Jan. 17, 1967 R. I. SULZER 3,299,200

BALLAST CANISTER CONSTRUCTION

Original Filed Dec. 22, 1958 2 Sheets-Sheet 1

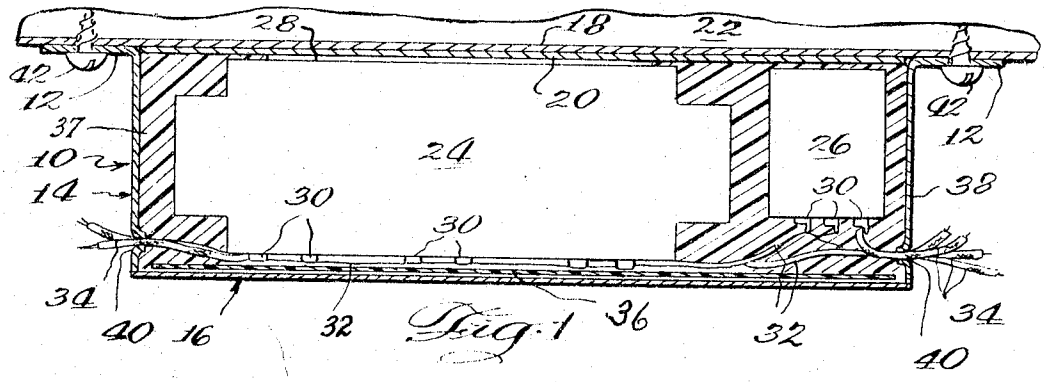

Fig. 1

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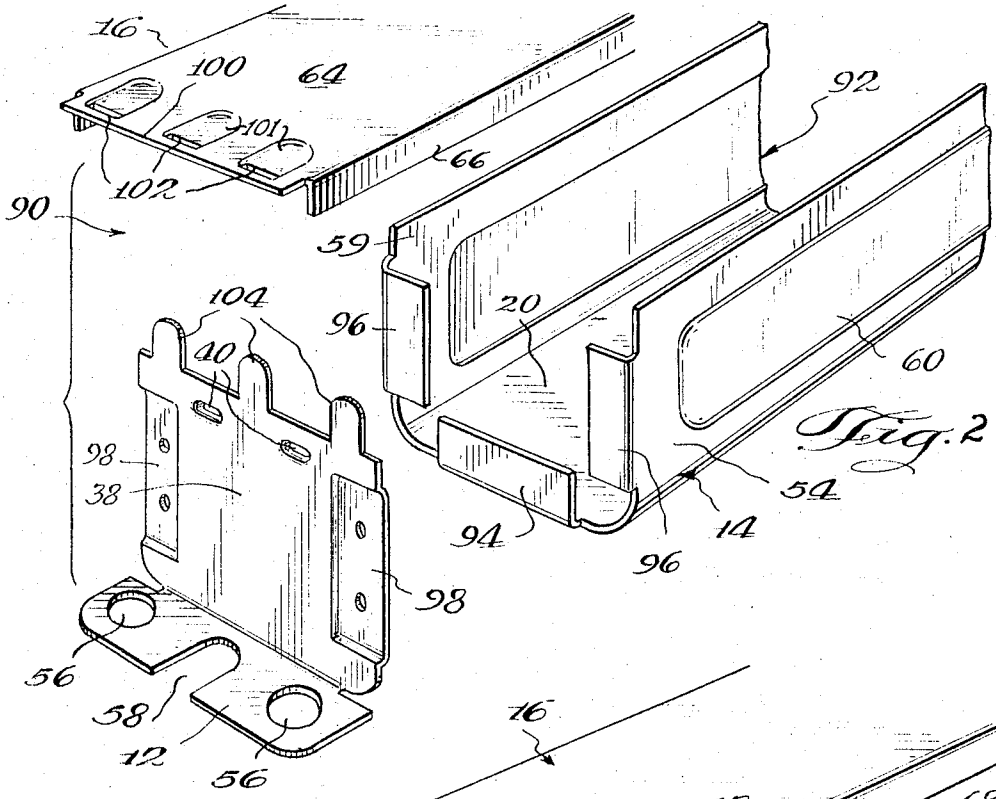

