

[54] **EXTENDIBLE LIGHTING FIXTURE**

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60076
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[51] Int. Cl. **H05b 33/00**
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174/57, 69

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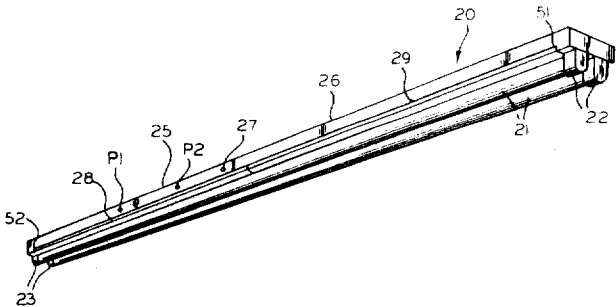
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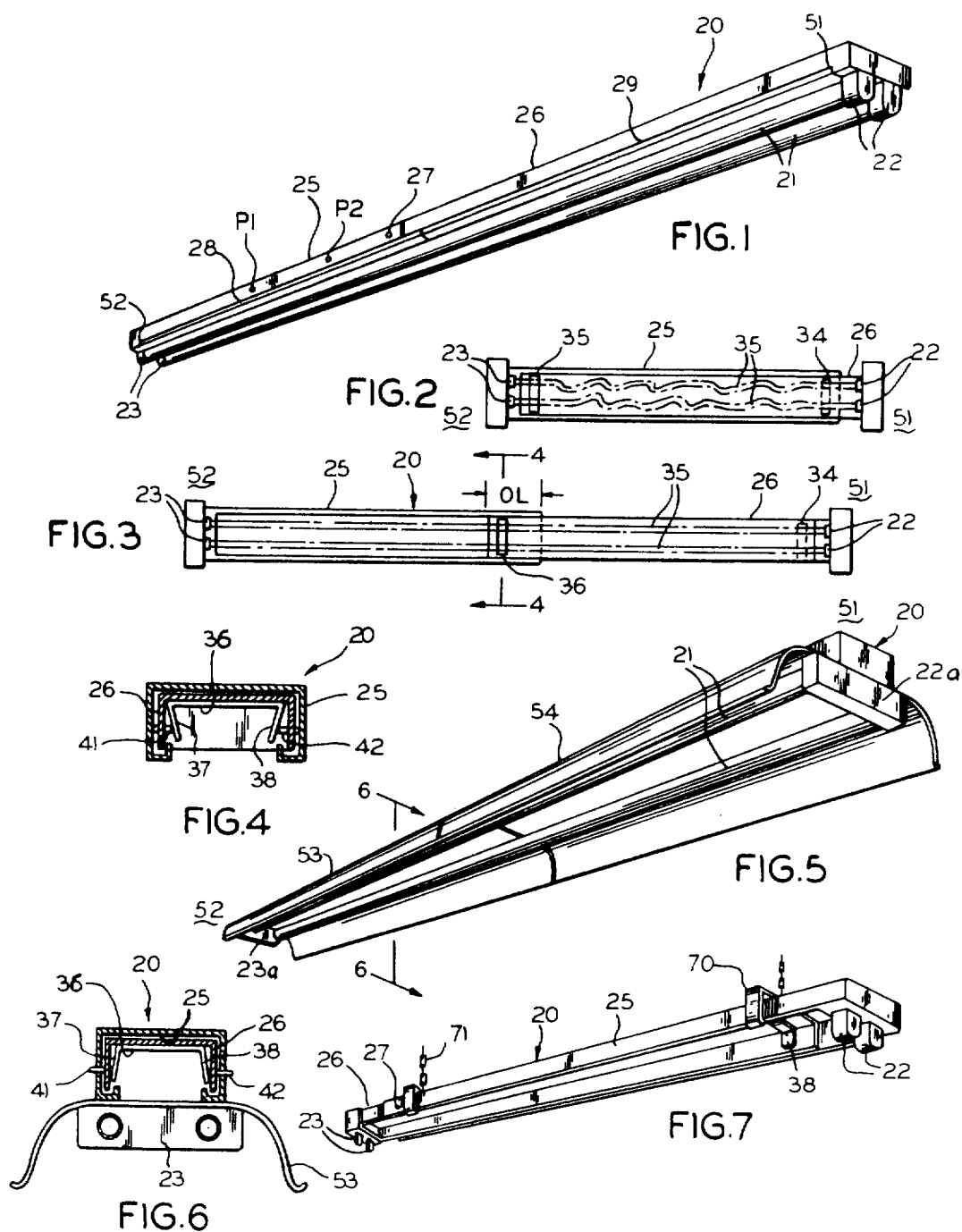
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[57] **ABSTRACT**

A flourescent lighting fixture housing is manufactured in a compact size and shape. While in this compact size, the fixture is shipped, warehoused, and otherwise manipulated prior to installation. To facilitate further manipulation during the actual installation itself, it is possible to mount the fixture while in its compact condition, and to thereafter extend it to its full length. There are many savings which result from such a fixture.

