United States Patent

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[54] **RESILIENT LIGHTING FIXTURE HANGER**
5 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **240/90,** 240/71, 240/67, 240/149, 240/85
[51] **Int. Cl.** **F21v 15/04**
[50] **Field of Search** 240/90, 67, 71, 149

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ABSTRACT: A lighting fixture hanger for isolating a lighting fixture depending therefrom from vibration, the hanger including a cushion displaying variable rate spring characteristics. In a preferred embodiment, the hanger incorporates a conical spring which can easily and quickly be captivatively assembled into a subassembly forming the essential functional portions of the hanger.

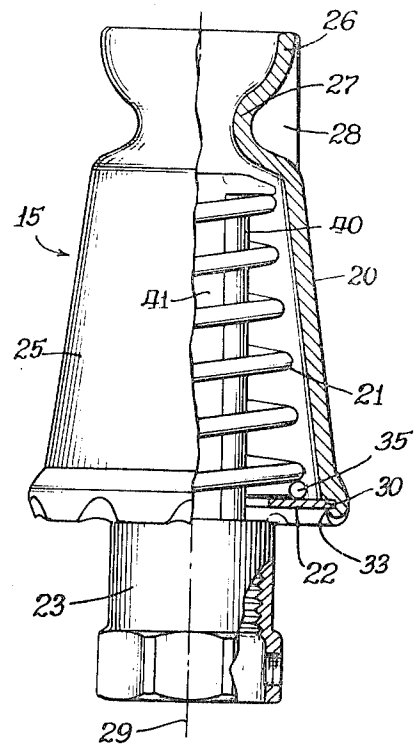


Fig. 1.

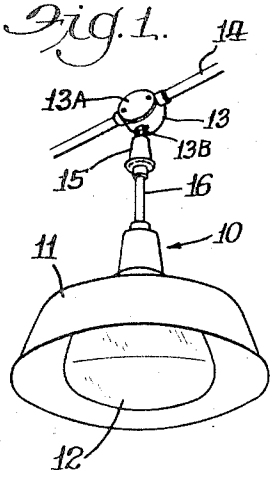


Fig. 2.

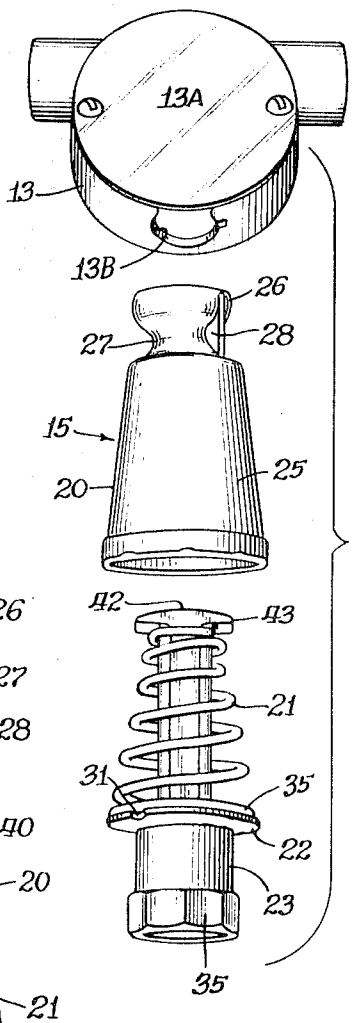


Fig. 4.

