Feb. 9, 1965 R. A. HEISLER 3,168,987

FIXTURE FOR FLUORESCENT LIGHTS AND THE LIKE

Filed Jan. 17, 1963 3 Sheets-Sheet 1

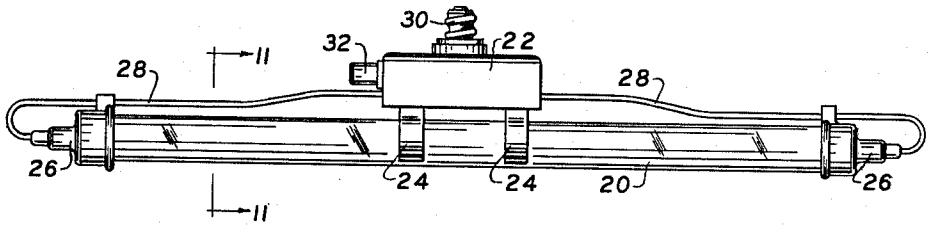


FIG. 1

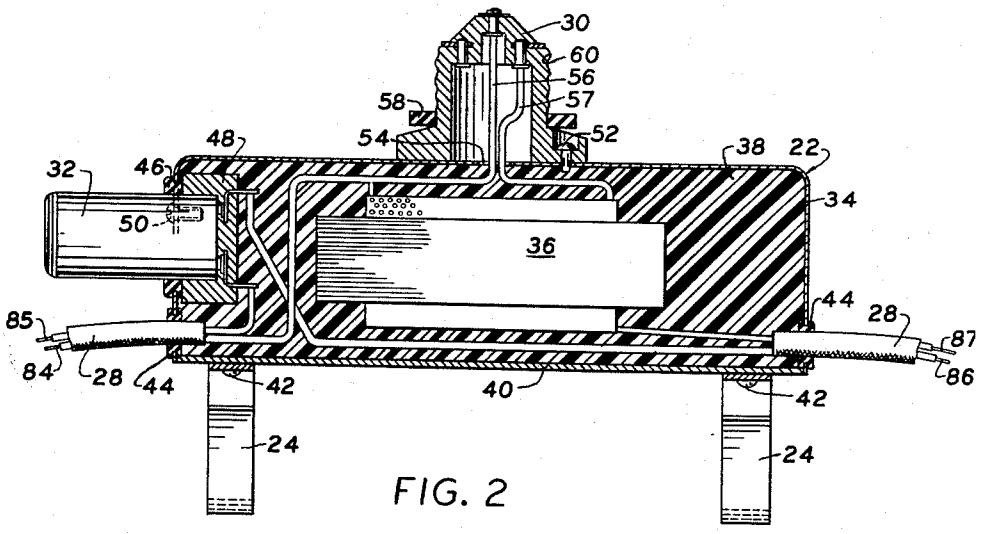


FIG. 2

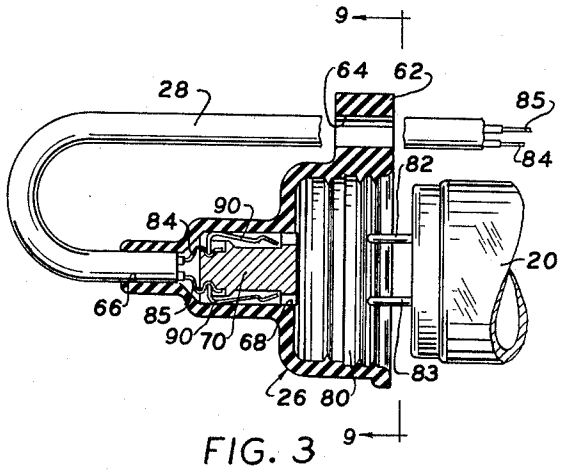


FIG. 3

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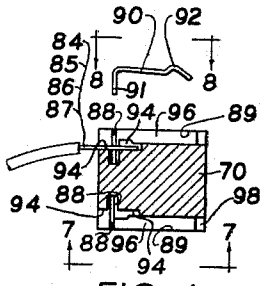


