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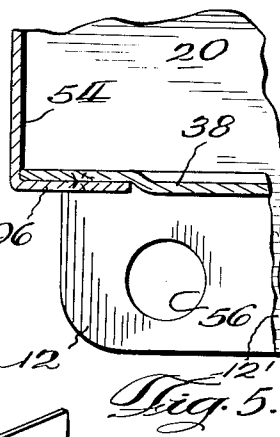
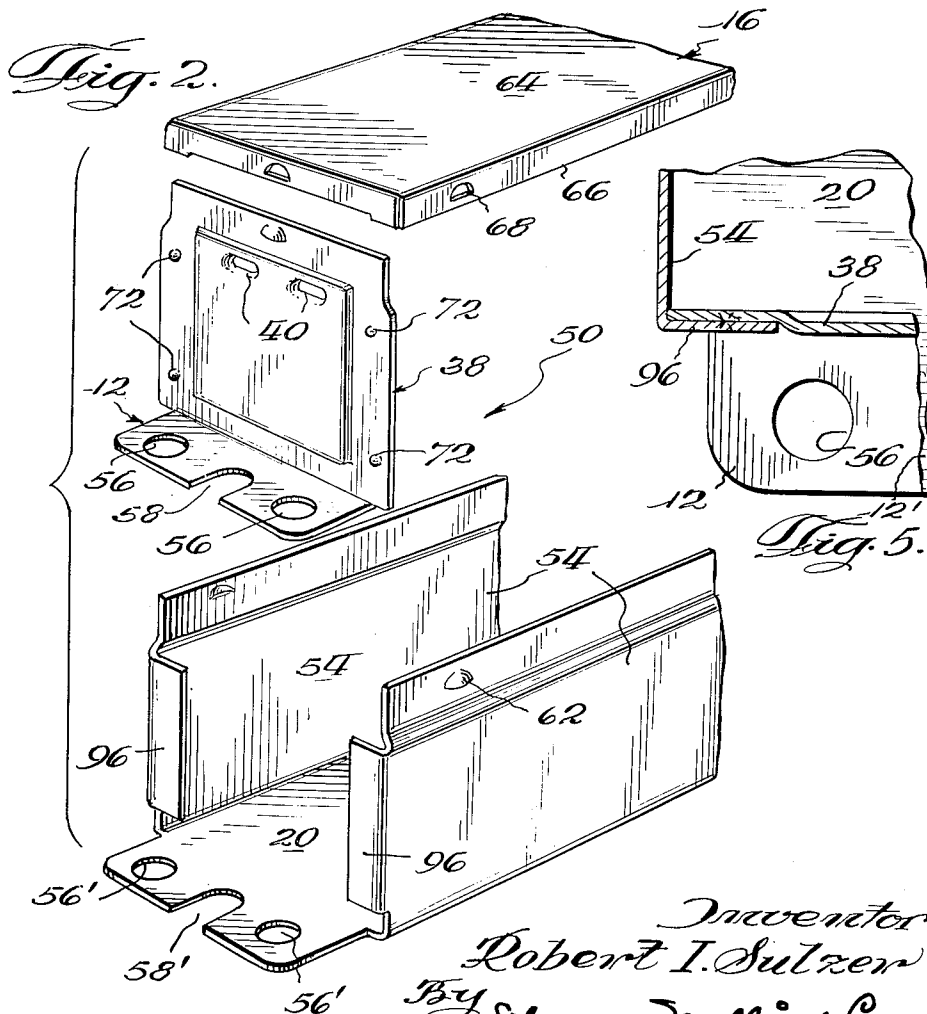
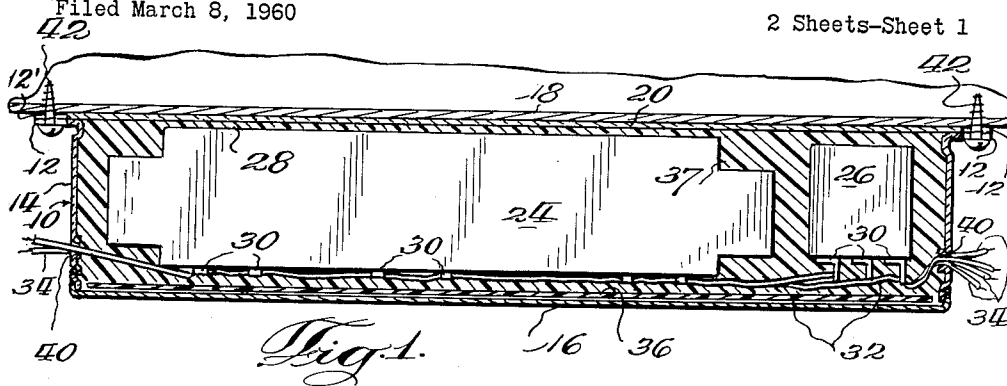
R. I. SULZER