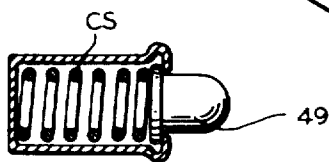
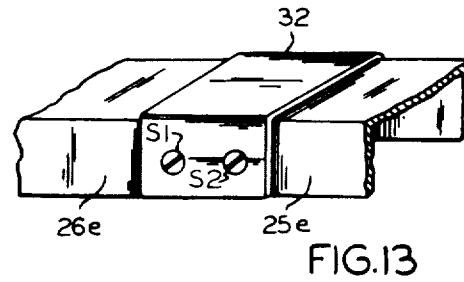
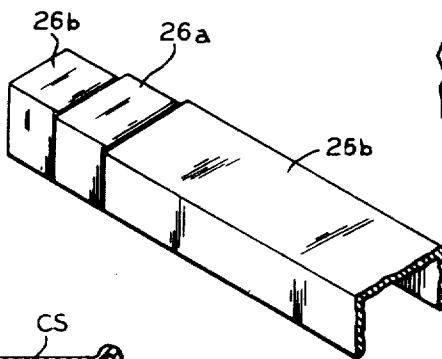
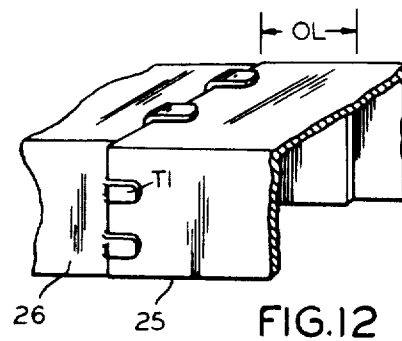
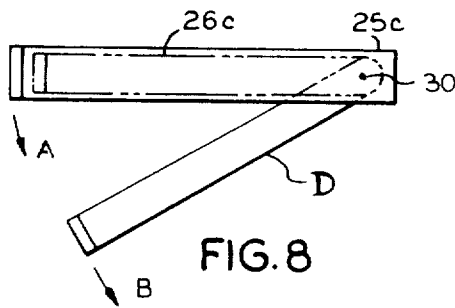
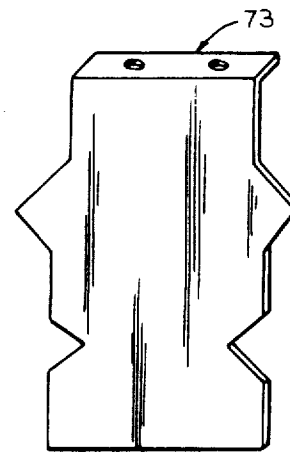
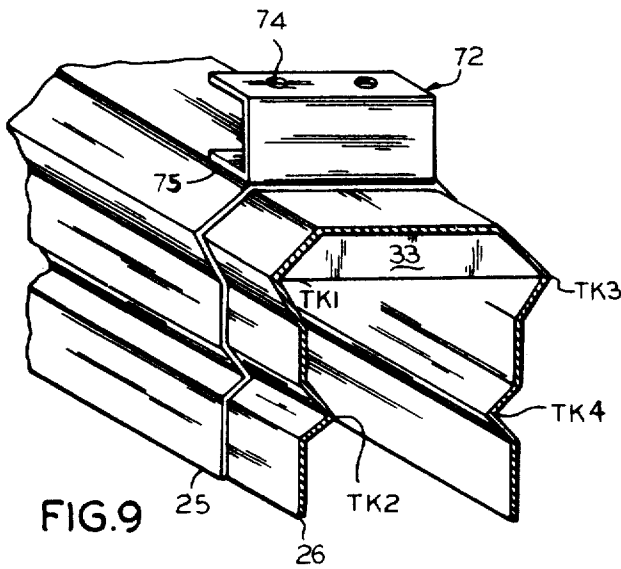
14 Claims, 23 Drawing Figures





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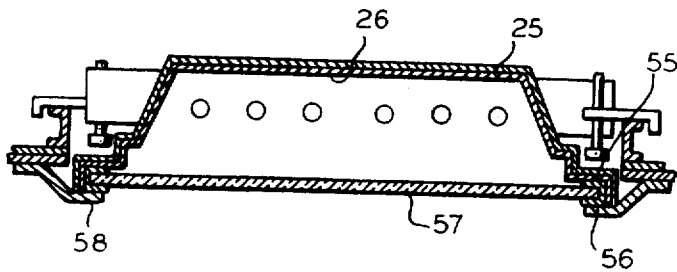