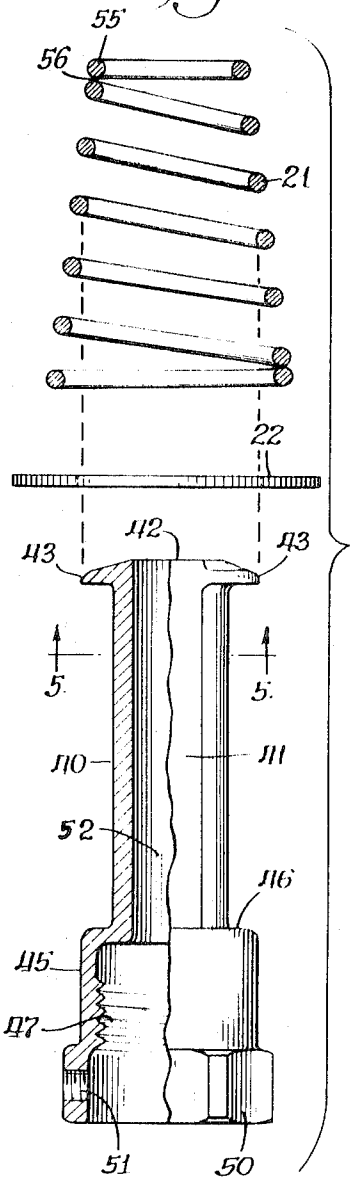
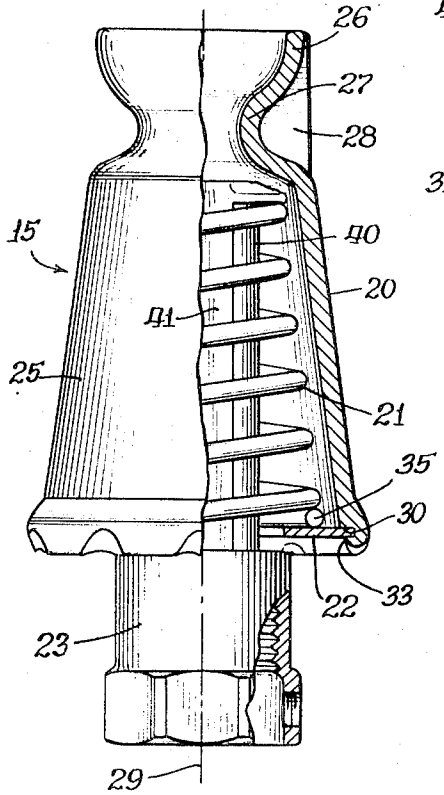


Fig. 3.



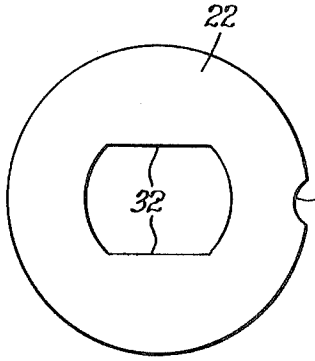


Fig. 6.

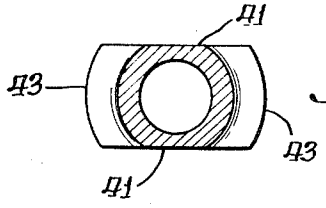


Fig. 5.

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RESILIENT LIGHTING FIXTURE HANGER

BACKGROUND OF THE INVENTION

It is generally well known that light bulbs and lamps which are subjected to vibration experience a shorter life than those which are not so subjected. Thus, where lights are mounted in locations where there is a continuous vibration, such as in a factory containing heavy equipment which moves about or vibrates, the light fixtures are frequently mounted with a shock-absorbing cushion interposed between the fixture and the ceiling or other like support. This is to prevent the vibration which is transmitted from the machines to the structure from being transmitted from the structure to the fixture. Fixture hangers also usually incorporate some form of swivel mechanism to permit the fixture to hang vertically and assist the vibration isolation afforded by the cushion. By installing such a device in a vibrating environment, bulb or lamp life is increased beyond what it would be without the device. As a result, maintenance and material costs are conserved over a long period of operation.

With the large variation in the size of lighting fixtures, manufacturers of fixture hangers who wish to have a hanger available for every available fixture must produce and have available a wide variety of sizes.

For example, Appleton Electric Company of Chicago formerly produced four hangers of different capacity to handle different size fixtures; one being rated for use with fixtures weighing between 3 and 6 pounds, another for use with fixtures weighing between 6 and 12 pounds, a third for use with fixtures ranging from 12 to 24 pounds, and the heaviest being suitable for use with fixtures ranging from 24 to 48 pounds. Each of these basic units was produced in a variety of options to provide for the specific size of conduit interposed between the hanger and the light fixture, and also to provide for the particular type of outlet box to which it was attached. Thus, with only four basic weight ranges, which means four basic units, the various modifications called for by purchasers might generate 20 to 40 different models which must be carried in stock and listed separately in the manufacturer's catalog.