FIG. 4

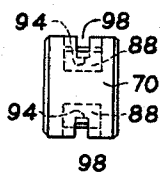


FIG. 5

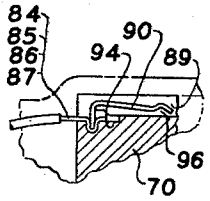


FIG. 6

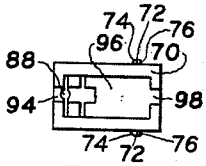


FIG. 7



FIG. 8

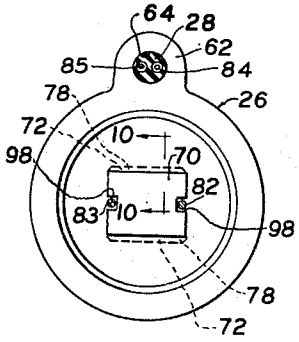


FIG. 9

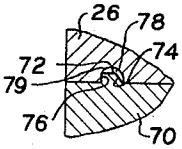


FIG. 10

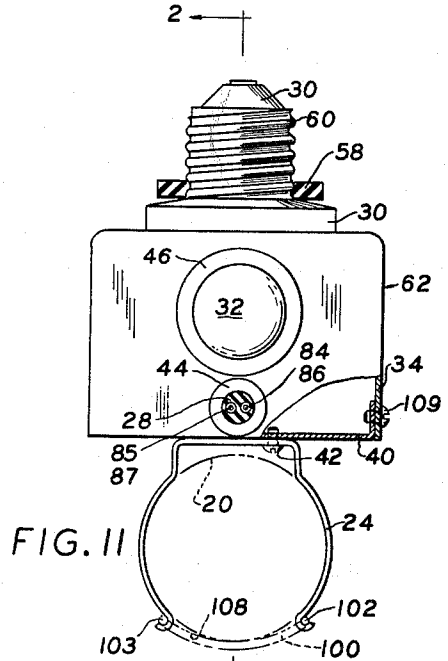


FIG. 11

FIG. 12



FIG. 13

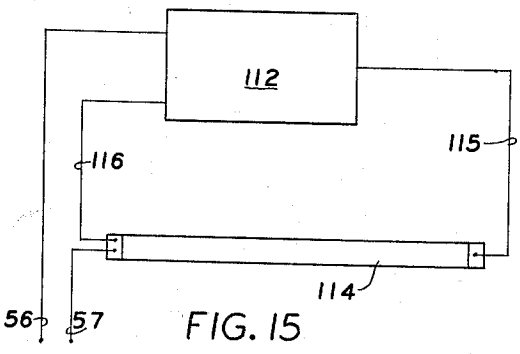


FIG. 15

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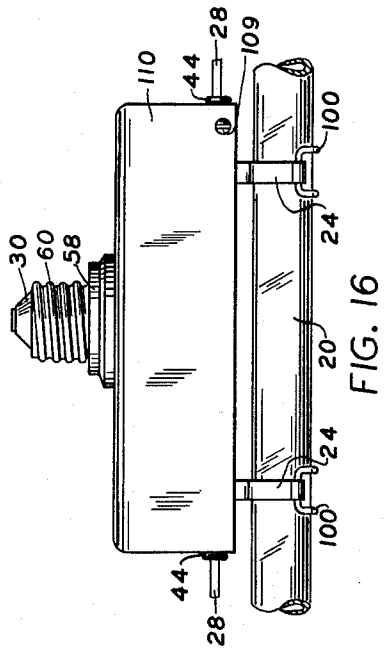