Fig. 2

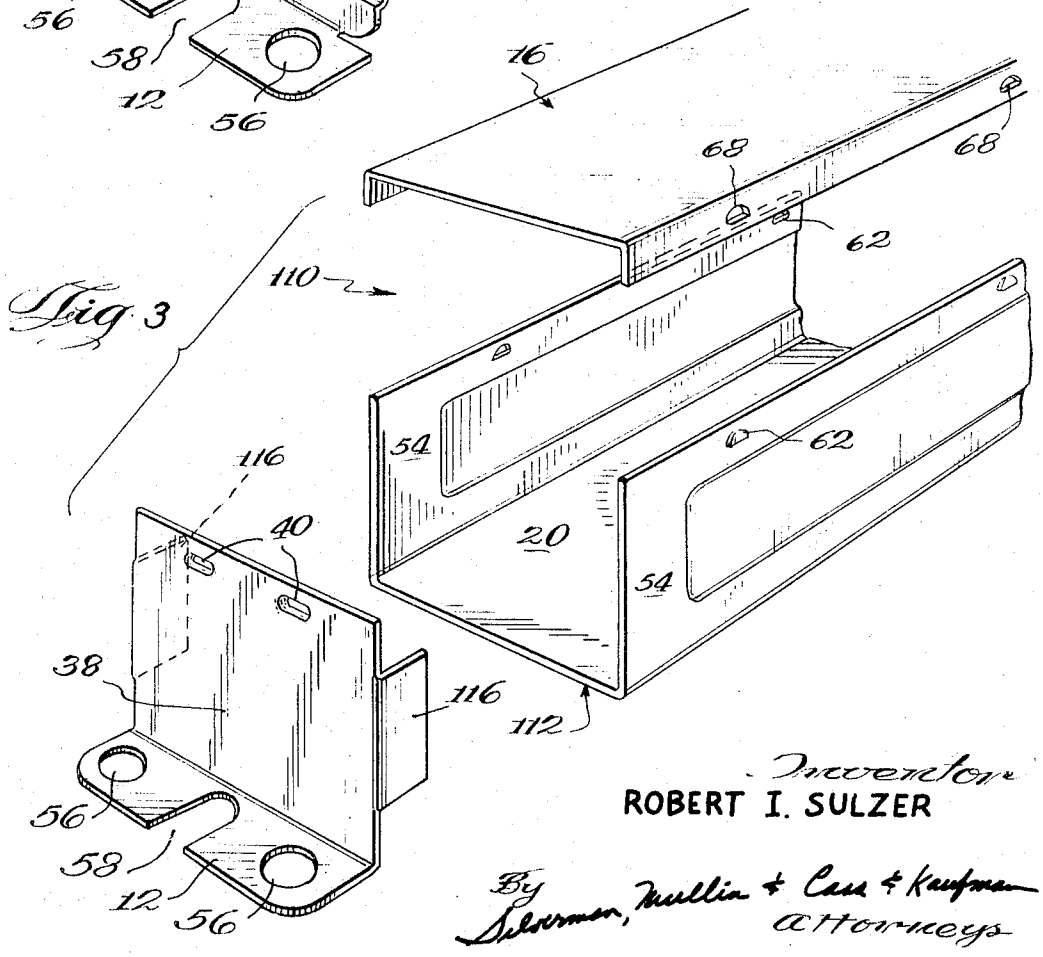

Fig. 3

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BALLAST CANISTER CONSTRUCTION

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Original application Dec. 22, 1958, Ser. No. 782,158, now Patent No. 3,113,694, dated Dec. 10, 1963. Divided and this application May 17, 1963, Ser. No. 281,226

16 Claims. (Cl. 174—52)

This invention relates generally to the construction of sheet metal containers for electrical components and more particularly is concerned with the construction of a canister for ballasts and the like apparatus.