SUMMARY OF THE INVENTION

In its preferred form, the invention is made up of four basic elements. These elements consist of a housing which is swivelly connected to an electric outlet box, a central stem piece to which the fixture is attached by means of a length of conduit, vibration isolation means in the form of a conical spring, having a nonlinear spring rate, and a washer. These four elements not only create a particularly simple construction, but as will be described in greater detail hereinbelow, the spring permits a fewer number of basic units or weight ranges to cover the same total weight range of available fixtures. The net result is that there is a drastic reduction in the total number of fixture hanger variations which must be cataloged and inventoried.

In assembling the hanger, the stem, spring and washer are designed to form a primary subassembly which screws together simply but which is quite difficult to disassemble. The shape of the conical spring facilitates this assembly, and thereby this particular spring shape serves at least a dual purpose.

DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a light fixture depending from a fixture hanger which includes the principles of the present invention.

FIG. 2 is a perspective view of the fixture hanger with its various components axially separated, this view also including a standard electrical outlet box to which the hanger can be mounted.

FIG. 3 is a side elevation, partially in cross section, of the fixture hanger assembly shown in FIG. 1 and 2.

FIG. 4 is a side view, partially in cross section, of the several components which form the major subassembly in an axially displaced and exploded configuration showing their relative positions just prior to assembly.

FIG. 5 is a cross-sectional view of the upper internal end of the stem piece taken substantially along the lines 5—5 of FIG. 4.

FIG. 6 is a plan view of the washer.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and initially with particular reference to FIG. 1, there is shown a light fixture 10 including a combination shade and reflector portion 11 and a globe portion 12 which surrounds a bulb (not shown). The light receives current from an outlet box 13 which is connected into the rigid conduit system 14, this conduit being rigidly affixed to some solid structure such as a ceiling. Outlet box 13 is provided with a cover plate 13A and a yoke type of socket mounting 13B (see also FIG. 2).

Between the outlet box 13 and the fixture 10 is a hanger assembly 15 and a length of conduit 16. Conduit 16 is of some desirable length such that the fixture 10 will be situated a convenient or proper distance from the floor. Hanger assembly 15 is interposed between electrical box 12 and conduit 16 and forms a vibration-isolating mounting in series therewith for the purpose of isolating shock and vibration in the electrical box 13 from the fixture 10. As was mentioned earlier, bulb life generally diminishes with increasing vibration, and it is thus desirable to so isolate bulbs where the structure carrying the lighting fixtures is subjected to vibration and shock.

Fixture hanger 15 consists of four major components; a housing 20, a variable rate cushion in the form of conical spring 21, a modified washer or closure plate 22, and a central stem 23.

Housing 20 has a lower, frustoconical portion 25 opening and diverging downwardly so as to resemble a bell, and it has an upper, hemispherical portion 26 opening and diverging upwardly. These two portions are hollow and these hollows communicate with one another at a reduced-diameter neck portion 27 so that wires can be threaded therethrough. With the exception of an antirotational tang or web 28 formed therewith, the housing has an axis of symmetry 29 such that cross- sectional planes cut perpendicular thereto would display an annular ring of material. Hemispherical portion 26 has a smoothly contoured lower surface similar to a portion of the ball in a ball and socket joint to provide a bearing surface for a swivel mounting. In mounting a fixture hanger assembly, this upper portion 26 is removably entrapped within an outlet box, generally as seen in FIG. 1. The inner, lower end of the bell-shaped lower portion 25 has a shoulder 30 cut or cast therein to provide a flat surface for receiving the modified washer 22.

With the exception of a notch 31 in its outer peripheral edge and a pair of identical and parallel flats 32 defining a part of its central hole, washer 22 is of generally standard shape. Notch 31 fits within a single tab or projection (not shown) provided therefor on the shoulder 30 of the housing 15. When properly oriented angularly, the notch 31 slips over the projection so that the washer 22 can fully and flushly engage the shoulder 30, and in this position the washer is restrained against rotational movement relative to the housing 15. Also in this position the washer is restrained against axial movement relative to the housing by a staking operation which deformably drives material under the lower surface of the washer as at 33.

Contained entirely within the lower portion 25 of the housing is a vibration isolation device in the form of a variable rate cushion. More specifically, this variable rate cushion takes the form of a conical spring having a lower and preferably ground end 35 resting on washer 22.

Having a relatively large diameter lower end 35, the spring 21 maintains a solid footing on the washer 22, and the inward taper to the upper end not only inherently provides a variable spring rate, but also permits the use of a smaller flange on the stem piece 23 as well as a particularly simple method of assembly, to be described in greater detail below.