FIG. 16

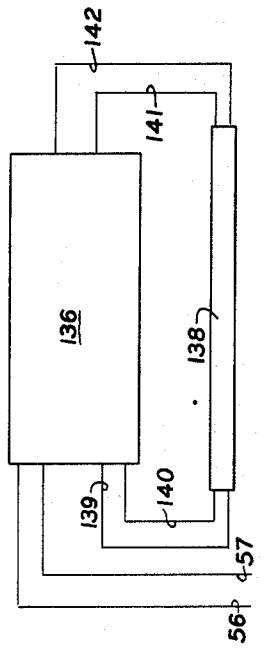


FIG. 18

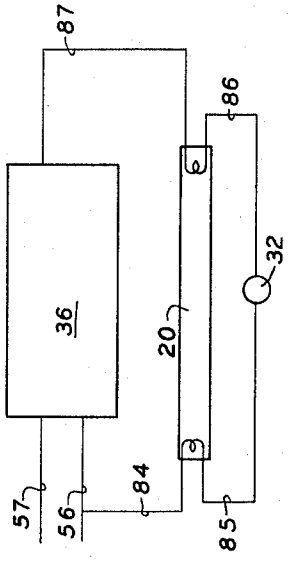


FIG. 14

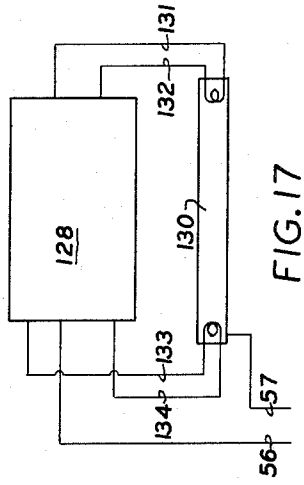


FIG. 17

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3,168,987

FIXTURE FOR FLUORESCENT LIGHTS AND THE LIKE

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Filed Jan. 17, 1963, Ser. No. 252,097
6 Claims. (Cl. 240—51.11)

This invention relates to improvements in moisture-resistant fixtures for fluorescent tubes and more particularly to those fixtures intended for use in damp or humid conditions.

Although the use of fluorescent tubes has been widespread for many years and many specialized and general fixtures have been made so as to use them, fixtures adapted for use under humid, damp and adverse weather conditions have not been generally available.

It has been found that beneficial results useful in the controlled growing of flowers and vegetables such as are found in nursery and greenhouse enterprises are available in the rays emitted from certain fluorescent tubes. The use of these tubes in such growing conditions require that safe and satisfactory fixtures be moisture resistant. In addition the fixtures, in so far as possible, should be useable in present electrical installations and physical equipment.

The present invention contemplates the providing of an economical, moisture-resistant fluorescent fixture including in its scope certain features using among other components, a conventional ballast housed in a rust-proof or rust-resistant container. The container is further combined with a standard screw fitting adapted for insertion into a conventional female screw receptacle. A moisture resistant closure at this connection is made by placing a sponge rubber bushing around the screw fitting. This rubber bushing additionally enables the fixture to be screwed to a certain predetermined point where the lamp will be oriented or aligned as desired by the user. Mounted within the container is a starter socket aligned with a resilient bushing so that a starter can be easily inserted or removed from the socket. This bushing excludes moisture and prevents the moisture from reaching the starter socket.

A bottom cover plate is attached to the container and mounted on this bottom plate are two spring-type clips which hold the fluorescent tube in a secure manner and in a spaced relationship to the container. Also from the container are led two flexible water-proof electrical conductors passing through rubber grommets to prevent the chafing of the conductors as they pass through the container wall. On the other end of the conductors are arranged rubber end caps each acting as an electrical insulator, a moisture barrier and as a holder of a contact block. The end caps in addition have orientation provision in relation to the contact pins of the fluorescent tube and are easily slid on or off the ends of the tube for installation or replacement of the tube.

With the foregoing and other considerations in mind this invention contemplates providing a moisture-resistant fluorescent fixture, safe to use and easy and economical to manufacture. The fixture is further intended to be easy to install and to be easily serviced in the replacement of expandable components such as starters and fluorescent tubes. The fixture further provides an insulated assembly so arranged and constructed that accidental exposure to electrical current or shock is nearly non-existent.

It is an object of this invention to provide a fixture which utilizes the strength of the fluorescent tube to provide a support for the end electrical connections. It is further contemplated that in utilizing the tube as a self-support and the consequent elimination of metal shields, brackets or conductors and the like, the tube thus exposed and when lighted will provide illumination in virtually a three hundred sixty degree arc.

It is a further object to provide a ballast container of moisture resistant construction and with a support means for holding the fluorescent tube in fixed relationship thereto. It is also intended that end caps, adapted to engage and be retained on the ends of the fluorescent tube in a moisture-excluding manner, will also act as effective, safe, electrical insulators and carriers of electrical contacting means.

With the foregoing objects, features and advantages in view together with others which will appear as the description proceeds, it will be noted that the invention comprises certain novel features of construction, arrangement and structure hereinafter more fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, and that various changes in the form, proportion, size and minor details of the described construction, arrangement and structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of this invention, there is illustrated in the accompanying drawings a preferred embodiment, from an inspection of which when considered in connection with the following description, this invention, its mode of construction, assembly and operation and many of its advantages should be readily understood and appreciated. Referring to the drawings in which the same characters or references are employed to indicate corresponding or similar parts through the several figures of the drawings:

FIGURE 1 is a somewhat simplified side view of the assembled fixture;

FIG. 2 is an enlarged sectional view of the ballast container showing the internal components taken on the line 2—2 of FIG. 11;