This application is a divisional application of co-pending application Serial No. 782,158 filed December 22, 1958 by Robert I. Sulzer, entitled "Ballast Canister Construction," now Patent No. 3,113,694.

In recent years the use of fluorescent lamp lighting has increased greatly over common incandescent lamp lighting for many reasons, included in which are increased light for comparable wattage in power, improved character of the light, etc. The ordinary fluorescent lamp is almost always mounted by suitable socket supports to a sheet metal fixture, which is in some instances used as a starting aid. The sheet metal fixture, in addition to supporting the lamps and sockets, is required to house the additional equipment that may comprise parts of the fluorescent lamp circuit, and in such instances, contains a ballast or ballasts. Fluorescent lamps are gaseous discharge devices which not only require high initial potentials to assist in ionizing the internal gases to cause the discharge to commence, but are also negative resistance devices. The flow of current through a gaseous discharge device is not limited by the internal impedance of the device itself, and hence external impedance must be provided. The two functions, namely, the assist to ignition and the provision of impedance to limit current flow are provided in a transformer which steps up the line voltage to the desired ignition value, and which also provides reactance to limit the current flow. This latter quality is achieved through the deliberate building of leakage into the transformer, a technique the details of which are of no concern to this invention. In addition to the transformer, the gaseous discharge circuit may include (and usually does) condensers for their effect upon the reactance for current limitation, their effects upon starting and/or their effect upon power factor.

The transformer and condenser or condensers are enclosed in a metal box or canister, being properly interconnected with marked leads protruding from the canister to enable the proper connections to be made with the fluorescent lamps, the source of electrical power, starters, and the like. The canister is thus a complete unit which can be manufactured independently of the fixture, and is adapted to be installed in the fixture either by the fixture manufacturer or by a builder making an installation directly in fixtures purchased without such units.

The units have come to be referred to in the trade as "ballasts" and each unit may contain a transformer, condensers, electromagnetic chokes, small resistors and the like, in various combinations.

Ballasts are required to dissipate heat, since the transformers and other electromagnetic devices have various losses, including eddy current losses, heating due to leakage of flux and the like, and heat is of great importance in ballast design. Some heat is also produced by condensers. Underwriters and other organizations concerned with public safety and fire prevention establish certain important requirements relative to the temperature of the ballasts during use thereof, not only under normal conditions but under conditions of emergency as well. The ballast manufacturer is beset with the problem of assisting the dissipation of heat from the ballasts as rapidly as possible for such safety reasons. The dissipation of heat is also a factor in efficient ballast operation as well, and hence it is desirable to keep the ballast cool.

In the manufacture of the ballasts, the assemblage of the windings which includes the transformer and terminal strips, are disposed in the canister together with the condenser or condensers and suitably connected together with leads extending out of the end walls of the canister. The usual process is to deposit a relatively thin layer of a heated viscous material known as "potting compound" in the bottom of the canister and place the relatively heavy components in this deposit while same is still fluid, pressing them down to cause the compound to flow into the interstices and around the edges. This provides a close bond between the components and the bottom wall so that heat may be readily transferred through the compound to the wall. The compound is formed of mixtures of pitch or asphalt and silica, in various proportions, and which will be hard or at least substantially hard at ordinary temperatures at which the ballast is designed to be maintained. Overheating of the ballasts can cause this compound to run out.

Thereafter the tops of the components, which have the terminals and connected wires, are covered by means of a strip of insulating material, such as specially treated paper, to serve as an insulation from possible grounding or the like. Then the remainder of the canister is filled with the potting compound, the same being run in under high temperature so that same is of relatively low viscosity. Finally, the metal cover is attached to the open top of the canister and the ballast is complete.