3,049,579

BALLAST CANISTER CONSTRUCTION

Filed March 8, 1960

2 Sheets-Sheet 1



Inventor
Robert I. Sulzer
By Silverman, Mullin & Co.,
Attorneys

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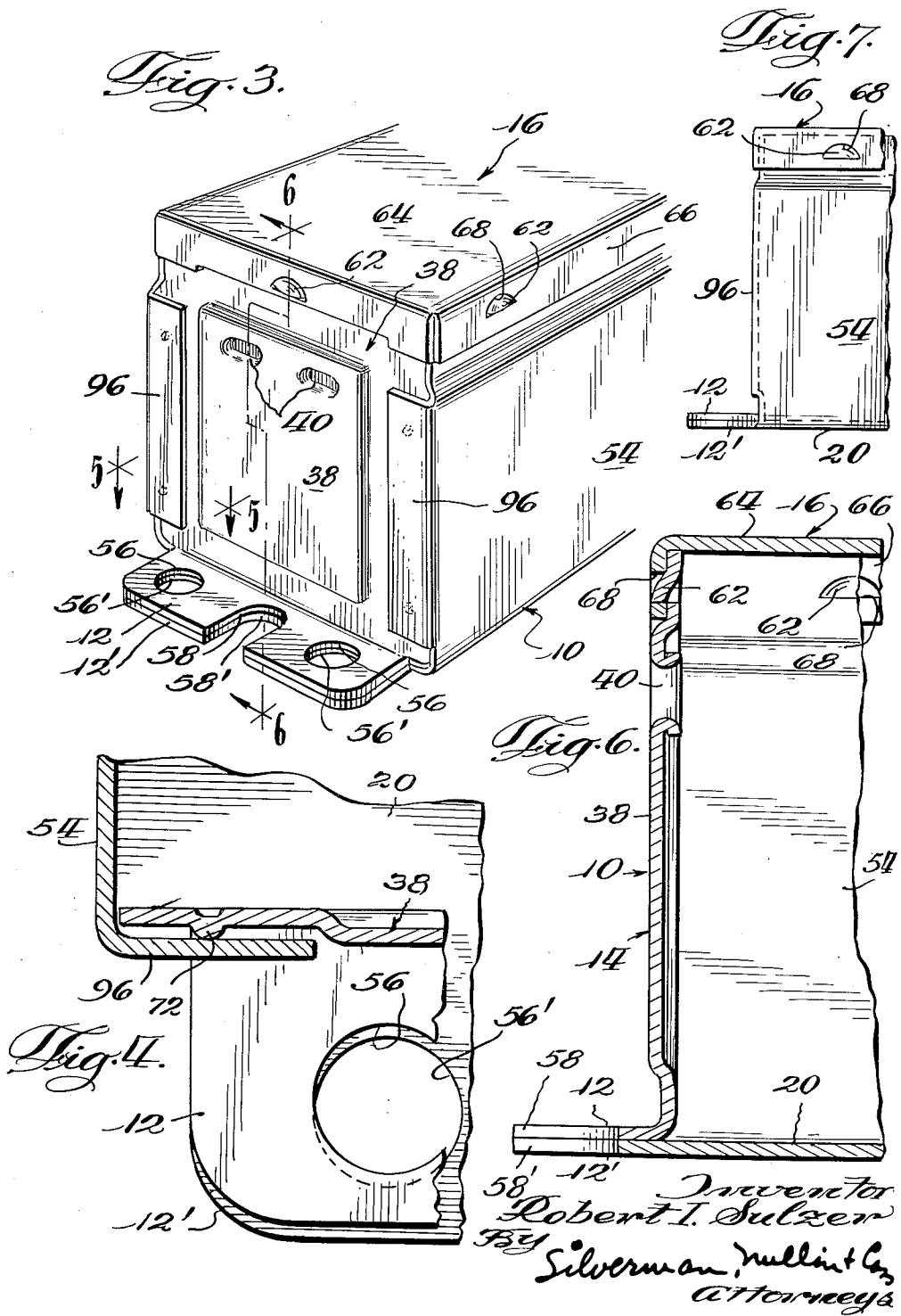
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BALLAST CANISTER CONSTRUCTION

Robert I. Sulzer, Skokie, Ill., assignor to Advance Transformer Co., Chicago, Ill., a corporation of Illinois

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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 is a continuation-in-part application of my copending application, Serial No. 782,158 filed December 22, 1958, for the invention entitled Ballast Canister Construction.