FIG. 3 is an enlarged sectional view of the end cap assembly showing the tube ready to be inserted;

FIG. 4 is a somewhat simplified sectional view of a contact block with the spring contact shown above ready to be installed;

FIG. 5 is an end view of the contact block;

FIG. 6 is a fragmentary sectional view showing the method of assembly of spring contact with the contact block;

FIG. 7 is a view of the contact block taken on the line 7—7 of FIG. 4;

FIG. 8 is a top view of the spring contact taken on the line 8—8 of FIG. 4;

FIG. 9 is an end view looking into the end cap taken from the line 9—9 of FIG. 3;

FIG. 10 is a fragmentary enlarged view showing the engagement of the contact block and the rubber end cap taken on the line 10—10 of FIG. 9;

FIG. 11 is an enlarged end view of the ballast container taken on the line 11—11 of FIG. 1;

FIG. 12 is a top view of a safety spring clip;

FIG. 13 is a side view of the spring clip;

FIG. 14 is a diagram of a high and low power factor preheat fluorescent circuit as used with the components in FIG. 1;

FIG. 15 is a diagram of another embodiment utilizing a high power factor, instant start fluorescent circuit;

FIG. 16 is a side view of another exemplification having a ballast container assembly using no starter;

FIG. 17 is a diagram of a lower power factor, rapid start fluorescent circuit using a ballast container such as in FIG. 16;

FIG. 18 is a diagram of a high power factor, rapid start fluorescent circuit using a ballast container such as in FIG. 16.

In the exemplified construction the general arrangement of the major elements is shown in FIG. 1. A fluorescent tube 20 is held in fixed relationship to a ballast container 22 by means of a pair of spring clips 24. Each end of the tube 20 supports and is covered by an end cap 26. Electrical current is carried from ballast container 22 to end cap 26 by means of a pair of conductor wire assemblies 28. Upon the top of ballast container 22 is mounted a male electrical plug 30 of conventional design and construction and adapted for installing in a drop light or other similar electrical outlet. Extending out of the ballast container 22 through an insulated opening therein and to be hereinafter described in a starter 32 of conventional design, construction and use.

The preferred arrangement of the elements within and leading from the ballast container 22 is shown in FIG. 2. A shell 34 is formed to house the components required to be sealed within. This shell is preferably of a rust proof metal such as aluminum or may be made of steel with a rust resistant outer surface. A ballast 36 is disposed within the shell 34 and located so that a surrounding medium of pitch 38 will seal and support the ballast in an insulated position. The bottom of the ballast container 22 is protected by a cover 40 which is preferably made of a material similar to shell 34. By means of screws or rivets 42 the spring clips 24 are fastened to the cover 40. The wire conductors 28 are passed through holes formed in the end walls of the shell 34 with a rubber grommet 44 providing the required insulating and wear protection against the sharp metal edge hereafter to be more fully described. On one end of the shell 34 and adjacent to the outlet for wire conductor 28 is a hole formed for the starter 32. A resilient water-proof bushing 46 is fitted in this hole, the bushing 46 having an inside diameter of such size as to permit the insertion of the starter 32 with a friction fit sufficient to prevent water or moisture to pass from the outside atmosphere to the inside of the ballast container. In practice it has been found that starters of twenty, thirty and forty watt capacity are about thirteen-sixteenths of an inch in diameter and that accordingly the bushing 46 is made with an inside diameter approximately one sixty-fourth inch smaller. It has also been found that a preferred material for bushing 46 is neoprene rubber of approximately fifty durometer hardness. Just inside the shell 34 and aligned opposite the hole in bushing 46 is a starter socket 48 of conventional design and construction. Screws 50 are used to attach the starter socket 48 to shell 34. The electric plug 30 is attached to shell 34 by means of screws 52. A hole 54 is formed in the top of shell 34 to permit passage of wires 56 and 57 from the electric plug 30. A sponge rubber or similar material is used in making a gasket 58 which provides an adjustable moisture-resistant seal between plug 30 and the electrical outlet into which the fixture is to be installed. This gasket 58 is of sufficient thickness to allow nearly one hundred-eighty degrees of rotation and engagement of thread 60 in a mating thread of a receptacle (not shown). A gasket 58 made of neoprene sponge rubber approximately three-sixteenths inch thick and having an inner hole so as to be fitted snugly to thread 60 has been very satisfactory.

