

June 2, 1964

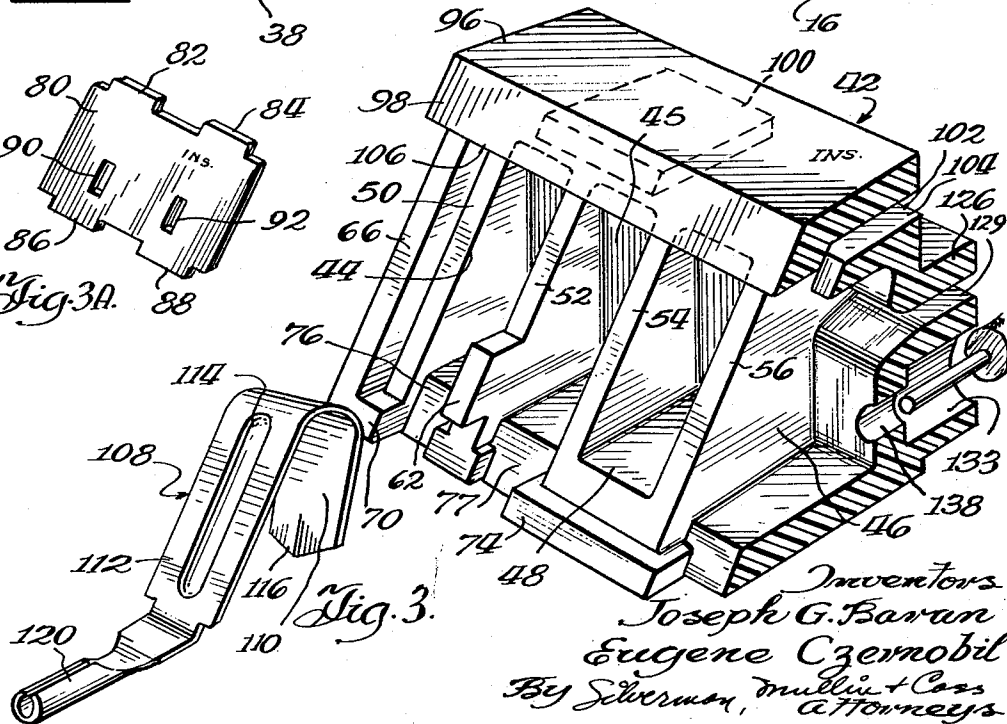
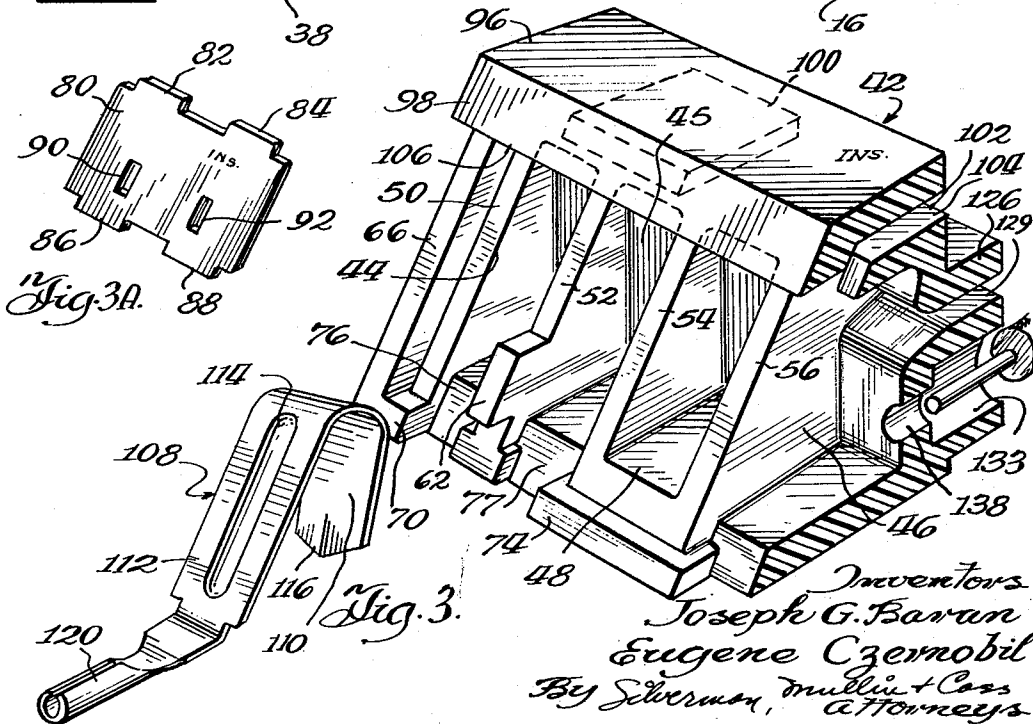
