown in FIG. 6. For a completely waterproof ballast casing, a bead of sealing compound **40** may be applied to the flared edge **12** as shown in FIG. 4, or to the inner surface of the flange **13**.

The container **10** comprises a bottom **15**, end walls **16**, and side walls **17**. Lead receiving openings **18** are formed in the end walls **16**. A receptacle **19** is located at the upper edge of the inner surface of each end wall **16**. The receptacle, as shown in FIGS. 2, 4 and 5, comprises a side wall **20**, a bottom wall **21** which abuts the container wall **16**, end walls **22**, and flanges **23** which are spot welded at **24** to the container walls **16**. Openings **25** are formed in the side wall **20** which are in substantial alignment with the lead receiving openings **18**. The edges of openings **18** and **25** are rolled edges, as shown in FIG. 4.

The type of ballast shown has at least six leads and usually eight or more. A set of openings **18**, **25**, is provided for each lead or for each pair of leads. It will be observed that the openings **18** and **25** are of a width sufficient to receive two leads side by side so that the six openings will accommodate up to twelve leads.

The leads are separately threaded through each hole and the receptacle **19** is filled with a suitable thermosetting sealing material **27**, such as polyester, epoxy, urethane or silicone thermosetting resins. The sealing material **27** forms a bond with the surface of the insulation of the lead **26**, and also with the painted metal walls of the receptacle. The leads **26** are customarily insulated with neoprene or as imilar non-fibrous insulating material, and the thermosetting sealing compound forms a bond with the neoprene or other insulation which not only prevents any seepage of water along the surface of the insulation, but also provides a mechanical connection which permits the ballast to be handled by the leads, the bond being sufficiently strong that it will not be broken by the forces encountered in handling the leads of a relatively heavy ballast.

The fact that the sealing material also makes a bond with the wall of the receptacle avoids the possibility that a crevice will open up between the sealing material **27** and the container, due to flexing of the container in handling, or due to thermal expansion, which would serve as a moisture path bypassing the bond with the lead insulation.

The sealed leads and the container constitute a preassembled unit, which simplifies the assembly and soldering operations. Preferably, the leads are positioned in the container and receptacle so that the length of that portion of each lead extending into the container is predetermined to permit subsequent internal connection to be made to the ballast components with no excess or slack. Then the components, such as the core-coil assembly **29**, shown in dotted line, and a condenser **29***a* are placed into the drawn can with its preassembled leads. The internal connections are then made to the components, and the can is filled with a suitable potting compound, which may be either the usual asphaltic potting compound, or a thermosetting material which, when cured, will not soften or flow when heated. In the case of an asphaltic compound, a fiber insulating liner **28** is placed over the components **29** during the potting operation, and submerged about ¼ of an inch below the top surface. In the case of a thermosetting potting material, the liner **28** is not necessary.



After potting, the cover **11** is placed on the edges **12** and the flanges **13** rolled over as in FIG. 6. In the case of a thermosetting potting material where there is no liner **28**, the potting material can be injected through a suitable opening (not shown) in the cover **11**, as shown in the aforesaid Koke Patent No. 3,299,201.

The mounting means for the ballast comprises a bracket **30** at each end, as shown in FIGS. 1 and 2. Each bracket has a wall contacting body portion **31**, a flange portion **32** which extends outwardly at right angles to the body portion, and a downturned end **33**. The flange portion **32** is disposed in a plane parallel to the plane of the bottom wall **15** of the can, but spaced above same by substantially ¼ inch, for example. Bolt holes **34** are provided in the flange portion **32**.

When the ballast is mounted on a support member **35** by a bolt **36**, a bolt retaining nut **37** is first threaded on to the bolt before the ballast is located. The retaining nut **37** prevents the bolt **36** from dropping through the support member **35**. Then the ballast is placed on the support member with the bolts **36** extending through the bolt holes **34** and the nuts **38** are applied and tightened up. By virtue of this arrangement, the flange portion **32** and the downturned end **34** provide a nut receiving recess **39** for accommodation of the bolt retaining nut **37** which permits the bottom wall **15** to be urged firmly against the upper surface of the support member **35** in heat conducting relationship.

Although the downturned end **33** provides a lower edge which is disposed substantially in the plane of the lower surface of the bottom wall to provide a support abutting edge, an exaggerated clearance between the edge and the support is shown in FIG. 7. Preferably this clearance is of the order of from .01 to .03 inch to accommodate surface irregularities and in normal operation the clearance is taken up by the nut **38**. Thus, as the nut **38** is tightened up, the bottom wall **15** is resiliently urged against the support surface **35**, but the resilience is that provided by a slight dishing of the flange portion **32** or span, rather than a cantilever type of flexing which would overstress the bend between the body portion **31** and the flange portion **32**, if the downturned end were omitted.

Although only a preferred embodiment of my invention has been shown and described herein, it will be understood that various modifications and changes may be made in the construction shown without departing from the spirit of my invention as pointed out in the appended claims.

I claim:

1. A ballast comprising a casing, ballast components disposed in said casing, potting compound surrounding said ballast components and embedding same in said casing, said casing comprising

a drawn sheet metal container having a bottom wall, two end walls, and two side walls, and an open top,

a bracket secured to each end wall comprising a wall contacting body portion, a flange portion extending longitudinally from said body portion and disposed in

a plane substantially parallel to the plane of said botom wall and spaced above same, and a downturned end portion terminating substantially in the plane of said bottom wall to provide a support surface abutting edge,

said flange portion having a bolt receiving opening, and cooperating with said downturned end portion to provide a nut receiving recess,

lead receiving openings in the upper part of at least one of said end walls, receptacle providing means mounted on the inner surface of said end wall opposite to said lead receiving openings, openings in said receptacle providing means, each in substantial alignment with said lead receiving openings, insulated ballast leads extending through said aligned openings, a thermosetting sealing compound disposed in the receptacle of said receptacle providing means and surrounding said ballast leads and providing a moisture proof joint with the insulation of said ballast leads,

the upper edges of said walls being flared,

a flanged cover overlying said container with the flanges thereof extending inwardly and interlocking with said flared edges,

whereby said ballast may be secured to the upper surface of a horizontal supporting member with said bottom wall in heat conducting relationship thereto, said casing providing a waterproof enclosure for said ballast with respect to standing water of a depth at least as great as the height of said lead receiving openings.



2. A ballast as claimed in claim 1 which includes sealing material disposed between said flared edges and said cover.

3. A ballast as claimed in claim 1 in which said receptacle providing means compirses an elongate sheet metal member having a central portion providing a side wall, end portions each providing an end wall perpendicular to said side wall and an outwardly extending flange disposed in a plane parallel to said side wall, said flanges being secured to one of said container end walls, said central portion having a bent portion extending toward said container end wall and providing a bottom wall for said receptacle.

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