Ballasts heretofore have had their canisters constructed with flanged end formations at the top of the canister body receiving the electrical components, and the cover plates cooperate with these flanged formations through the use of ears, welding, rivets and the like to enclose the canister. Thereafter the flanged formations are used to fasten the ballast to the metallic plate of a fixture, and in the process, the portion which is so fastened is the cover. Thus, the source of heat comprising the electrical components is separated from the cover plate by the strip of insulating paper and the space which must necessarily be provided in order to assure clearance of the terminals and connections. Since the most efficient transmission of heat is obtained by transfer to the fixture wall to which the ballast is secured, the ballast construction is such as to prevent most rapid cooling of the ballast.

This invention recognizes that the maximum heat dissipation would be assured if the bottom of the ballast, that is, the part which has the components practically engaged thereagainst, were disposed in face to face contact with a planar member of the fixture. The primary object of the invention is to achieve this through the provision of a novel form of canister in which the means for fasten-

ing the ballast to a metal base or plate are disposed on the canister on the side opposite that which is covered during the manufacture of the ballast.

In conjunction with the primary object of the invention, other objects are concerned with the provision of a novel canister construction which enables the ballast to be operated cooler than heretofore possible, because the heat-producing electrical components are as closely disposed relative the metal plate member to which the ballast is adapted to be secured, as feasible.

Other objects and advantages of the invention will occur to those skilled in this art as the description thereof develops hereinafter, not the least of which is the disposition of the leads extending from the ballast canister spaced from the base or plate to which same is secured, making them easier to handle and connect, and less likely to become frayed or short-circuited during installation and connection of the ballast. The description of a preferred embodiment is augmented by the drawing, the same being exemplary and not intended by limitation, since it is obvious that considerable variation in size, proportion, and minor details is capable of being made without departing from the the spirit or scope of the invention.

In the drawings:

FIG. 1 is a sectional, semi-diagrammatic view illustrating the manner in which a ballast having a canister constructed in accordance with the invention is secured to the base plate or other metallic surface member of a fluorescent lamp fixture.

FIG. 2 is an exploded perspective view of one end of a ballast canister constructed in accordance with the invention, the opposite end being identical therewith and hence not shown.

FIG. 3 is an exploded perspective view of one end of a modified form of the ballast canister construction, the opposite end being identical therewith and hence not shown.

Generally, the invention comprises a ballast canister in which the base of the canister which is to be secured to the sheet metal surface of the fixture is that face which has the electrical components disposed on the interior of the canister as closely engaged thereto as possible. That portion of the electrical components which is most closely engaged to a wall of the canister cannot be the side or face which has the terminals and connections because these must be insulated from the inner surface of the canister, and hence the face opposite that provided with the terminals is that face which is most closely engaged to a wall. The unobvious solution of the problem is emphasized by the requirements of manufacture, namely, that the components must be disposed initially in the trough portion of the canister with the terminals facing upward, the trough must remain with its open face also upward because it is to be filled with a hot potting compound which is fluid, the trough must be closed off by the cover member in this position, and flanges or lugs must be provided to enable securement of the entire device to the metal surface of the fixture.

The invention is characterized by the provision of novel sheet metal structures solving the problems described.

In FIG. 1 there is illustrated an installation of a ballast constructed in accordance with the invention, said ballast being shown secured on the interior of a fixture to a sheet metal surface thereof. The ballast canister is designated **10** and may be presumed to be any one of those illustrated, and the same is provided with the flanges or brackets **12** on opposite ends thereof. There is generally a trough part **14** and a cover part **16**, permanently secured together in any manner as will be explained, with the cover part spaced from the fixture wall **18** and hence being on the bottom of the ballast in the disposition shown. In the specification which follows, the ballast canister will be described in the disposition it assumes during manufacture, irrespective of the disposition during installation, since the ballast may be disposed on its side, or as in FIG. 1 or reversed from that. The walls of the trough portion **14** will thus be located for purposes of description with reference to the disposition of the trough **14** during manufacture of the ballast and the wall opposite the open face of the trough formation **14** will be called its bottom wall **20**.