Electrical wire conductors 28 as shown in the present embodiment are flexible leads with a plastic or rubber sheath. The conductors 28 are of sufficient length to permit end cap 26 to be slid on or off the end of tube 20. To effect a moisture-resistant seal of the electrical contacts to the tube 20 a new and novel end cap 26 is shown in FIGS. 3, 6, 9 and 10. In the preferred embodiment the cap 26 is made of neoprene rubber of approximately fifty to sixty durometer. To support the wire conductor 28 a support lug 62 is formed on the cap 26. A passageway 64 is formed in the lug 62, the passageway 64 being a snug, sliding fit for the conductor 28. The end of the cap 26 has also a passageway 66 formed therein. Passageway 66 is made so as to be a very snug fit

on the conductor 28. In the present instance the conductor 28 is slightly larger than a quarter inch in diameter and the passageway 66 is made ten to fifteen thousandths of an inch smaller than the conductor. At the termination of the passageway 66 is formed an insulator block recess 68 so arranged and constructed as to snugly receive insulator block 70. The block 70 is rectangular in shape and is formed of a phenolic plastic or similar electrical insulating material. As shown in FIGS. 4, 5, 6, 7, 9 and 10 the block 70 cooperates with end cap 26 to provide certain passageways for wire, pins and lock means to be hereinafter described.

Referring now particularly to block 70 there are disposed on opposite sides of the block a pair of engaging lugs 72, each lug having a sloped side 74 and a right-angularly formed shoulder 76. To mate with and engage lugs 72, a recess 78 is moulded in cap 26, the recess providing an abutment 79 to engage the right-angle shoulder 76 of the block 70. To accept and retain the end of tube 20 the cap 26 has an annular recess 80 formed therein. In the present instance the end of the tube 20 is approximately one and fifteen-thirty seconds inches in diameter and is radiused into a flat end with pins 82 and 83 extending therefrom. To permit the tube 20 to be slid into the annular recess 80 and yet to cause the cap 26 to effect a moisture resistant seal, the recess 80 in the present instance is made from twenty to twenty-five thousandths inches smaller in diameter than the tube 20.

The insulator block 70 is arranged to hold the ends of a pair of wires. As shown the pair of wires may be either 84 and 85 or as designated on the other end 86 and 87, each pair being carried in wire conductor 28.

To assemble the various elements listed above into the pair of end caps 26 the following method of assembly is preferred. The pair of wire conductors 28 is cut to a pre-determined length, the outer end is fed through a passageway 64 in support lug 62 and then two or three inches are drawn through passageway 66. Wire ends 84, 85, 86 and 87 are exposed by removing a portion of the sheath of conductor 28 and about a quarter inch of wire is exposed by removing the insulation from the ends of wires 84, 85, 86 and 87. An uninsulated wire end is then laid in formed groove 94, then spring contact 90 is placed in position and the bent leg 91 is pushed into channel 88. This procedure is repeated for each end of wire 84, 85, 86 and 87. The insertion of leg 91 into channel 88 to a position where the wire is crimped and locked in groove 94 and under leg 91 as shown in FIG. 6 provides an economical and shielded assembly. After both contacts 90 are assembled in place the block 70 is inserted into block recess 68 while at the same time the conductor 28 is drawn back through passageway 66. When the block 70 reaches the rear of recess 68 the lug 72 will have entered recess 78, the sloped side 74 permitting easy insertion. After the shoulder 76 has reached the engaging point of abutment 79 the withdrawal of the block 70 is restricted. It is to be noted that when assembled into block 70 the V-formed protuberance 92 lies in an engaging path of pin 82 and 83 when the tube 20 is inserted.

One configuration of spring clip 24 is exemplified in FIG. 11 and in conjunction therewith is a safety snap spring 100 shown in phantom outline in FIG. 11 and in solid detail in FIGS. 12 and 13. This snap spring 100 is contemplated to be used at the discretion or desire of the operator. As shown the clip 24 has the ends rolled so as to provide openings 102 and 103. The safety snap spring 100 is made of wire of such a diameter that the ends 104 will slide into and pivot in the opening 103. The opposite end 106 of the clip 100 is snapped into the opening 102. The sides 108 are formed in an arcuate manner to enable the clip 100 to lie adjacent to the tube 20 and at the same time be able to be snapped into the clip opening 102.