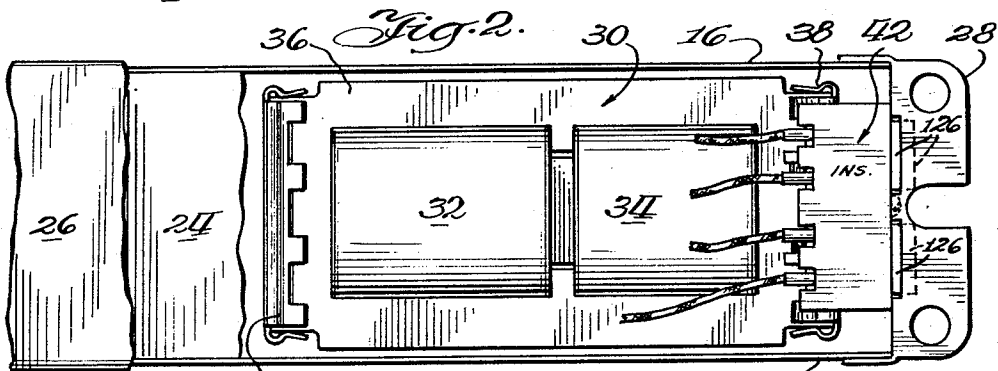
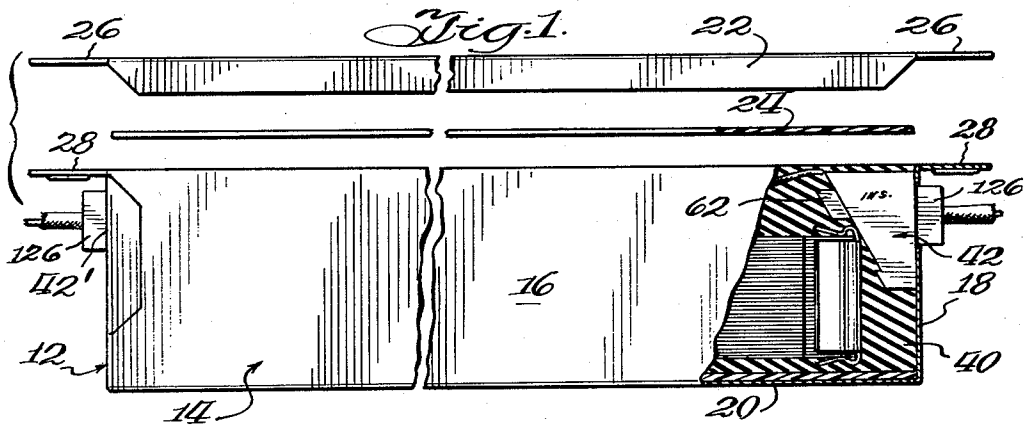
J. G. BARAN ET AL