Thus in FIG. 1, the bottom wall **20** of the ballast canister **10** is mounted in face to face engagement with the fixture wall **18** of the fixture **22** to provide maximum heat dissipation from the components on the interior of the ballast **10**. The components here are the transformer **24** and condenser **26** both of which have their bottom surfaces (related to their position during manufacture) either directly engaged with the bottom wall **20** of the trough portion **14**, or at most separated therefrom by a thin layer of potting compound, say about $\frac{1}{32}$ of an inch in thickness between the wall **20** and the outermost contours of the components **24** and **26**. This thin layer is designated **28**. The upper surfaces of the components **24** and **26** have terminals designated generally **30** to which connecting wires such as **32** are secured and which provide connections for the externally extending leads **34**.

There must be sufficient space between the cover member **16** and the main protuberances of the transformer **24** to permit the clearance for the terminals **30** and leads **32**. In addition, a strip of insulating material **36** such as fiber paper is disposed between the transformer **24** and the cover member **16**. This means that the heat from transformer **24** will not as readily be conducted to the cover member **16** as it will to the bottom wall **20**. The entire ballast canister is filled with potting compound as shown at **37**. The space between tops of components **24** and **26** will be greater than the thickness of the layer **28**, if used, and may be as much as $\frac{3}{8}$ of an inch and better.

It will be noted that the flanges **12** are coplanar with the wall **20** and hence are opposite to the placement of flanges of ballast canisters heretofore used, the latter having been combined with the cover members of prior structures. The leads **34** extend from the end walls **38** through openings **40** which are provided spaced from the flanges **12** and hence the likelihood of interference between these leads and the fastening means **42** is decreased. Also the leads are more readily manipulated and connected to the circuits of the fixture **22**.

The ballast canister **90** of FIG. 2 has four parts, the cover member **16**, the body portion **92** and the end walls **38**. The end walls **38** and the body portion **92** are welded or otherwise fastened together to provide the trough portion **14**. The body portion **92** has a bottom wall **20**, side walls **54** with panel formations **60**, and the ends of the walls are all provided with integral right-angle bent flanges such as shown at **94** and **96**. The end wall **38** has an integral right angle bent flange **12** provided on the bottom end thereof formed with slot **58** and holes **56** and has the same openings **40** formed therein for leads adjacent the top edges thereof. There are opposite panels or depressions **98** adjacent the side edges, these panels adapted to align with and be welded to the flanges **96**. Suitable means such as upset projections may be provided to facilitate spot welding and/or to align the end wall **38** during assembly. Either or both of the panels **98** and the flanges **96** may be so provided. Also similar means may be used to facilitate welding the flange **94** to the wall **38**.

The cover member **16** is formed as a rectangular plate **64** having depending flanges **66**. There is an end extension **100** of the plate **64** which is slotted at **102** to cooperate with the integral tabs **104** provided on the upper edge of the wall **38**. When assembled the tabs are bent over to lock the cover member in place.

Each end extension **100** may be bent at right angle, downwardly to lie against the face of an end wall **38**, either before or after assembly. Also shallow depres-

sions or recesses may be formed in the plate 64 as at 101 to seat the tabs 104 flush with the surface of the plate 64.

The structure 110 shown in FIG. 3 is relatively simple in formation. The cover member is a rectangular plate having depending flanges on opposite edges thereof, these flanges being punched with arcuate openings 68 or other formations designed matingly to engage with formations 62 to lock the cover member in place upon the trough portion 14 when the ballast canister 110 was fully assembled. The side walls 54 are provided with formations 62 to cooperate with formations 68 of the cover member. The body 112 is a relatively simple channel formation having the bottom wall 20 integral with the side walls 54. The end wall 38 has a flange 12 with slot 58 and holes 56 that is adapted to be assembled to an end of the channel formation 112 with the integral flanges 116 either inside or outside of the ends of the walls 54, to which they are respectively welded. The method of assembly of the cover is obvious.