FIG. 15

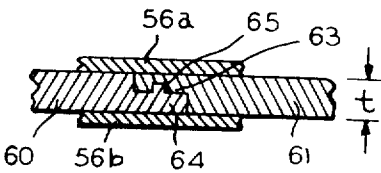


FIG. 18

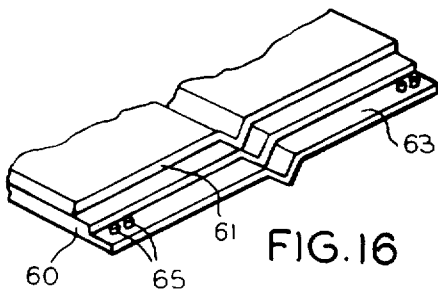


FIG. 16

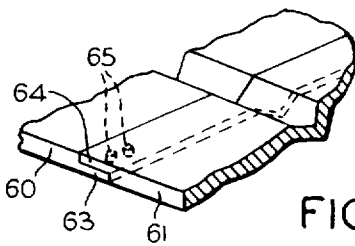


FIG. 17

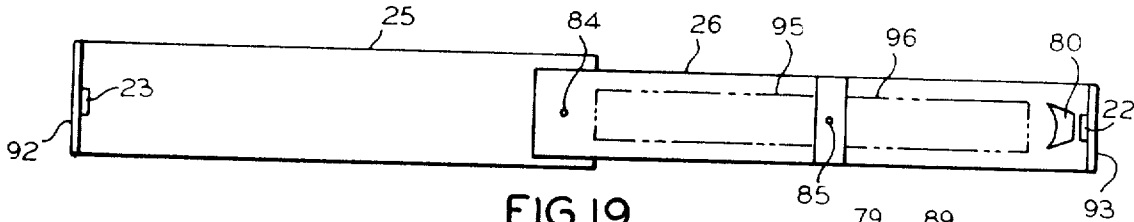


FIG. 19

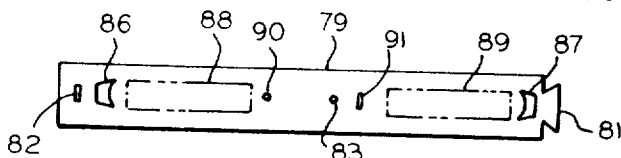


FIG. 20

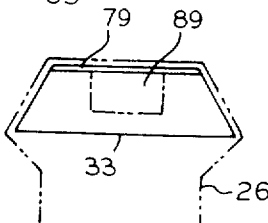


FIG. 21

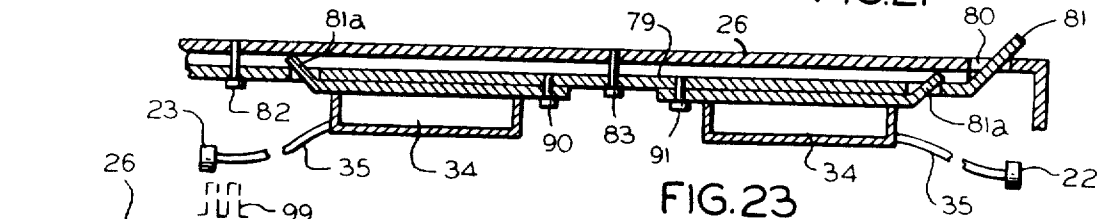


FIG. 23

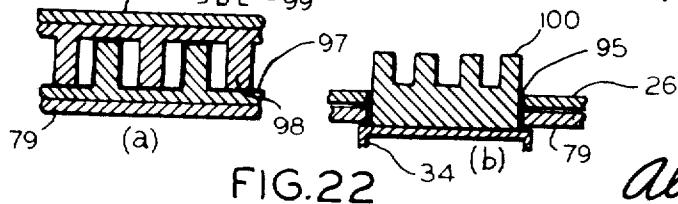


FIG. 22

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EXTENDIBLE LIGHTING FIXTURE

This invention relates to fluorescent lighting fixtures, and more particularly to extendible lighting fixtures.

The invention is designed to provide new and novel fixtures and to capitalize upon a number of opportunities for improvements in the lighting industry. Fixtures of this general type have been available for many years, during which there have been an evolutionary series of changes. While these changes have improved pre-existing fluorescent lighting fixtures, they have tended to overlook material benefits which could be derived from a totally new design. Thus, for example, either new manufacturing techniques have been used to make old style fixtures; or, new style fixtures have been made by old production techniques. Usually any redesign of fixtures have been carried out without due consideration of transportation or installation problems, or the like. Thus, there are many heretofore neglected opportunities for consolidating past gains in the industry and for progressing to newer gains.

For example, fluorescent lighting fixtures come in many shapes, sizes, and appearances. However, almost all of them share a common part which might be described generically as an elongated, box-like housing. Generally, this housing includes a die formed channel made from a relatively thick sheet of steel. The housing provides support for sockets or terminals at the opposite ends of a fluorescent tube. The housing also provides a wireway which extends between the sockets and an enclosure for a ballast. In addition, a great variety of reflectors, refractors, covers, and couplers, snap-in-parts, or the like, may be added to provide different styles and types of fixtures. Also, the fixtures may be provided with a number of different types of mounting brackets and adaptors for giving wall, ceiling, or pendant support.

The present practice is to provide separate housings, boxes, and the like for each fixture design. Thus, there are duplicate tools for making each separate carton size. Excessive inventories are required to insure a minimum supply of fixtures and parts for each size. The factory workers must learn about manufacturing, handling, and installing many different types of fixtures. There would be a very great savings if all or most of these many fixture designs could be provided from a single basic unit which may be adapted to accommodate many different sizes, types, and numbers of fluorescent tubes.

The fluorescent lamps used in these fixtures may have any suitable length, such as 2, 4, 6 and 8 feet, for example. Regardless of the length, most of the housing represents a waste of space since the end fittings or sockets, wires, ballast, or the like occupy a very small proportion of the total housing volume. The remainder of the housing is provided only to extend over the length of the fluorescent tube. In even the smallest of the fixtures, this wasted space represents wasted money since it increases the size of cartons, shipping volume, and warehouse space. Hence, a maximum compactness is not only always desired, but also avidly sought after.

In the large sizes, (such as 8 foot lamp fixtures) the wasted space makes an awkward device, which requires two or more people to manipulate it, thus increasing the installation labor costs. Aside from cost factors, the large and bulky fixtures exact further tolls. For example, the weight and leverage of the long fixtures puts strains upon the bodies of workmen who must lift, hold, and install them. Whereas, in any size, the lifting of a smaller, more compact box causes less body strain than the lifting of a longer box of the same weight.

A convenient fixture is one which one man may lift, mechanically attach, and then electrically connect without requiring either an assistant or any special on site tools, other than the simple hand tools (such as wire cutters and screw driver) normally used to make such fixture installations. Such a fixture should be foolproof to install. Mechanically and dimensionally, it should be and remain stable throughout the entire life of the fixture. It should be very difficult to make a faulty installation which might result in an equipment failure, such as a collapse of the unit. There should be a positive construction which will withstand and resist installation site irregularities such as uneven or undulated ceilings or walls, skewed supports, poorly installed brackets or the like.

The above described and other problems should be solved; however, they may not be solved at the expense of the sales appeal of the fixture. Thus, the fixture must be good looking and adaptable to home, office, and industry. It should be possible to use a great variety of different lens and provide a variety of lens patterns. The fixture should easily meet industry standards and receive the approval of any regulatory or safety agencies. For example, all parts of the fixture must be properly grounded, there should be no hot spots where heat accumulates. The weight of reflectors and other attachments should be adequately supported.

Accordingly, an object of this invention is to provide new and improved fluorescent lighting fixtures. In this connection, an object is to reduce the bulk of the fixtures prior to the installation thereof. Here, an object is to provide for an overall reduction of fixture cost by reducing the volume of shipping and storing space.