3,135,822

BALLAST WITH PUSH-IN TERMINAL BLOCK

Filed Oct. 30, 1961

3 Sheets-Sheet 1



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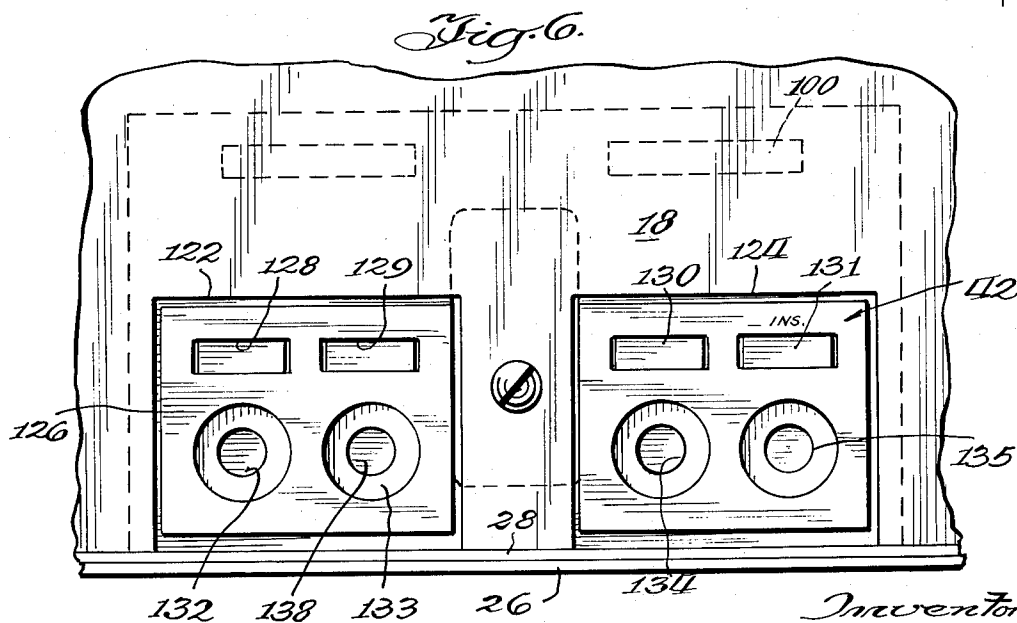
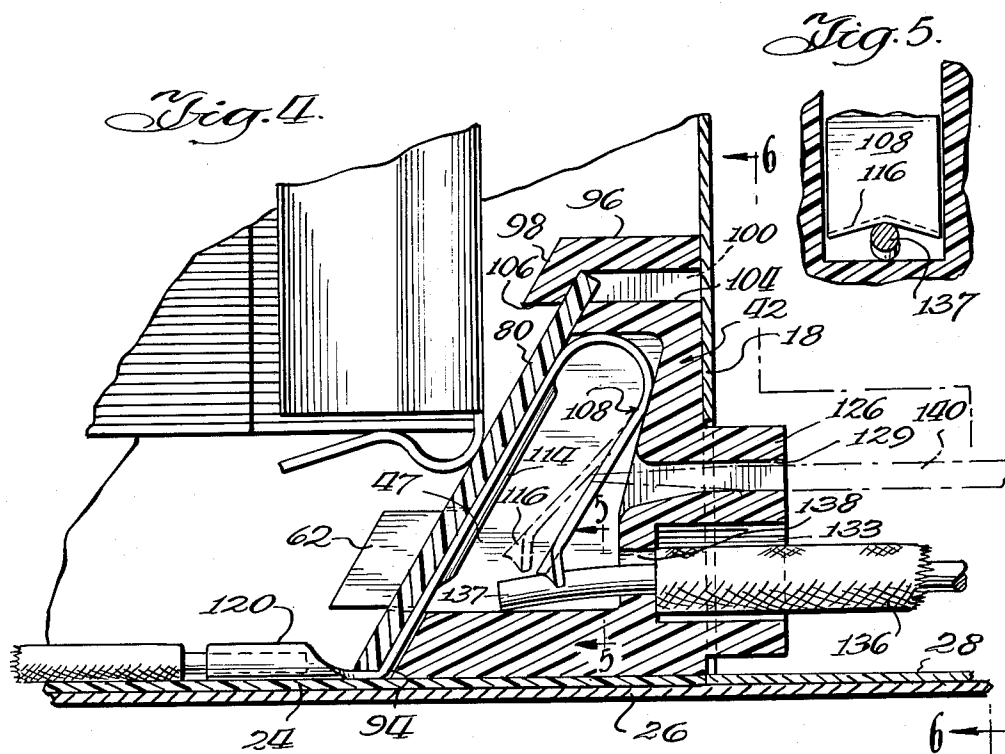
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BALLAST WITH PUSH-IN TERMINAL BLOCK