In every case, as described above, the cover member 16 is secured to the respective trough portion 14 at the top of the trough member 14, with the openings 40 adjacent said top end. Flanges 12 are provided coplanar or substantially coplanar with the bottom wall 20 of the canister structure so that when the ballast is eventually mounted to a metal surface 18 of a fixture 22, the bottom surfaces of the components 24 and 26 will be practically disposed against the bottom wall 20 to provide for maximum dissipation of heat thereto. This wall 20 is that one which will be engaged against the metal surface of the fixture, which is opposite to the arrangement in ballasts heretofore.

It is believed that the invention has been sufficiently explained to enable those skilled in the art to understand the same and construct the structures taught thereby, and it is again desired to reiterate that the structures of the invention are capable of wide variation.

What it is desired to secure by Letters Patent of the United States is:

1. A ballast canister adapted to house electrical heat-producing components immersed in potting compound and the components having electrical terminals and leads adapted to extend from said components to the exterior of said canister, said canister adapted to be mounted to a metal surface for heat dissipation from said components to said surface, said canister comprising a trough-like formation open at its top and having walls closing the ends of said formation, and said formation including a generally planar bottom wall and parallel side walls integral with said bottom wall, the components and potting compound adapted to be disposed in said formation with the leads extending through said ends and terminals adjacent said open top, a cover member secured on the formation to close off said open top, and bracket means provided on said canister substantially coplanar with said bottom wall whereby to enable said canister to be mounted to said surface with said bottom wall juxtaposed face to face relative to said surface, said cover member and the top edges of said closing walls having slot and tab engaging means for enabling said cover to be locked in place upon said canister.

2. A ballast canister adapted to house electrical heat-producing components immersed in potting compound and the components having electrical terminals and leads adapted to extend from said components to the exterior of said canister, said canister adapted to be mounted to a metal surface for heat dissipation from said components to said surface, said canister comprising a trough-like formation open at its top and having walls closing the ends of said formation, and said formation including a generally planar bottom wall and parallel side walls integral with said bottom wall, the components and potting compound adapted to be disposed in said formation with the leads extending through said ends and the terminals adjacent said open top, a cover member secured on the formation to close off said open top, and bracket means provided on the canister substantially coplanar with the said bottom wall whereby to enable said canister to be mounted to said surface with said bottom wall juxtaposed face to face relative to said surface, and said closing walls and ends having flange means cooperatively arranged to retain said walls in permanent engagement with said trough-like formation.

3. A ballast canister adapted to house electrical heat-producing components immersed in potting compound and the components having electrical terminals and leads adapted to extend from said components to the exterior of said canister, said canister adapted to be mounted to a metal surface for heat dissipation from said components to said surface, said canister comprising a trough-like formation open at its top and having walls closing the ends of said formation, and said formation including a generally planar bottom wall and parallel side walls integral with said bottom wall, the components and potting compound adapted to be disposed in said formation with the leads extending through said ends and the terminals adjacent said open top, a cover member secured on the formation to close off said open top, bracket means provided on said canister substantially coplanar with said bottom wall whereby to enable said canister to be mounted to said surface with said bottom wall juxtaposed face to face relative to said surface, and closing walls having openings therein adjacent the upper edges thereof through which said leads are adapted to pass whereby when the canister is so mounted said leads are spaced from said surface, said closing walls and ends having flange means cooperatively arranged to retain said walls in permanent engagement with said trough-like formation.