Yet another object of the invention is to facilitate the manipulation and installation of fluorescent lighting fixtures. Here, an object is to reduce the labor cost for installing the fixtures. In particular, an object is to provide means by which one man may install large and bulky fixtures.

In keeping with an aspect of this invention, these and other objects of the invention are provided by a fluorescent lighting fixture housing which is manufactured in a compact size and shape. While still in this compact size, the fixture is shipped, warehoused, and otherwise manipulated prior to installation. When the compact fixture reaches the point of installation, it is extended in size to conform to any one of a standard size fluorescent tube, thereby enabling the one housing to provide for an installation of any convenient full size fluorescent lamp. To facilitate a manipulation of the fixture during its installation, it is possible to mount the fixture while in its compact condition, and to thereafter extend it to its full length. It is also possible to snap-in a containerized unit of convenient components to further tailor the fixture to customer needs.

The nature of several preferred embodiments of the invention, for accomplishing these and other objects, may be understood best from a reading of the following specification, when taken with the attached drawings, in which:

FIG. 1 is a perspective view of the inventive fluorescent lighting fixture housing in a fully extended condition;

FIG. 2 is a plan view, looking up toward the bulb side of the fixture, showing it in a compact condition, as originally manufactured;

FIG. 3 is a plan view, similar to FIG. 2, showing the fixture in a fully extended position;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3, before a full extension of the fixture;

FIG. 5 is a perspective view of another embodiment of the invention, especially — although not exclusively — well adapted for industrial use;

FIG. 6 is a cross-sectional view of the embodiment of FIG. 5 taken along line 6—6 thereof after the fixture is fully extended.

FIG. 7 is a schematic illustration of an exemplary method of installing the inventive fixture;

FIG. 8 schematically shows another embodiment of the invention wherein the compact size is accomplished by a hinged fixture structure;

FIG. 9 is a fragmentary perspective view showing a cross-section of a fixture housing with a double track sidewall configuration to facilitate a telescoping movement;

FIG. 10 shows an end plate for the channel of FIG. 9 with an alternative hanger;

FIG. 11 is a schematic showing that the invention may use — not just two — but a plurality of sections to make an even more initially compact housing;

FIG. 12 is a perspective view of a fragment of the housing showing a snap together arrangement;

FIG. 13 is a perspective view of a fragment of the housing connected together by a coupler plate;

FIG. 14 shows an alternative embodiment of an indexing device used to lock the housing in its extended condition;

FIG. 15 is a schematic end elevation view of a troffer fixture with a telescoping prismatic lens therein;

FIG. 16 is a fragmentary perspective view of the edges of two prismatic lenses in the telescoped position;

FIG. 17 is a fragmentary view of the two lens in an extended position;

FIG. 18 is a fragmentary side elevation view taken from FIG. 17 and showing the overlap of the extended lenses and the frame holding them together;

FIG. 19 schematically shows a plan view of the inventive housing, explaining a refinement thereof which further aids the installation;

FIG. 20 schematically shows a snap in plate for holding certain components, such as ballasts, in the housing of FIG. 19;

FIG. 21 schematically shows the end view of the snap-in plate of FIG. 20;

FIG. 22 shows two heat sink arrangements in schematic form; and

FIG. 23 is a cross-sectional view which shows the plate of FIG. 20 mounted in the housing of FIG. 19 with ballasts attached thereto.

The inventive lighting fixture is shown in FIG. 1 as an exemplary open strip light including a housing 20, two fluorescent lamps 21, and lamp sockets 22, 23. These sockets are commonly called "tomb stone" sockets; however, the invention also covers all other forms of sockets, such as the turret sockets 22a, 23a of FIG. 5. Also the invention is broad enough to cover the use of any number of fluorescent lamps, such as three or four lamps, for example.

The housing 20 has two nesting parts 25, 26 which are indexed in an extended position by a suitable keying device 27 which automatically provides a positive locking, as will become more apparent. When the housing parts are extended, they may be locked together at 27 by any suitable locks, latches, slips, screws, tools, bend tabs, or coupling devices (hereinafter collectively called "locking means"). In this particular arrangement, two covers 28, 29 are arranged to snap over the open side of the two housing parts 25, 26. Some of the housing parts 25, 26 and covers 28, 29 may be die formed from approximately 20-gauge steel which is either previously enameled, thereafter enameled, or otherwise protected in any suitable manner. Also, some of these parts and covers may be at least partly formed on a press brake. Preferably, no welding is required to assembly any of these parts.

By way of example, the housing is shown here with two parts 25, 26, as the preferred embodiment, since it is more rigid than it would be with more parts. However, other suitable numbers of housing parts may also be provided. For example, FIG. 11 shows three telescoping sections 25b, 26a, 26b. Here, it is important to note that all three sections 25b, 26a, 26b telescope inside one another. This allows the fixture to be compacted to a very small size. Except for unusual requirements, it is not desirable to provide a center section having pull out sections at either of its ends because the end sections would then abut against and interfere with each other inside the center section. This way the fully telescoped unit would be longer because some additional housing overlap must be provided at each of two points — instead of at one point — to insure rigidity. Thus, the term "multi-part housing" is used hereinafter to describe any convenient number of fully telescoping housing parts.

When the fixture 20 is initially manufactured, it is in a somewhat collapsed or compact condition. For example, FIG. 2 shows one embodiment wherein the two nested parts 25, 26 are telescoped together. FIG. 8 shows another embodiment wherein the two parts 25c and 26c are hinged together at a pivot point or hinge pin 30. Thus this fixture has a compact form wherein the housing parts 25c, 26c are manufactured and folded together, to be unfolded on the installation site by swinging the inside part in the direction of arrows A, B (as indicated at 26d). Thus, FIG. 8 has been drawn to show that the inside part 25 has swung to the position D in its movement toward a fully extended position. While the embodiment of

FIG. 8 shows the two fixture sections 25c, 26c hinged in a nesting, face to face relationship, it should be understood that other arrangements may also be used. For example, they could be hinged in a side-by-side or back-to-back arrangement.