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3 Sheets-Sheet 2



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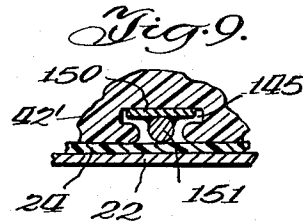
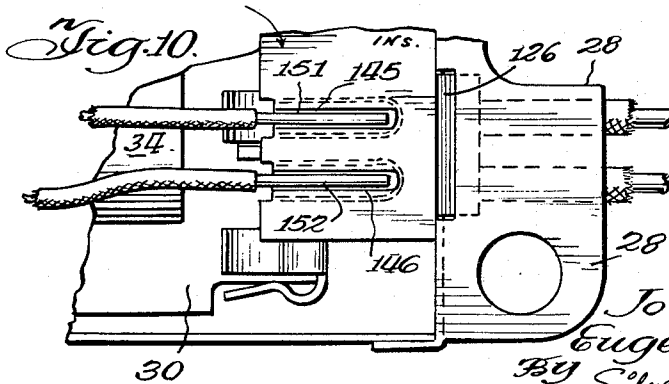
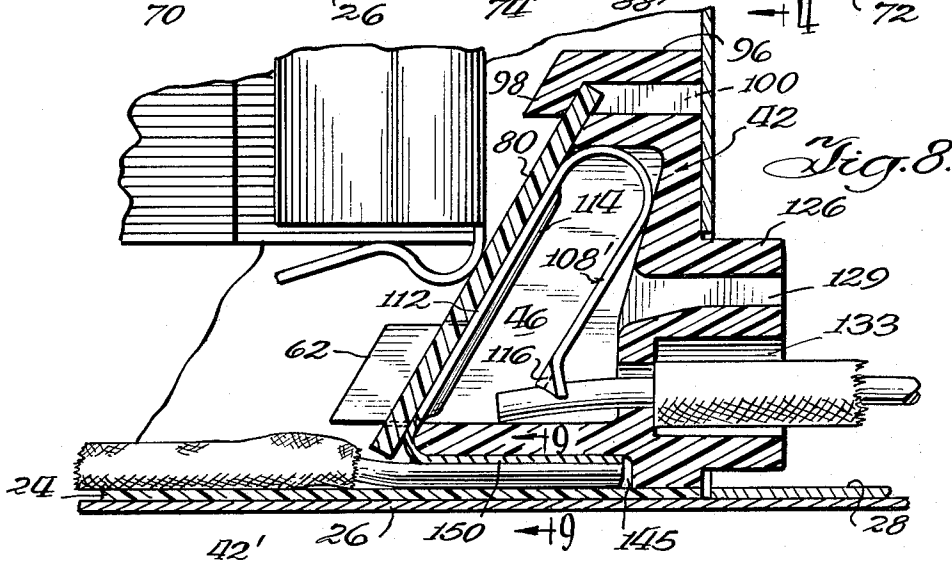
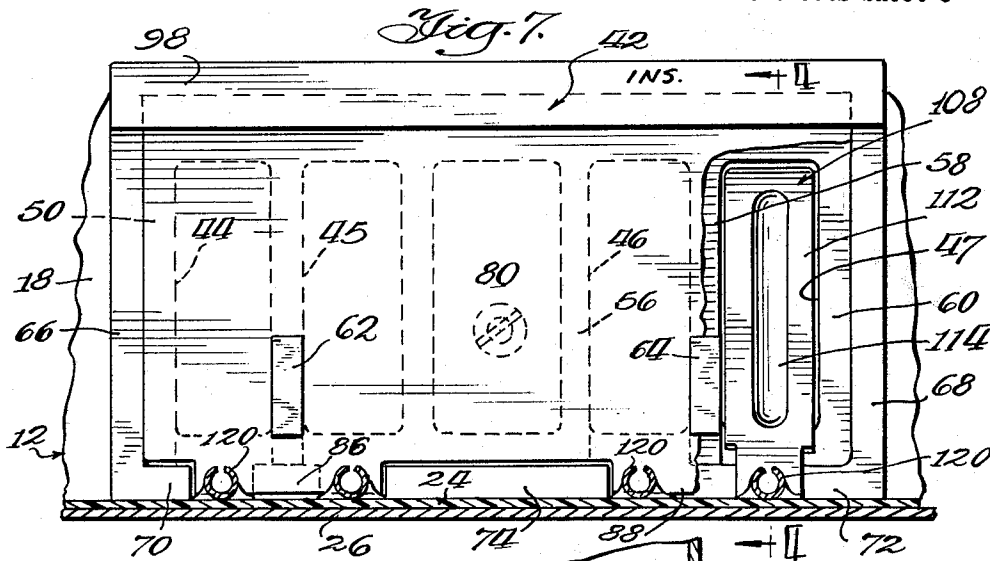
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BALLAST WITH PUSH-IN TERMINAL BLOCK

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3 Sheets-Sheet 3



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3,135,822

BALLAST WITH PUSH-IN TERMINAL BLOCK
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This invention relates generally to ballast apparatus, and more particularly is concerned with a ballast which has incorporated therein a terminal block by means of which the ballast may be connected into a circuit merely by pushing the bared ends of the circuit wires into the block.

The ballast with which this invention is concerned is a device the purpose of which is to ignite certain gaseous discharge devices connected in circuit therewith, and after ignition of the said devices, to maintain the same ignited with proper regulation. Fluorescent lamps are the type of gaseous discharge device for which the apparatus to be described herein was especially designed, although the invention is not limited thereto.

A ballast normally consists of a transformer of iron core construction, and one or more condensers, disposed within a metal canister and potted with suitable potting compound. Electrical leads extend from the transformer and condenser externally of the canister to provide connections to the source of electrical current and connections to the gaseous discharge devices controlled by the ballast. The normal canister comprises a rectangular box of steel having a cover plate secured thereto providing fastening means to enable the canister to be secured to a metal fixture which normally carries the gaseous discharge devices.

The ballast apparatus as sold is provided with a label having a circuit diagram thereon, and the leads extending from the ballast are color coded so that the fixture manufacturer or electrician connecting the ballast into a circuit will be able to ascertain the proper connections.