In the present instance, the preferred method of assembly of the components of FIG. 1 into shell 34 is to be particularly noted. After the attachment of the starter

socket 48 and electrical plug 30 in place in shell 34, the ballast 36 is brought into position and in accordance to the circuit diagram shown in FIG. 14 the wires 56, 57, 84, 85, 86 and 87 are connected. The starter socket 48 as shown in FIG. 2 and as commercially supplied, has the back sealed off either with a fibre back cover or with an attached piece of sealing paper. All wire joints are protected by commercially approved insulators, tape or other common shielding medium wherein possible contact with each other or with shell 34 or ballast 36 is eliminated. The shell 34 is now placed with the electrical plug 30 in a down position and the ballast 36 is spaced away from shell 34 by using wires 56, 57, 84, 85, 86 and 87 as spacers within the shell 34. Fluid pitch 38 is then poured into the shell until the shell 34 is filled. Cover 40 is now placed in position and by means of screws 109 is fastened in place. After pitch 38 has solidified the assembly is ready to be used.

Although the preferred embodiment contemplates the use of a starter 32 and provision is therefore provided in ballast container 22, the use of a fluorescent tube 20 having the characteristics of a "rapid" or "instant" start tube would justify the selection of components usually used with such tubes. Accordingly the starter 32 would be eliminated and a ballast with the desired capacity and characteristics would be placed inside a shell 110 whence the ballast container would appear as in FIG. 16.

In illustrating the circuits that can be utilized in assembling a fixture it is readily conceded that many variations are possible. The circuits chosen for purpose of illustration are very commonly used to accommodate the lamps selected. Each circuit utilizes a commercial ballast designed and furnished to accommodate the particular condition present, and in no way is it to be construed that the circuits are anything but an illustration of a way of producing four different results with four different ballasts and lamps suitably constructed for use with said ballasts.

As the generally more economical circuit from the standpoint of cost of the components, the high and low power factor, with pre-heat starter diagram as shown in FIG. 14, is selected as the circuit used in FIG. 2. The ballast 36, starter 32 and lamp 20 have previously been described.

When a high power factor, instant-start unit is desired, a circuit such as that illustrated in FIG. 15 is selected. A ballast 112, commercially available, of the proper size and characteristics is used. No starter or socket is required. An instant start lamp 114 is selected and in conductor 28 is fed by a wire 115 led to one end of the lamp 114, while in the other conductor 28 wire 57 and 116 are led to the other end of the lamp.

When a low power factor, rapid-start fluorescent unit is desired, a circuit such as that illustrated in FIG. 17 is selected. A ballast 128, commercially available, of the proper size and characteristics is used. No starter or socket is required. A rapid start lamp 130 is selected and in conductor 28 is fed by wires 131 and 132. The other end of lamp 130 is fed by wires 133 and 134. Line 57 is led to a capacitance strip (not shown) placed adjacent to the lamp 130.

When a high power factor, rapid-start fluorescent circuit is desired, a circuit such as that illustrated in FIG. 18 is selected. A ballast 136, commercially available, of the proper size and characteristics is used. No starter or socket is required. A rapid start lamp 138 is selected and in conductor 28 is fed by wires 139 and 140. The other end of lamp 138 is fed by wires 141 and 142.

The fixtures utilizing circuits illustrated in FIGS. 15, 17 and 18 would use the ballast container assembly shown in FIG. 16.

Use and Operation

After the ballast container 22 is assembled as outlined above and the end caps 26 are assembled the tube 20 is brought into position and snapped in place in clips 24. The pins 82 and 83 are then aligned so as to engage the guideways 98 in caps 26 and the lugs 62 of the caps are placed in the up position. The end caps 26 are then pushed onto the ends of tube 20 with the pins 82 and 83 engaging guideways 98 thence onto spring contacts 90 whence the electrical circuit is completed. To replace the tube 20, the end caps 26 are pushed off the old tube 20 and the tube is removed from springs 24, the new tube is then installed as above. The assembly is screwed into a socket with thread 60 engaging a corresponding female thread with the gasket 58 sealing the male electric plug 30 and the female outlet. The gasket 58 being resilient enables the tube 20 to be aligned in a desired position.

Having described my invention with some particularity, the above disclosure is by way of illustration and although a specific embodiment has been shown and described it will of course be understood that various other modifications may be devised by those skilled in the art which will embody the principles of the invention as found in the true spirit and scope of the appended claims.