Or, the housing parts could be joined together by a snap-in arrangement, as shown in FIG. 12 wherein a plurality of tabs, such as T1, are pierced in one part 26 and formed to fit over the end of the other part 25. A different form of tab on one part may be bent up into the other part in a locked position, as by a screw driver, for example. Yet another embodiment (FIG. 13) shows that two parts 25e, 26e are joined together by a coupler plate 32 which fits over the butt ends of parts 25e, 26e and are held in place by quarter turn washer type fasteners or sheet metal screws S1, S2. Still other forms of coupling devices may be used. Or combinations of forms could be used, such as a folding form (FIG. 8) with pierced tabs (FIG. 12).

In greater detail, FIG. 2 shows two housing parts 25, 26 which are closely fitted to telescope and slip together in a fairly tight fit. As shown in FIG. 9, the side walls may be shaped, as by a press brake, for example, to form a pair or more of tracks TK1-TK4 which assist in providing a smooth sliding action, and which add strength in the side walls. Likewise, the top or bottom walls may also be shaped to form tracks. As will become more apparent, the outwardly projecting track TK1, TK3 also holds a component support panel 33 in place.

In one exemplary construction for 8 foot fluorescent lamps, the larger cross-section outside housing part 25 is 4 feet long, and the smaller cross-section inside housing part 26 is 4½ feet long. Hence, the total length of this 8 foot fixture is a little more than 4½ feet long when in the compact condition shown in FIG. 2. When extended, the 8 foot lamp fixture is about 98-99 inches long with a 6 inch overlap OL between the parts in the middle of the fixture.

The fixture components are mounted in the smaller cross-section inside housing part 26. Therefore, the larger cross-section outside part 25 does not contain any obstacles which would limit the telescoping action in any manner. For example, FIG. 2 shows a ballast 34 in the small cross-section inside housing part 26. It could also show any other components, such as switches, transformers, or the like.

The slack electrical wires 35 are placed inside the smaller cross-section housing part in a relaxed and randomly folded condition. When the two housing parts 25, 26 are extended outwardly, the wires are also extended, as shown at 35 in FIG. 3. These wires 35 conduct the electrical currents between the end sockets 22, 23.

Means are provided for automatically and positively locking the fixture in its fully extended position. More particularly, a spring loaded indexing detent clip 36 is provided inside the smaller cross-section housing part 26. As best seen in the cross-sectional views of FIGS. 4 and 6, this detent clip may comprise a somewhat U-shaped spring 36 which is preferably shear formed from a carbon material. The upper part of the U-shaped section 36 is attached, in any suitable manner, to the inside of the smaller cross-section part 26. The arms 37, 38 of the U-shaped section have upstanding detents 41, 42 formed thereon. These detents 41, 42 press against the inside surface of the larger cross-section part 25 and deflect the arms 37, 38 inwardly against the spring bias. As the parts 25, 26 are telescopically slid apart toward the extended position, the detents 41, 42 slide along the inside surface of the outside part 25. When the detents 41, 42 find the indexing holes 27, they pop through the holes under the urging of the springs 37, 38. Once the detents pass through the holes 27, the two housing parts are locked together, and they cannot telescope any further.

In the small, one lamp fixture, the housing parts 25, 26 are narrow, and the U-shaped configuration of the spring 36 is ideal. On the other hand, in some large fixtures (say four lamps wide), the housing parts 25, 26 may be in the order of 9 or 10 inches wide, for example. Here, there would be a substantial waste of spring material if the detent spring 36 were U-

shaped. Therefore, in wide housing fixtures, two separate detent members are provided, one for each side (replacing spring arms 37, 38). This way, two detents (FIG. 14) may be substituted for the two arms 37, 38 of the one spring 36.

In greater detail, an indexing detent is shown in FIG. 14. Here, there is a completely self-contained unit comprising a somewhat bullet shaped detent end 49 enclosed within a somewhat hat shaped structure and biased toward an outward position by a coiled spring CS. As the housing parts telescope from their compact to their extended positions, an inside surface of the outside housing pushes the detent 49 in inwardly against the bias of the coil spring CS. When the detent 49 reaches the index hole 27, it pops through the hole under the urging of the spring bias. Thereafter, these detents positively lock the two housing parts in their extended position.

In order to accommodate several different lamp sizes, the housing sections may be extended outwardly to several different length positions. More particularly, FIG. 1 shows that a detent may lock the housing at the fully extended position (such as 8 feet, for example). It is possible to provide holes at two or more positions P1, P2 which may also receive the locking detent to position the housings at intermediate length stops (such as 4 or 6 feet). However, it should not be necessary to manually push the detent back into the hole to allow a further extension. This could be costly in installation time. Therefore, an alternative is to provide semi-pierced knock out plugs which preclude a locking by the detent of the housing parts. Before he starts the installation, the installer removes the detent receiving knock-out plug marked with an indication of the desired fluorescent tube length. Thus, the housing automatically stops and locks at any one of many different lamp lengths.

An alternative embodiment simply provides holes, as at P1, P2, etc. for receiving sheet metal screws or quarter-turn washer type fasteners. Here, however, the installer must align the housing parts in order to insert the screws or fasteners. Therefore, the type of indexing and latching means which are used depends to a large extent upon the convenience of the user as compared with the time required for installation and the cost factors. This is especially true with the installation method and techniques to be described in connection with FIG. 7.

The preferred embodiment is one which can not be easily re-collapsed into its compact condition after it has once been fully extended. Therefore, it is contemplated that various forms of locking tabs may also be used in conjunction with the detents 41, 42 or 49 to preclude their removal. In the case of the embodiment of FIGS. 8, 12, 13 suitable latches may also be placed inside the housing to snap over the ends of the two housing parts, as they are joined together in their extended conditions.