Such structures are subject to certain disadvantages which it is the primary object of this invention to obviate. Ballasts which have the externally extending wires connected through suitable openings in the ends of the ballast must be provided with means to prevent the strain of the external wire from being transmitted directly to the windings of the transformer or terminals of the condensers. Accordingly, it is necessary to provide some form of terminal board on the interior of the canister secured to the components thereof. Although it is advantageous to use such terminal boards with the invention herein, it is not necessary since the winding wires may be connected directly to the terminal block which is secured to the canister, and all of the strain which is occasioned by external wires is thereby taken care of by the terminal block.

In handling ballasts, it is inconvenient to have a plurality of long wires hanging out of the ballast. These wires get caught on objects when the ballasts are being processed, they require larger packages, they get dirty and discolored, they break off. The invention herein enables the manufacturer either to handle the ballasts without any wires whatsoever protruding therefrom, or if he desires, he may insert the necessary external wires after all processing has taken place.

Some fixture manufacturers may require external wires of sizes other than those furnished by the ballast manufacturer or may not want any external wires at all since they desire to connect the components of the external circuit directly to the ballast without the need for added connections. In such case, the ballast may be furnished to the one who installs the same in a circuit without any wires protruding whatsoever.

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As heretofore constructed, ballasts have had the wires which extend therefrom passing through openings punched in the walls of the canister. Such openings often cut through the insulation of the wire causing faults and short circuits, upon which occasion the entire ballast had to be discarded by the user. The invention obviates this since the terminal block is of insulating material, and there is no likelihood that the connecting wires either on the interior of the canister or the exterior thereof will frictionally engage any metallic edge.

An important object of the present invention is to provide a ballast which includes electrical components disposed in a canister and having the lead wires thereof connected to a terminal block which has a part exposed to the exterior of the canister and presenting openings through which external lead wires may be inserted and frictionally engaged to establish connection with the components on the interior of the ballast.

Many other objects and advantages will become apparent as the description of the invention proceeds in connection with which description the two embodiments of the invention are illustrated in the accompanying drawings in order to render lucid an understanding of how the invention is constructed and operated.

In the drawings in which like characters of reference are used to designate the same or equivalent parts and components throughout the several figures of the drawings:

FIG. 1 is a side elevational view of a ballast constructed in accordance with the invention, the cover and insulating sheet being in exploded relationship, and a portion of the ballast being broken away to show the construction of the interior thereof.

FIG. 2 is a top plan view of the same with the cover removed.

FIG. 3 is a fragmentary perspective view of the terminal block of the invention showing the details of construction thereof.

FIG. 3A is a perspective view on a reduced scale, showing the interior cover plate of the block of FIG. 3.

FIG. 4 is an enlarged sectional view of the invention showing a fragmentary portion of the ballast having the terminal block secured thereat.

FIG. 5 is a fragmentary sectional view taken along the line 5-5 of FIG. 4 and in the indicated direction.

FIG. 6 is an end-on view of the ballast of FIG. 4 taken along the line 6-6 and in the direction indicated.

FIG. 7 is an elevational view taken of the terminal block on the interior thereof looking from the left-hand side of FIG. 4 toward the right with portions broken away to shown the construction.

FIG. 8 is a view similar to that of FIG. 4 but illustrating a modified form of the invention.

FIG. 9 is a fragmentary sectional view taken generally along the line 9-9 of FIG. 7 and in the direction indicated.

FIG. 10 is a fragmentary bottom view of the terminal block of the modified form of FIG. 8.

Referring now to the figures, in FIG. 1 there is illustrated a ballast which may be designated generally by the reference character 12, and the same is shown comprising a metal canister 14 having a box-like configuration provided with side walls 16, end walls 18 and a bottom wall 20 formed of sheet metal by any usual techniques, such as, bending welding, stamping, etc. During the construction of the ballast 12, the box-like canister 14 is open at its top and the components are placed therein and the canister covered. In FIG. 1, the cover member 22 is shown in exploded position above the remainder of the canister 14 with a sheet of insulating paper 24 therebetween. The paper 24 is placed on top of the components before the ballast is closed permanently to

prevent any terminals or wires from engaging against the inside of the cover member 22. The ends of the cover member 22 and the canister bottom 14 are provided with flanged extensions 26 and 28 respectively, suitably perforated, slotted or otherwise treated, in order to form a bracket to enable the ballast 12 to be secured to a fixture or other metal surface.

The interior of the ballast 12 may be provided with a transformer, such as shown at 30, having windings, an iron core and the like. In the particular structure shown, the windings are designated 32 and 34 and the core is 36, the said core being formed of a plurality of laminations held together by suitable clamps such as shown at 38.