Referring now to stem piece 23, this piece includes a central shaft portion 40 having a pair of parallel flats 41 on opposite sides thereof which are spaced slightly closer together than the parallel flats 32 defining the central hole in the washer 22. Thus, when the upper end of stem piece 23 is inserted through washer 22, there can only be a slight degree of relative rotation therebetween. The upper end 42 of the stem piece has a pair of diametrically opposed ears 43 projecting laterally outwardly therefrom. When viewed in cross section (see FIG. 5), the shape of this end of the stem piece can be seen to be substantially identical to the shape of the hole in washer 22, however, its size in cross section is slightly smaller so that the eared end of the stem piece can be inserted through the washer. Also, as can be seen by the dashed line in FIG. 4, the distance between the lateral extremities of the two ears is considerably less than the inner diameter of the lowermost coil of spring 21. In fact, this dimension on the stem piece is roughly comparable to the inner diameter of perhaps the middle coil of the spring 21.

The lowermost end of the stem piece is designed to receive a piece of conduit having external threads at its upper end. To this end, this lowermost end has an enlarged-diameter portion 45 which thereby forms a shoulder 46 which can serve as a seat for the washer 22. This enlarged portion 45 has connection means in the form of internal thread 47, and this thread is sized to receive a standard ¾inch pipe thread. Immediately below portion 45 is a further enlarged portion 50 having a plurality of parallel flats arranged around its external periphery similar to a nut. Extending transversely through portion 50 is a threaded hole 51 for receiving a setscrew (not shown), and extending entirely through the stem piece longitudinally is a passageway 52.

Thus, when it is desired to snugly secure a piece of conduit or conduit plus attached fixture to the lower end of the stem piece, the outer surface of lower portion 50 can be grasped with an ordinary wrench while the conduit is screwed up into threads 47. The setscrew can then be driven into the conduit to prevent it from turning. In the event ½-inch conduit is used rather than the ¾-inch conduit, a ¾ to ½-inch reducer is supplied with the hanger.

In assembling the fixture hanger, washer 22 is dropped over the upper or eared end 42 of the stem piece 23. The larger end of spring 21 is then similarly slipped thereover, but the projecting ears 43 on the stem piece only permit the spring to slip about half way thereover before interference results. However, by grasping pieces 21 and 23 and rotating them relative to one another in the proper direction, the ears 42 screw themselves up along the coils of diminishing diameter. Although the upper end 55 of the wire forming the spring is snugly nestled against the second coil as at 56, the ears 43 can reasonably effortlessly be snapped past this contact point 56 whereupon the spring 21 is totally entrapped between the ears 42 and the washer 22 which rests on shoulder 46. Although there is no reason for so doing, it will be appreciated that it would be considerably more difficult to remove the spring from the stem piece because the upper two coils would have to be separated by some external means before the ears 42 could be slipped therebetween and reversibly rotated to disassemble the parts.

With the spring 21, washer 22, and stem piece 23 now forming an interlocking subassembly, this subassembly is inserted up into the lower bell-shaped end portion 25 of the housing such that the washer 22 seats flushly against the shoulder 30 therein. As will be recalled, this can only occur when the notch 31 in the washer 22 bridges the projection (not shown) cast integrally with and onto the shoulder 30. When in this position, the lowermost end portions of the housing are stacked over the washer at eight equally spaced locations around its periphery to lock the washer in place. Upon attaching the setscrew and ¾ to ½-inch reducer, the hanger is ready for shipment.

In installing the hanger into an outlet box such as that shown at 13, the cover plate 13A is removed from the outlet box to expose a side entrance to the socket 13B which matingly received the hemispherical ball end 26 of the housing 20. After inserting this end 26 into the electrical box with reduced-diameter neck 27 situated in yoke opening 13B, the cover plate 13A is replaced and secured. While this ball and socket mounting permits a swivel action of the hanger assembly, the web or protrusion 27 permits only a few degrees of relative rotation. Thus, since the outlet box is rigid, the housing 20 is not free to rotate appreciably around its axis of symmetry 29. Similarly, washer 22 is keyed to housing 20 by means of the interlocking projection and slot 31, and stem piece 23 is keyed to washer 22 by means of the proximity of flats 41 on the stem piece and flats 32 on the washer. As will be appreciated, the stem piece can rotate only a very few degrees after the hanger is installed in the electrical box. As a result, there cannot be sufficient rotation of the fixture or hanger to cause the electrical wires to twist or to unattractively orient the fixture.