To help explain the criteria used to select between them, a description of some of the advantages of the positive indexing and latching arrangement used in the invention may be in order. In greater detail, the fixture housing parts should have an evenly aligned appearance when it is installed. Thus, there should not be any angular bend, warpage, or twisting between housing the parts 25, 26. The edges or crack between the housing parts should go unnoticed. A positive grip must always be maintained upon the end terminals of the fluorescent tube. Therefore, even when subjected to building variations, the spacing between the sockets 22, 23 must be accurate, and the housing parts must not creep or change in length over the lifetime of the fixture. When extended, the housing parts should be locked together positively enough so that the two housing parts will not come apart if the support is undulated or skewed, or even if the fixture is negligently hung in a non-horizontal manner. Thus, the latching mechanisms should be positive under all of these and other standard or non-standard conditions.

After the two housing parts 25, 26 are fully extended (as shown in FIG. 3), the cover plates 28, 29 (FIG. 1) are snapped on over the outside edges of the housing 20. These plates pro-

vide a pleasing appearance and close the housing to entry of foreign matter. Preferably the outside ends 51, 52 of the housing 20 is shaped to receive and support the ends of the covers 28, 29. This may be done by tabs, somewhat as shown in FIG. 12. Then, the covers are pushed up against the bottom of the housing 20 to snap into a closed position. This way both cover plates may be fitted into place by a workman who is standing near the center of the fixture.

The embodiment of FIGS. 5 and 6 is especially well suited for pendant installation in industrial plants, for example. The housing 20 (FIG. 5) is substantially the same as the housing shown and described in FIGS. 1-4. However, the cover plates 28, 29 are not snapped into place, as described for the embodiment of the FIG. 1. Instead, the two reflector sections 53, 54 are fitted over the open side of the housing 20. Again, the ends of these reflectors may be adapted to fit into clips at 51, 52 so that there is no need for a second worker to help hold the reflector.

Once the outside end of the reflector 54 is clipped in place near an end 51, it may be attached at its inner end to the center of the housing 20 by any suitable means, such as a quarter turn washer type fastener. Then, the outside end of the reflector 53 is clipped in place near an end 52. Thereafter, the inner end of the reflector 53 is attached to the center of the housing 20. Again, any suitable attachment means may be used, such as a quarter turn washer type fastener. Hence, only one workman is required to install the reflectors 53, 54 on the housing 20.

It should be noted that electrical fixtures, such as these, have a safety aspect since they are connected to and associated with electrical power and since they tend to heat considerably when in use. Accordingly, various trade and industry organizations and government agencies set standards which specify how the fixtures are to be made, the heat is to be distributed within them, the electrical grounding is to be accomplished, and the like. One result of these standards and specifications is that the reflectors (such as 53) are heavy, usually weighting in the order of 12 to 15 pounds for an 8 foot length. This means that the supporting housing 20 must have substantial strength in order to carry this and other weight without bending or giving. The mode of the attachment must preclude the possibility that the reflector could fall off and hurt someone. Another point is that the metal used to make the housing and reflector must have the same thickness throughout its entire area. Thus, the metal must be free of bends, folds, or kinks which might tend to thin the metal and thereby concentrate heat to form hot spots.

FIGS. 1-4 show an open strip fixture and FIGS. 5 and 6 show an industrial fixture, by way of example. However, the invention also finds use in connection with any other type of fluorescent lamp fixtures. For example, the inventive housing may be used with a recessed, lay-in, or a flange type of fixture. With a suitable frame and prismatic lens or diffuser, the housing 20 may become part of a surface mounted fixture. In place of a diffuser, an egg-crate louver may be provided to make a school lamp fixture. When certain end plates are added, the lamp housing 20 becomes a wall bracket fixture. Other fixtures which may incorporate the inventive housing are the so-called wrap around and the corridor types of fixture. Those who are skilled in the art will readily perceive how the inventive housing may be used on or in connection with still other types of fixtures.

The inventive method of providing for such lenses will be understood best from a study of FIGS. 15-18. In greater detail, the fixture of FIG. 15 is an end cross-sectional view of a so-called "recessed troffer." The telescoping housing parts 25, 26 are essentially the same as described above in connection with FIGS. 1-6. In addition, the skirt of the fixture is placed at 55 to form a trough for receiving a frame 56 surrounding a preferably prismatic lens 57. Each such lens is a flat sheet or plate of plastic or glass with lens patterns embossed therein. The means for holding the lens frame 56 in the trough 55 is not too important; it is here shown as an escutcheon plate 58.

Various methods may be provided for attaching the escutcheon plate 58 in the trough 55, such as spring loaded stops or clips, hinges, or the like. The escutcheon, lens, frame, etc., are also telescoping, and they may be attached to the fixture at the time of manufacture. Or, they may be added after the installation of the fixture.

According to the invention, two flat lens plates 60, 61 are placed in somewhat aligned positions, next to each other inside the channel of a somewhat springy U-shaped frame 56. The edges of this frame are designed to spring apart slightly and allow the two lenses 60, 61 to slide over each other with a small amount of friction. Thus the leading edge of one lens falls over the trailing edge of the other lens, and then the slight relaxation of the frame channel 56 prevents the lenses from sliding back over each other.

As shown in FIGS. 16-18, the ends of the lenses 60, 61 may be provided with opposing, recessed flat land areas 63, 64 which come together to give a joint thickness which is approximately equal to the thickness of each single lens, per se. To help position and orient these two prismatic lens, with respect to each other, one lens may be provided with upstanding bosses, and the other lens may have many dimples 65. Thus, when the end of lens 61 passes over the end of lens 60 and the land area at its trailing edge falls over the land area at the leading edge of lens 60, the dimples in one lens falls over the bosses on the other lens, thereby tending to lock them together. Since the combined lens have a uniform thickness throughout their entire length and since the prismatic pattern may be carried over the land areas, the overlap zone is hardly visible except for the crack at the edge of the two lens. This crack may be disguised by one or more prisms or flutes extending across the width of the lens and parallel to the crack.