Condensers and similar components are provided within the canister 14, but these are not shown.

In the construction of the ballast 12, the components including the transformer and condensers are placed in the bottom of the box, and the connections are made from the terminals of the various electrical components to wires which extend outwardly of the box, after which the entire canister 14 is filled with hot pitch or other potting compound, such as shown at 40, the paper member 24 placed on top, and the box covered.

According to the invention herein, a molded or otherwise formed block designated generally by the reference character 42 is mounted in the end of the ballast, serving to provide a means mounting terminals for the wire leads on the interior of the canister 14 while presenting slots or sockets into which external wires may be pushed in order to establish connections with the leads on the interior of the ballast 12. A similar block, such as shown at 42', may be provided at the opposite end of the ballast, but the construction thereof is identical with the block 42, and hence, there is no necessity for explaining the construction of the block 42'.

In FIGS. 3, 4, 5, 6 and 7, the disposition of the block 42 is upside down relative to the disposition of the block in FIG. 1 in order best to show the construction and operation thereof.

Referring now to the FIGS. 3, 4, 5, 6 and 7, block 42 is preferably formed of a thermo-setting plastic material such as a phenolic resin to enable the same to withstand heat of the potting compound 40 and to provide high impact strength and good insulation.

The block 42 has a generally trapezoidal, vertical section configuration with the broader portion disposed toward the top of the canister, as indicated in FIG. 2, in order to leave as much space as possible for the electrical components within the ballast. A plurality of parallel cavities of generally triangular configuration is provided transversely of the block. These cavities are designated 44, 45, 46 and 47, there being four in the particular structure shown. It will be noted that the cavities are in groups of two separated by a space which in this instance is hollow as at 48 for economy of material. The cavities 44 to 47 open toward the interior of the ballast 12 and there is formed thereby a plurality of walls defining the cavities. Cavity 44 has the wall 50 on one side thereof and the wall 52 on the other. The wall 52 serves as a partition between the cavities 44 and 45. A wall 54 is located between the cavity 45 and the hollow space 48. Wall 56 defines the opposite side of the space 48, and the remaining walls are 58 and 60.

Each of the walls 52 and 58 has a protruding ear or lug as shown at 62 and 64, these lugs extending outwardly and to the left as viewed in FIG. 3 and FIG. 4.

The block 42 has a framing ledge or flange on opposite sides thereof as an integral continuation of the wall 50 and 60 respectively, the framing ledges being 66 and 68, there being a short continuation of the framing ledge 66 and 68 along what will be termed the base of the block as shown at 70 and 72. The central section of framing ledge at 74 is provided immediately adjacent the central hollow cavity 48. The exposed edges of the walls

50 and 52, 54, 56, 58 and 60 thereby provide a recessed seat in a common plane with the exception, of course, of protruding lugs 62 and 64.

The bottom of each of the cavities 44, 45, 46 and 47 is foreshortened as shown at 76 and 77 in FIG. 3 and thereby is set back from the plane defined by the front edges of the walls 50, 52, 54, 56, 58 and 60. As will be seen, a cover plate of insulating material is adapted to be engaged over the cavities within the framing ledges 66, 68, 70, 72 and 74 to cover the cavities. This cover plate is designated generally 80 and is shown in perspective view in FIG. 3A. Such cover plate 80 is formed of a generally rectangular member of sheet insulating material such as fiberboard and is provided with tongues 82 and 84 along its upper edge and spaced tongues 86 and 88 along its lower edge. A pair of slots 90 and 92 is provided generally aligned with the center of the tongues 86 and 88.

The cover plate 80 is adapted to be engaged over the cavities as explained, with the protruding lugs 62 and 64 engaged respectively in the slots 90 and 92. With the cover plate 80 properly seated against the front edges of the walls 50, 52, 54, 56, 58 and 60 in a manner to be described more in detail hereinafter, all of the cavities including the center cavity 48 will be completely covered, but there will be a relatively narrow passageway between the rear surface of the cover plate 80 at the lower tongues 86 and 88 and each of the foreshortened bases of the cavities 44, 45, 46 and 47. One such space is shown at 94 in FIG. 4 and its purpose is to provide means for extending the contact spring out of the cavity as also will be explained hereinafter.