I claim:

1. In a moisture-resistant fixture for a fluorescent tube comprising a ballast container, a ballast insulated from and residing in said container, an electrical socket engaging means attached to and extending from said container, spring clips attached to the container and adapted to removably hold a tube intermediate its ends in spaced relationship to the container, a pair of flexible moisture-resistant wire conductors passing through the walls of and extending from said container, flexible moisture-resistant end caps mounted on the end of said wire conductors and adapted for mounting on the end of and to be supported by the fluorescent tube, a recess formed in said end cap, an insulating block removably mounted in said recess, a guideway formed in said block the guideway arranged to receive a contacting pin on the end of the fluorescent tube, pin contacting means in said block arranged to effect an electrical connection to said pin, a flexible contacting and sealing means defining an annular recess in the end cap and arranged to engage and hold the end of the tube in a manner to exclude moisture, and electrical conducting means to carry current from said socket engaging means to said pin contacting means.

2. Structure according to claim 1 wherein a resilient bushing is disposed on the electrical socket engaging means, the bushing effecting a moisture resistant seal between the said means and a mating electrical outlet when inserted therein.

3. In a moisture-resistant fixture for a fluorescent tube comprising a ballast container of moisture-resistant material, a cover for said container, a ballast element within said container, an electrical socket engaging means attached to and extending from said container, retaining means attached to the container and adapted to removably hold a tube intermediate its ends and in spaced relationship to the container, a starter socket within said container and having the receiving portion disposed outwardly opposite a resilient bushing defining a moisture-restraining starter passageway, a pair of flexible moisture-resistant wire conductors passing through the walls of and extending from said container, flexible moisture-resistant end caps mounted on the end of said wire conductors and adapted for mounting on the end of and to be supported by the fluorescent tube, a recess formed in said end cap, an insulating block removably mounted in said recess, a pair of guideways formed in said block, the guideways arranged to receive a pair of contacting pins on the end of the fluorescent tube, pin contacting means in said block arranged to effect an electrical connection to said pins, a flexible contacting and sealing means defining an annular recess in the end cap and arranged to engage and hold the end of the tube in a manner to exclude moisture, and electrical conducting means to carry current from said socket engaging means to and through said ballast and starter to said pin contacting means.

4. Structure according to claim 3 wherein a resilient bushing is disposed on the electrical socket engaging means, the bushing effecting a moisture resistant seal between the said means and a mating electrical outlet when inserted therein.

5. Structure according to claim 2 wherein the insulating block recess of the end cap is of a rectangular cross section, a pair of oppositely disposed grooves formed in the walls of the recess, a pair of protuberantly formed shoulders formed on the exterior walls of the insulating block and adapted to engage and be retained by the grooves in the recess when the insulating block is seated in said recess, at least one flat spring contact receiving and retaining cavity formed in the side of the insulating block, a tube-pin entering channel formed in the end wall of the insulating block, a groove substantially at right angles to the longitudinal axis of the block, the groove being additionally formed in the spring receiving cavity and adapted to receive the stripped end of the wire conductor, and a flat spring contact having a bent-leg portion and when inserted in the cavity the bent-leg portion of the spring contact is adapted to slide in and engage the right angle groove and to engage the stripped end of the wire so as to provide a current carrying connection and lock the stripped wire end of the wire in the groove, and the other end of the flat spring laying in the cavity and adjacent the tube pin entering groove and in the way of the tube pin so as to positively engage the entering pin of a fluorescent tube.

6. Structure according to claim 4 wherein the insulating block recess of the end cap is of a rectangular cross section, a pair of oppositely disposed grooves formed in the walls of the recess, a pair of protuberantly formed

shoulders formed on the exterior walls of the insulating block and adapted to engage and be retained by the grooves in the recess when the insulating block is seated in said recess, at least one flat spring contact receiving and retaining cavity formed in the side of the insulating block, a tube-pin entering channel formed in the end wall of the insulating block, a groove substantially at right angles to the longitudinal axis of the block, the groove being additionally formed in the spring receiving cavity and adapted to receive the stripped end of a wire conductor, and a flat spring contact having a bent-leg portion and when inserted in the cavity the bent-leg portion of the spring contact is adapted to slide in and engage the right angle groove and to engage the stripped end of the wire so as to provide a current carrying connection and lock the stripped wire end of the wire in the groove, and the other end of the flat spring laying in the cavity and adjacent the tube pin entering groove and in the way of the tube pin so as to positively engage the entering pin of a fluorescent tube.

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NORTON ANSHER, *Primary Examiner.*