4. A ballast canister adapted to house electrical heat-producing components immersed in potting compound and the components having electrical terminals and leads adapted to extend from said components to the exterior of said canister, said canister adapted to be mounted to a metal surface for heat dissipation from said components to said surface, said canister comprising a trough-like formation open at its top and having walls closing the ends of said formation, and said formation including a generally planar wall and parallel side walls integral with said bottom wall, the components and potting compound adapted to be disposed in said formation with the leads extending through said ends and the terminals adjacent said open top, a cover member secured on the formation to close up said open top, bracket means provided on said canister substantially coplanar with said bottom wall whereby to enable said canister to be mounted to said surface with said bottom wall juxtaposed face to face relative to said surface, said closing walls having openings therein adjacent the upper edges thereof to which said leads are adapted to pass whereby when the canister is so mounted said leads are spaced from said surface, said cover member and the top edges of said closing walls having slot and tab engaging means for enabling said cover to be locked in place upon said canister.

5. A sheet metal ballast canister to house the electrical components of a ballast for gaseous discharge devices, said components being immersed in potting compound and the ballast adapted to be mounted to a metal surface, and comprising a channel member having a bottom wall and side walls and being open at ends and top, a generally rectangular plate having a transversely bent flange on its bottom edge secured on each end of the channel member to enable said member to form a receptacle for said components and potting compound, the flanges being generally co-planar with said bottom wall and serving as brackets to enable securement of said canister to said metal surface, and a cover member adapted to be secured over said open top.

6. A ballast canister as described in claim 5 in which

each of said plates has perforations adjacent its upper edges to pass electrical leads.

7. A ballast canister as claimed in claim 5 in which welding flanges are provided on said channel member generally in the plane of the ends thereof and each of said plates has means cooperating with said welding flanges aligned and in welded engagement therewith.

8. A discharge lamp ballast for mounting in a lamp and ballast supporting fixture comprising a case formed of heat conductive material, said case including a mounting wall adapted to be disposed against a fixture surface when said ballast is mounted for use and a second wall opposite said mounting wall, a core and coil ballast component disposed in said case closely adjacent said mounting wall, a homogenous layer of heat conductive insulating compound between and in direct and efficient conductive heat transfer contact with said ballast component and said mounting wall, said core and coil being provided with electrically conductive elements on the side thereof opposite said mounting wall, a sheet of electrical insulation material overlying said conductive elements between said core and coil and said second wall, and means for mounting said case in a fixture with said mounting wall in conductive heat transfer relation with such fixture.

9. A discharge lamp ballast for mounting in a lamp and ballast supporting fixture comprising a case formed of a heat conductive material, said case including a mounting wall adapted to be disposed against a fixture surface when said ballast is mounted for use and a second wall opposite said mounting wall, a core and coil ballast component disposed in said case in direct heat conductive contact with said mounting wall, a homogeneous layer of heat conductive insulating compound filling the remainder of said case, said compound being in direct and efficient conductive heat transfer contact with said ballast component and said mounting wall, said core and coil being provided with electrically conductive elements on the side thereof opposite said mounting wall, a sheet of electrical insulation material overlying said conductive elements between said core and coil and said second wall, and means for mounting said case in a fixture with said mounting wall in conductive heat transfer relation with said fixture.

10. A discharge lamp fixture assembly comprising a fixture formed of heat conductive material and including a supporting surface area to receive a ballast, a ballast case formed of heat conductive material and having a mounting wall including a mounting surface of substantially the same configuration as said supporting surface area, said ballast case having substantially the full area of said mounting surface in direct heat conductive contact with said supporting surface area, a core and coil unit disposed in said case closely adjacent said mounting wall, a homogeneous layer of heat conductive insulating compound between said unit and said mounting wall and in direct and efficient conductive heat transfer contact with said unit and in direct heat conductive contact with substantially the full area of the surface of said mounting wall adjacent said unit, and a cover closing the side of said case opposite said mounting wall.