To assist in extending the lenses along with the fixture the outboard edges [e.g. near 51, 52 (FIG. 2)] of the lenses 60, 61 may be attached to the housing parts 25, 26.

FIG. 7 shows how one workman may install an 8 foot fixture without requiring the assistance of a helper. In greater detail, while the fixture is still in the compact condition, shown in FIG. 2, one end is hung, as at 70, as by means of a side clamp hanger, for example. Then, the opposite end is hung in a similar manner as at 71. Next, the end 26 is extended outwardly until the detents 41, 42 or 49 snap into the holds 27.

If the fixture is not to be used with a full sized 8 foot fluorescent tube, a knock out plug may be removed, as at point P2, and the detent will stop the outward sliding at 6 feet, for example.

The extended far end of section 26 is hung in a similar manner, as by the use of a side clamp hanger. The attachment at 71 may be either a temporary or a permanent support; thus, after the far end 23 is hung, the attachment 71 may or may not be removed.

Also, the inside of the small cross-section housing part 26 may be provided with a relief area and channel so that the larger cross-section outside part 25 may be bolted in place. Then, the smaller inside part 26 may be extended to its full length and bolted into position. This way, bolts may be used to attach the fixture to the ceiling, for example.

While FIG. 7 shows that the attachment is made by means of side clamp hangers and chains 70, 71, it should be understood that other suitable modes of attachments may also be used. Any suitable clip or bracket may be provided with the packaged fixture. For example, FIGS. 9 and 10 show two forms of a stand off bracket 72, 73. In the embodiment of FIG. 9, a bracket in the form of a folded piece of sheet metal 72, having screw holes 74, is attached to a housing section at 75. The form of attachment at 75 may vary from fixture to fixture. In one embodiment, it may be spot welded, and in another it may be attached by quarter turn washer types of fasteners. In the embodiment of FIG. 10, the bracket is an end plate clipped or fastened to the housing, as at 51, for example. The upper end of the plate is bent inwardly to facilitate an attachment of the fixture to a ceiling, for example.

FIGS. 19, 20, and 23 schematically illustrate a further refinement of the invention which makes the fixture still more universal in its application and still lighter to install. Here, the outer housing parts 25 and 26 may be constructed in any manner disclosed above. However, as so constructed, they do not contain any of the electrical parts, such as sockets 22, 23, ballast 34, or wires 35. Thus, the housing is very light and may be installed quickly and easily by one man. A plate 79 (FIGS. 20 and 23) includes all of the electrical parts to be installed in housing 26.

The inside of the smaller of the housing part 26 includes a lanced or punched out opening 80 for receiving an insert tab 81 (FIGS. 20 and 23) on plate 79. If the wide end of the tab 81 is inserted into the wide end of the opening 80, the narrow end of the tab 81 is captured in the narrow end of the opening 80, when plate 79 is pushed to the right, as viewed in FIGS. 19 and 23. The edges of opening 80 and tab 81 are tapered to give a wedging action which draws the plate 79 tightly into a mechanical contact with the housing 26. Once the plate 79 is so positioned, one or more quarter-turn washer type fasteners 82, 83 are turned into mating screw holes 84, 85. This action quickly and easily secures the plate 79 to the small housing section 26.

The plate 79, in turn, includes two openings 86, 87 which are adapted to receive tabs 81a (FIG. 23) on the fluorescent ballast housings 34. These ballasts fit against the plate 79 in the positions shown by the dot-dashed rectangles 88, 89. When the ballast is in place, it may be captured by quarter-turn washer type fasteners acting in the holes 90, 91. Thus, the same pieceparts 25, 26, and 79 may accept either one or two ballasts, at 88, 89 to provide for use of either two or four fluorescent lamp tube fixtures.

At the factory, the sockets 22, 23 are electrically attached to the ballasts 34 by suitable wires 35. The ballasts are mechanically attached to the plate 79, and the sockets are mechanically attached to plates 92, 93 which clip onto the extended ends of the housings 25, 26. Preferably, all of these parts are packed at the factory in a single box and shipped to the customer as a unit.

Heat sink (or dissipation) means may be provided at the interface between the housing 26 and plate 79 if the power consumption increases to a sufficiently high level. More particularly, the dot-dashed rectangles 95, 96 in FIG. 19 indicate areas where the ballast may generate heat. Thus, the invention provides means for dissipating heat in this area. In the simplest form, this heat dissipation may be accomplished by simply punching out the areas 95, 96. Thus, the heat in plate 79 may be radiated directly into the atmosphere.

In FIG. 22, a heat sink is provided wherein the flow of heat from the ballast is positively aided. In greater detail, a first extruded aluminum (or other heat conductive material) section 97 (FIG. 22a) (outlined in heavily inked lines) is attached inside the top of cover 26. A mating extruded aluminum section 98 (outlined in lightly inked lines) is attached to the top of the plate 79. These two sections overlap in a manner which enables an efficient flow of heat from the ballast to the outside of the housing. A finned heat sink 99 may also be attached to the top of the housing 26 to further help radiate the heat. According to still another embodiment, FIG. 22(b), the areas 95, 96 are cut out to allow heat fins 100 on the top of the ballast housing 34 to project through the plate 79 and the housing 26 to the surrounding air.

Thus, to install the fixture, the housing of Fix. 19 is attached at the large end and then extended to the desired length while it is still an empty shell. Then, the plate 79, with ballast attached, is snapped into position and fastened in place by quarter-turn washer type fasteners or sheet metal screws 82, 83. Finally, the wires 35 are drawn out and the socket plates 92, 93 are clipped onto the opposite ends of the housing parts 25, 26.