It will be seen that each of the tongues 86 and 88 is engaged respectively between the extensions 70 and 72 and the center continuation of the framing ledge 74 properly to seat the cover plate 80. The block 42 is provided at 96 with a portion which, although integral therewith, may be considered a cap. The cap has an overhang 98 which extends outwardly a substantial distance beyond the framing ledges 66, 68, 70, 72 and 74. Within the cap is provided a pair of rectangular hollow configurations as shown at 100 and 102. These two formations communicate with the left-hand face of the block 42 by the simple expedient of having the plane of the lower portion of each of the formations common with the lower plane of the overhang 98. Looking at FIG. 4, if the surface 104 is in the same plane as the surface 106, it is possible to mold the block without any need for undercuts, since the mating mold member for each of the cavity 100 and the overhang 98 can be moved right and left. The result is that the front, that is the left end of each of the formations 100 and 102 provide sockets extending upward past the bottom surface 106 of the overhang 98, thereby assisting in anchoring the cover plate 80 to the face of the block.

Each of the cavities 45, 46, 47 and 48 is provided with an inverted U-shaped or reverse bent member which may be termed a contact spring, best shown in perspective view at 108 in FIG. 3. The spring 108 is formed of some resilient metal. The general configuration, as stated, is an inverted U with one leg somewhat longer than the other and having a wire connecting terminal extending therefrom. The short leg 110 faces the rear wall of each of the cavities, whereas the long leg 112 generally will underlie the inner surface of the cover plate 80. These two legs are connected by a bight at 114 and the short leg has a sharp edge crimped or V-grooved configuration 116 at its extremity. The longer leg 112 may have a strengthening rib along its length as shown at 114. The bottom end of the long leg 112 extends along the passageway 94 as shown in FIG. 4 and out of the block to lie against the insulating paper member 24 as shown at FIG. 4. This formation may be shaped to provide a soldering terminal or lug 120 to enable wire or leads from

either the transformer 30 or the components within the ballast to be electrically connected thereto.

The block 42 is adapted to be engaged flush against the end wall 18 and the said end wall is provided with a pair of rectangular perforations as shown at 122 and 124. The block 42 has a pair of rectangular bosses 126 and 128, each generally aligned with a pair of cavities, these bosses being of conforming configuration and adapted because thereof to protrude outwardly of the end wall 18 as shown in FIGS. 1, 2 and 4 through perforations 122 and 124. Within the boss there are provided upper and lower passageways communicating with each of the respective cavities as will be explained.

It should be borne in mind that the designations upper and lower are only relative and are used for convenience in the description of FIGS. 4, 6 and 7 although it should be also appreciated that the actual disposition of the blocks shown, during the construction of the ballast, normally will be upside down. This is shown in FIGS. 1 and 2.

Looking at FIG. 6, the passageways above referred to are shown at 128 through 135. Each of the passageways 132, 133, 134 and 135 is adapted to receive therein an end of wire 136 which has partially been bared as shown at 137 in FIG. 4. Because of this, each of the passageways has a reduced diameter portion, for example, shown at 138 in FIG. 4. One of the contact springs 108 is arranged within each of the cavities, such as the cavity 46 in FIG. 4, so that the grooved formation 116 is presented to the bared end 137 as the wire 136 is pushed home into the passageway 133. The biasing effect of the short leg 110 will cause the formation 116 to scrape the bared end 137, establishing good electrical contact with the wire 136. Any attempt to withdraw the wire 136 will result in the sharpened edges of the formation 116 digging into the wire preventing this.

The purpose of the slots 128, 129, 130 and 131 is to enable the insertion of a screw-driver or other tool such as shown at 140. The end of the screw-driver is thereby enabled to lift the short leg 110 away from the bared end 137 of the wire 136 as shown by the broken line in FIG. 4 to enable the wire 136 to be withdrawn if it is desired to do so.

Considering now the general trapezoidal configuration of the block, it will be seen that it occupies a corner of the ballast which normally will be unoccupied in a ballast. For ensuring that the cover plate 80 will not become disassembled from the block 42, during the assembly of the ballast, the transformer 30 may be shifted to bear against the same as shown in FIG. 4. The cover plate 80 prevents the potting compound from entering the cavities to interfere with the operation of the contact springs within the cavities.

The interior wires which connect to the terminal formations or lugs 120 may either be lead wires connected to the components within the canister or they may be the extensions taken directly from the components themselves.

FIGS. 8, 9 and 10 illustrate a modified form of the invention.

This form of the invention utilizes a block 42' of construction similar to that of the block 42. The only difference of any consequence is that each of the cavities within the block 42' has an undercut groove immediately below the same in the base. Two of such grooves are shown at 145 and 146 in FIGS. 9 and 10. The contact spring 108' of the modified form of the invention has the U-shaped configuration of substantially the same construction as the contact spring 108. The lower extremity of the longer leg 112, however, is bent to the right instead of to the left as shown in the views. This provides a strip 150 which is inserted in the groove 145 provided immediately below the cavity, as explained. In FIG. 8 the cavity may be designated 46.