11. A discharge lamp fixture assembly comprising a fixture formed of heat conductive material and including a supporting surface area to receive a ballast, a ballast case formed of heat conductive material and having a mounting wall serving as a bottom wall of said case during assembly and including a mounting surface of substantially the same configuration as said supporting surface area, said ballast case having substantially the full area of said mounting surface in direct heat conductive contact with said supporting surface area, a core and coil unit disposed in said case closely adjacent said mounting wall, a homogeneous layer of heat conductive insulating compound between said unit and said mounting wall and in direct and efficient conductive heat transfer contact with said unit and in direct heat conductive contact with substantially the full area of the surface of said mounting wall adjacent said unit, and a cover closing the side of said case opposite said mounting wall.

12. A discharge lamp fixture assembly comprising a metallic fixture including a supporting surface area to receive a ballast; a metallic ballast case having a mounting wall serving as a bottom wall of said case during assembly, side walls integral with said mounting wall, said mounting wall including a mounting surface of substantially the same configuration as said supporting surface area, and mounting portions integral with said mounting wall and extending beyond said side walls; said ballast case having substantially the full area of said mounting surface in direct heat conductive contact with said supporting surface area, a core and coil unit disposed in said case closely adjacent said mounting wall, a homogeneous layer of heat conductive insulating compound between said unit and said mounting wall and in direct and efficient conductive heat transfer contact with said unit and in direct heat conductive contact with substantially the full area of the surface of said mounting wall adjacent said unit, and a cover closing the side of said case opposite said mounting wall.

13. A discharge lamp fixture assembly comprising a metallic fixture including a supporting surface area to receive a ballast, a ballast case of heat conductive material and having a mounting wall including a mounting surface of substantially the same configuration as said supporting surface area, said ballast case having substantially the full area of said mounting surface in direct heat conductive contact with said supporting surface area, a core and coil unit disposed in said case closely adjacent said mounting wall, and a homogeneous layer of heat conductive insulating compound between said unit and said mounting wall and in direct and efficient conductive heat transfer contact with said unit and in direct heat conductive contact with substantially the full area of the surface of said mounting wall adjacent said unit.

14. A discharge lamp ballast for mounting in a lamp and ballast supporting fixture comprising a case formed of heat conductive material and including a mounting wall serving as the bottom wall of said case during assembly of such ballast and adapted to be disposed against a fixture surface when said ballast is mounted for use, heat conductive insulating compound in said case, a core and coil ballast component immersed in said compound and including electrically conductive elements on one side thereof, said ballast component disposed in said case closely adjacent said mounting wall and oriented with said conductive elements on the side thereof opposite said mounting wall, a capacitor disposed in said case, electrical leads connected to said capacitor and to said conductive elements and extending externally of said case, said heat conductive insulating compound being in direct and efficient conductive heat transfer contact with said ballast component and said mounting wall, and said case including extensions generally coplanar with said mounting wall in conductive heat transfer relation with such fixture.

15. A discharge lamp ballast for mounting in a lamp and ballast supporting fixture comprising a case formed of heat conductive material and including a mounting wall adapted to be disposed against a fixture surface when said ballast is mounted for use, opposed generally parallel side walls integral with said mounting wall, end walls joined to said mounting and side walls to close the ends of said case, a cover closing the side of said case opposite said mounting wall, mounting portions generally coplanar with said mounting wall and extending beyond said side walls for mounting said case in a fixture with said mounting wall in conductive heat transfer relation with such fixture, heat conductive insulating compound in said case, a core and coil ballast component immersed in said compound and having electrical connectors, said ballast com-

ponent positioned closely adjacent said mounting wall and oriented with said electrical connectors adjacent said cover, said compound being in direct and efficient conductive heat transfer contact with said ballast component and said mounting wall.

16. A sheet metal canister for a ballast component comprising a box-like member having its top and ends open, and including a generally planar bottom wall, a cover member secured to said box-like member to close off said open top, and closing walls secured to each end of said box-like member to close off said member, and bracket means provided on said canister substantially coplanar with said bottom wall to enable said canister to

be mounted with said bottom wall in heat conductive face-to-face relationship with a mounting surface.

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