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 and 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 contained 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 effect 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 or 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 assist-

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ing 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, is 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 readily be transferred through the compound to the wall. The compound is formed of mixture 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 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 ear, 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 (usually filled with compound) 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.

In my copending application an arrangement is shown that takes advantage of the maximum heat dissipation occurring from the bottom of the ballast canister. Thus the part which has the components practically engaged thereagainst is disposed in face to face contact with a planar member of the fixture. This is accomplished by the provision of a novel form of canister in which the means for fastening the ballast to a metal base or plate are disposed on the side of the canister opposite that which is covered during the manufacture of the ballast. In addition the copending application shows several novel canister structures which enable the ballast to be operated cooler than heretofore possible, because the heat-producing electrical components are closely disposed relative the metal plate member to which the ballast is adapted to be secured.

The present invention has for its object the provision of an improved canister in which the ballast is disposed adjacent the bottom wall of the canister adjacent the fixture and in which the wall which supports the canister on the fixture is reinforced.

An important object of this invention is to provide a canister of the general construction of the said copending

application whereby to achieve substantially the objects and advantages of the invention of the said co-pending application, but one in which additional advantages obtain.

In the construction of the copending application some difficulty was experienced in providing sufficient strength and rigidity to the securing flanges by means of which the ballast is secured to a metal surface. The conventional canister used the cover member as re-enforcing means, but since the structure of the copending application has the securing flanges on the side opposite the cover obviously the cover member extensions are not available. Especially where thin gauge metal is used, some economical re-enforcing means had to be provided. Since the end walls of the canister were assigned other important functions, it was difficult to ascertain the solution to the problem.

The invention herein provides a solution to said problem as an object thereof through the construction described in which a flange or tongue is formed on the bottom wall of the body of the canister, and remains in the plane of said wall, being engaged in face to face engagement with a flange also formed on the end wall so that the two flanges combine for strength and rigidity.

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 the several preferred embodiments is augmented by drawings, the same being exemplary and not intended by way of limitation, since it is obvious that considerable variation in size, proportion, and minor details is capable of being made without departing from 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 a perspective view of one end of the assembled ballast canister construction, the opposite end being identical therewith and hence not shown.

FIGS. 4 and 5 are respective fragmentary sectional views of one corner of the canister taken through the line 5—5 in FIG. 3 to show the respective mating arrangements between the side and end or retaining walls, FIG. 4 showing the canister before the end wall has been welded in place, and FIG. 5 showing the structure after this has occurred.

FIG. 6 is a sectional view taken along the line 6—6 in FIG. 3 and in the direction indicated by the arrows.

FIG. 7 is a fragmentary front elevational view of one side of the canister.

Generally, the invention includes a ballast canister in which the face of the canister is secured to the sheet metal surface of the fixture and 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 surfaces 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 suitably supported flanges or lugs must be provided to enable securement of the entire device to the metal surfaces 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 is designated 10, and the same is provided with the flanges or brackets 12 and 12' on opposite ends thereof which together with screws 42 enable the ballast to be fastened in position. 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 chamber formed by the trough portion 14 is filled during manufacture and as the wall opposite its open face is then at the bottom, that wall will be called bottom wall 20.

Thus in FIG. 1, the bottom wall 20 of the ballast 10 is mounted in face-to-face engagement with the surface 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 positions 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 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 fibre paper is disposed between the transformer 24 and the cover member 16. This means that the heat from the transformer 24 will not as readily be conducted to the cover member 16 as it will to the bottom wall 20. The entire ballast is filled with potting compound as shown at 37. The space between tops of components 24 and 26 will be greater than the thickness 28 and may be as much as $\frac{3}{8}$ of an inch and better.

It will be noted that the flanges 12 are parallel to and engage with the extensions 12' of the wall 20 and hence are opposite to the placement of flanges of ballast canisters heretofore used, the latter have 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.