According to an alternative embodiment, the plate 79 has upstanding ends 33 (FIGS. 9 and 21) which are contoured to conform to the cross-sectional shape of the housing 26 (FIG.

9). Thus, to install the plate 79, the sides of the housing 26 are slightly sprung apart, and the ballast plate 79 is slipped into position. When the sides of housing 26 are released, the elasticity of the housing material causes them to capture the end plate 33. This locks the plate 79, and the attached ballast, into position.

An important aspect of the invention relates to the method of grounding the fixture parts. Preferably, the metal is pre-coated with baked enamel. As the various housing parts are shaped and formed into their final configuration, the metal is exposed to tools such as a press brake, in a manner which does not mar the enamel surface. Therefore, there is no ground making metal-to-metal contact between the layers of housing material since the enamel forms an insulation therebetween.

Accordingly, care is taken when the holes are punched, as at 27, 80, 86, 87, and the like, to be certain that bare metal is exposed. Likewise, the detent 49 of FIG. 14 or the spring 36 (FIG. 4) is installed in housing part 26 with metal-to-metal contact. The quarter-turn washer type fasteners or sheet metal screws are designed to bite into the enamel somewhat and thereby provide good metal-to-metal contact. In some places where there can be no injury to workers, the metal-to-metal contact may be insured by simply refraining from de-burring two pieces of metal which are snapped together. In any event, care is taken to insure good metal-to-metal contact between every piecepart in the fixture. Then, when the fixture is grounded at any point all parts are also grounded.

Therefore, it should be apparent that the invention not only saves space during shipping, warehousing, and on site storage, but also provides a new and novel method of handling and installing fluorescent lighting fixtures. This method has particular value when the lighting fixtures are extremely long and are of the type normally requiring two or more workers to install.

At the on site locations, the fixture may be installed by a single worker with no special on site tool. The fixture extends to and automatically locks at any desired one of many lengths which may be selected by the removal of a simple knock out plug. When the fixtures are in the selected extended length, the housing parts are rigid, and they resist twisting. They are positively locked together so that uneven ceilings, skewed hangers, or the like, do not cause the fixtures to come apart. While in place, the fixture can not extend further to release the fluorescent lamp tubes or reflectors. A great variety of fixture sizes, shapes, and styles may be assembled from the same pieceparts. The invention provides a variety of lens, ballast, and socket options. The various parts are positively grounded to each other.

Still other advantages are realized in the factory since only one set of tools are required to make all sizes of fixtures. One set of boxes and cartons ship all fixtures. All parts slide or clip together without any welding, riveting or other expensive fabrication process. A minimum amount of metal goes into each fixture.

Since other modifications will readily occur to those who are skilled in the art, the claims are to be construed as covering all equivalents normally falling within the true scope and spirit of the invention.

I claim:

1. A non-welded fluorescent lighting fixture comprising a multipart channel-shaped housing having a generally rectangular cross section and closed on one side by cover plates, said housing being initially manufactured in a compact assembly and telescopingly extendible to any of a plurality of positions, lamp receiving means comprising at least one socket terminal on each of said housing parts, said sockets depend-

ing from said rectangular housing on the cover plate side thereof, said housing forming a wire channel extending between said sockets,

means for telescopingly extending said compact assembly to one of said plurality of positions where said sockets on each of said housing parts are axially aligned and spaced apart by the selected length of a fluorescent lamp tube, housing locking means mounted on one of said telescopingly, rectangular housing parts and snapping into a mating means on another housing part for selectively indexing and limiting the length to which said fixtures may be extended; and

means for electrically interconnecting all of said fixture parts to provide a completely grounded unit.

2. The fixture of claim 1 wherein there are two of said housing parts telescopingly extended together when said fixture is in said compact assembly condition.

3. The fixture of claim 2 wherein said locking means comprises an indexing opening in one of said telescopingly parts and a spring biased detent on the other of said telescopingly parts, said detent falling into said indexing opening to positively lock the housing parts together when said fixture is extended to the selected length of said fluorescent lamp tube.

4. The fixture of claim 3 wherein said housing parts comprise an inner housing and outer housing, a plurality of electrical components in said fixture, and means whereby all electrical components of said fixture except the sockets on said outer housing part are mounted in said inner housing part.

5. The fixture of claim 2 wherein said housing parts comprise an inner housing part and an outer housing part, and a clip-in plate for attachment to said inner housing part, a plurality of electrical components in said fixture, and means whereby all electrical components of said fixtures are mounted on said clip-in plate.

6. The fixture of claim 5 and means on said clip-in plate for anchoring said plate firmly in said inner housing.

7. The fixture of claim 5 wherein each of said housing parts has a pair of side walls, each side wall being shaped to form a track section to facilitate a telescopingly of said housing parts, and means on said clip-in plate for snapping said plate into said track section thereby locking it into said housing.

8. The fixture of claim 5 and heat sink means mounted on said clip-in plate for dissipating heat from said components mounted on said plates and into the air surrounding said fixture.

9. The fixture of claim 1 wherein said housing has more than two of said parts nested together when in a compact condition with each of said parts overlapping substantially all of the other parts before said fixture is drawn out to said extended condition.

10. The fixture of claim 1 and a plurality of knockout plugs on at least one of said housing parts for selectively indexing the length to which said housing parts may be extended.

11. The fixtures of claim 1 and multi-part telescopingly lens means attached to said housing parts for diffusing light from said fluorescent lamp.

12. The fixture of claim 11 and indexing means associated with each of said lens parts for positioning said lens in an extended position after said lens is extended.

13. The fixture of claim 11 and trough means connected to said fixture for receiving and supporting said extended lens.

14. The fixture of claim 13 and means for selectively clipping a selected number of ballasts into said housing parts.

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