It will be appreciated that when the ballast is in the process of construction using the modified form of the invention, the plan appearance of the ballast will be somewhat as shown in FIG. 10. The base of the block 42 will thereby expose all of the grooves such as 145 and 146, and each of the grooves will have the strip 150 of the terminal or contact spring contained within the respective cavities 44, 45, 46 and 47 exposed. The assembler merely lays the lead wires such as shown at 151 and 152 within the grooves 145 and 146 respectively and solders the same in place. Thereafter, of course, the insulating sheets 24 and the cover 22 are applied.

The advantage of the modified form of the invention is that the same is easier to work with since there are no terminal extensions such as 120 protruding into the space normally occupied by the components within the ballast. In all other respects the modified form is the same as the one described in connection with FIGS. 1 through 7.

It is believed that the invention has been sufficiently described to enable those skilled in the art to understand the same and apply the principles thereof in the construction of the ballast. Considerable modification is capable of being made without departing from the spirit or scope of the invention as defined in the appended claims.

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

1. A ballast construction comprising a canister having ballast components therein provided with internal leads adapted to be electrically connected to circuit wires externally of the said canister, a block member mounted in a corner of the said canister having a plurality of cavities therein, each cavity having a spring contact member with a scraper end therein, the block providing a plurality of recesses opening externally of the canister and each communicating with a respective cavity and adapted to receive a bared end of said external wire into the interior of the cavity and into engagement with the said scraper end, a cover plate on the said block on the interior of said canister substantially closing off the said cavities but providing a passageway adjacent each cavity, each spring contact member having an extension thereof passing through the said passageway and exposed to enable electrical connection of an internal lead thereto.

2. A ballast construction as claimed in claim 1 in which the extensions of said spring contact members are arranged at an angle to and extend away from said block toward the interior of said canister.

3. A ballast construction as claimed in claim 1 in which the extensions of the spring contact members are reverse bent and disposed contiguous to a surface of said block.

4. A ballast construction as claimed in claim 1 in which said block member is generally trapezoidal in cross section configuration with the base thereof adjacent with and parallel to a face of said canister, said canister being formed as an open top box with said top comprising said face and having a cover for said top to close off the canister after said ballast has been completed, and said extensions of said spring contact members being generally in the plane of said base to enable connection of said internal leads thereto during construction of said ballast.

5. A ballast construction comprising a canister having an open top and an end wall, a cover member adapted to close off the top, a terminal block having a base presented to the open top, the block being mounted to said wall and having a portion exposed through said wall, a spring contact member with a contact end, disposed completely within said block, an access opening formed in said exposed portion for receiving a bared conductor therein and arranged so that the bared conductor will be gripped by said scraper contact end when said conductor is pushed into said access opening, said spring contact member hav-

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ing a terminal end extending out of said block on the interior of said canister and adapted to have an internal lead electrically connected thereto.

6. A construction as claimed in claim 5 in which the block base has a groove and the terminal end is engaged in the groove, whereby to enable said internal lead to be laid upon said terminal end in said groove for making said connection.

7. A construction as claimed in claim 5 in which said block has a cavity and the contact member is disposed in the cavity, the cavity being in communication with said access opening and there being a cover member closing off the cavity from the interior of the canister.

8. A construction as claimed in claim 7 in which a wall of said cavity is recessed whereby to provide a passageway when said cover member is in place, and said terminal end extends through said passageway.

9. A construction as claimed in claim 8 in which said passageway opens to the interior of said canister adjacent said base.

10. A construction as claimed in claim 8 in which said passageway opens to the interior of said canister adjacent said base, and said terminal end is bent back upon said base.

11. In a ballast construction, mounted in a canister, a

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terminal block provided with a plurality of contact members adapted to be connected with internal leads and providing for push-in connection of external leads, said block being of generally trapezoidal cross section and having a plurality of triangular cavities opening to the slanted face of said block a contact member in each cavity, a wire conduit formed in one wall of each cavity and aligned with the contact member, the opening being opposite the said walls to admit the contacts during assembly of said contacts in said block, a cover member engaging over said cavities and providing a passageway for each cavity, each contact member having an extension in said passageway and presenting a terminal end on the interior of said canister.

12. A structure as claimed in claim 10 in which the base of the block has a groove adjacent each cavity and the extensions are disposed respectively in said grooves.

References Cited in the file of this patent

UNITED STATES PATENTS

2,702,378	Talty	Feb. 15, 1955
2,713,668	Gibilisco	July 19, 1955
2,718,627	Benander	Sept. 20, 1955
2,883,641	Despard	Apr. 21, 1959
3,040,170	Chwan	June 19, 1962