In FIG. 2 there is illustrated a ballast canister which is designated 50. It can be used to construct the ballast 10, as shown by the canisters in FIGS. 1 and 3. Illustrated are the components of the trough portion 14 comprising end walls 38 and side walls 54 and the cover member 16, the latter being poised prior to securement to the open top of the trough portion.

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The canister trough portion 14 of FIG. 2 has a bottom wall 20 which is substantially flat to enable face-to-face engagement with the fixture surface 18; vertical side walls 54 and forming a channel shaped member with said bottom walls; and an extension 12' on each end of the bottom wall 20, only one of which is shown. The extension or flange 12' in this structure is a continuation of the bottom wall 20 and is provided with a pair of holes 56' as well as a center open ended slot 58 which permits the bottom wall 20 to be mounted in support of and reinforced with the retaining wall 38. The side walls 54 have arcuate protruding formations 62 punched outward of the walls adjacent the top edges thereof. The cover member 16 is a rectangular plate 64 having depending flanges 66 on the opposite edges thereof, these flanges being punched with arcuate openings 68 or other formations designed matingly to engage with the formations 62 to lock the cover member 16 in place upon the trough portions 14 when the ballast 10 is fully assembled.

The end walls 38 are formed of a single blank, for example, that is provided with a right angle bracket or flange 12 having a pair of holes 56 and an open ended slot 58 designed to align with holes 56' and slot 58' in the bottom wall extension 12'.

To assemble the components, the trough portion 14 comprising walls 54 and 20 is engaged with each end wall 38 by inserting the end wall between walls 54 and bringing the same flush against panels or flanges 96 at which time the holes 56 and slot 58 are partially aligned with respective holes 56' and slot 58' as may be seen in FIG. 4. The walls 38 may now be spot welded to the panels 96 at protuberances 72 to form the completed trough portion. On welding the apertures and slots in brackets 12 and 12' are brought into complete alignment as shown in FIG. 5 and the end wall sealed flush. After the ballast components are inserted in the trough 14 and the leads 34 drawn through apertures 40, the cover 16 is placed in position and it may be welded to the trough portion 14. Thus an extremely simple, sturdy economical assemblage is provided, and it will be particularly noted that because the end walls completely fill the gap in the channel and because of the mating engagement of 12 and 12' which is subsequently placed under pressure an extremely tight seal is provided.

The openings 40 are adjacent said top end, while the flanges 12 are provided in parallel engagement with the flanges 12' on 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 heretofore used in ballasts.

Now it will be seen that flanges 12 and 12' by means of which the ballast 10 is mounted to fixture wall 18 provide a secure, easily assembled mounting arrangement which may be shipped without fear of breakage and in which maximum heat dissipation is achieved by the extended area of contact between the fixture wall and the ballast. In addition the complete seal provided between

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the end walls 38 and the other components prevents the loss of potting compound, while the portions 12 and 12' mutually reinforce each other.

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 canister for use as a container for electrical ballast components and adapted to be mounted on a fluorescent fixture, comprising, a U-shaped channel member with the central leg of said U serving as the bottom wall of said canister during assembly, the ballast components disposed in substantial engagement therewith, said central leg extending beyond the side legs, a right angle bend on one end of each side leg projecting towards the right angle bend on the other side leg, and an L-shaped end wall connected between the right angle bends on opposite legs with one leg of the L in parallel mating alignment with the extended portion of said central leg, means comprising the mating leg and central leg extension for fastening said bottom wall to said fixture with said components in substantial engagement therewith in heat exchange selection to said fixture, heat generated in said canister, being dissipated through said central leg and fixture.

2. The arrangement claimed in claim 1 in which the extension of said central leg and the mating leg of the end wall each have an opening to permit fastening of said canister to said fixture and in which the end wall is spot welded to said projections.

3. A canister for use as ballast container on a fluorescent fixture comprising, a U-shaped channel member with the central leg of the U serving as the bottom wall of said canister, ballast components disposed in substantial heat exchange engagement therewith, said central leg having an extension on each end protruding beyond the side legs, a right angle bend on each end of each side leg projecting towards the right angle bend on the adjacent end of the other side leg, an L-shaped end wall having one leg overlapping engaged between the right angle bends on adjacent ends of opposite legs of the U, the other leg of the L in parallel mating alignment with a respective extension of said central leg, stable secure means comprising the other leg and central leg for affixing said wall to the bottom of said fixture with said components in substantial engagement therewith in close proximity to said fixture to permit heat dissipation through said wall and fixture, and a cover member enclosing the area between said side and end legs opposite said central leg.

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