In mounting the electrical fixture, either the length of conduit 16 or the conduit with the fixture attached is screwed into the threads 47 with the wiring extending through the central hold 52 of the stem piece 23 and then through the hollow housing 15. They then exit within the electrical outlet box 13 where they are properly attached into the power lines.

As will be appreciated, this mounting permits the fixture to swivel freely from side to side as well as deflect vertically. The shape of the spring not only gives it a firm base of support, but it also inherently achieves a simple assembly. These two advantages are intertwined with perhaps the most significant advantage, and that advantage is that achieved by the use of a variable spring rate cushion. This variable rate permits a wider weight range of fixtures to be hung from each hanger. In the configuration described, the hangers are less expensive than earlier models and two basic units are sufficient to replace the four formerly required. For example, and because of the inherent characteristics of a variable rate spring, the lower capacity hanger of the two replacing units has been designed for and is capable of performing a satisfactory job in mounting fixtures ranging from 3 to 12 pounds, while the larger hanger satisfactorily carries hangers ranging from 12 to 48 pounds. A third hanger has been introduced which is capable of carrying loads from 48 to 120 pounds. Thus, it can be seen that the same weight range of fixtures can be handled by half as many basic units.

Although this description has set forth specific weight ranges in its designs, these are not intended to be limiting. And, while the invention is shown in the drawings to assist in an understanding of one preferred embodiment of the invention, this is not to defeat that purpose of a patent which is to protectively cover the inventive concepts contained therein. The appended claims are the chief aid toward this purpose as it is these that point out the scope of the invention.

I claim:

1. An improved vibration-isolating mounting for a lighting fixture, comprising: a generally hollow support including a housing and having a bottom surface with a hole therethrough, a compression spring carried vertically in said housing and having a lower coil resting on said bottom surface and an upper coil thereabove, a single-piece stem member in said housing having an integrally formed protrusion above and of a larger transverse dimension than the diameter of said upper coil and extending over a portion thereof for bearing downwardly thereon, said stem having central portions depending from said upper end generally axially thereof and through the hole in the bottom surface of the supporting housing to a lower end below said hole, said lower end of the stem having attachment means thereon for connection to a lighting fixture assembly, said protrusion on the stem including at least one laterally outwardly extending ear means jutting outwardly in a generally singular lateral direction away from said stem for effecting captivating assembly of the spring on the stem member by screwing one onto the other.

2. The mounting as set forth in claim 1, wherein one end of said compression spring has a smaller inner diameter than the other end, and wherein said smaller inner diameter is less than said transverse dimension of the stem member, and said other end has a larger inner diameter than said transverse dimension of the stem member to facilitate the rapid captivating assembly of the spring onto the stem piece.

3. For use in hanging electrical fixtures or the like, improved vibration isolation means, comprising: a generally hollow and bell-shaped housing with a passageway extending axially therethrough and having swivel means generally at the top thereof for providing a universal connection to the mating portions of an electrical outlet box and for causing said housing to depend generally vertically therefrom, said housing opening downwardly at the bottom portions; a closure plate fixedly secured to the bottom portions of said housing, said plate having an opening therein; an axially aligned compression spring of varying diameter and having a variable spring rate carried within said housing, said spring having a relatively large diameter lowermost portion bearing downward against said plate around said opening; and an elongate stem piece extending axially through said conical spring and having an upper end with a pair of diametrically opposed and laterally outwardly extending lugs having an overall lateral dimension between the maximum and minimum diameters of said spring and greater than the diameter of the coil immediately therebelow for resting thereon, said stem piece having a thinner intermediate portion extending through said closure plate opening, said stem piece having a lower end of larger transverse dimensions than portions of said closure plate opening, and said stem piece also having a lowermost portion below said plate including means for attaching a light fixture thereto.

4. The vibration isolation means as set forth in claim 3, including means on said stem piece and closure plate for preventing relative rotation between said lowermost portions of the stem piece and the housing.

5. The vibration isolation means as set forth in claim 3, wherein said closure plate, spring, and stem piece form a subassembly, and wherein the hole in said closure plate is large enough to admit the upper end of said stem piece therethrough.