Nov. 1, 1955 C. H. HODGKINS 2,722,666

ELECTRICAL RECEPTACLE

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Fig. 2.

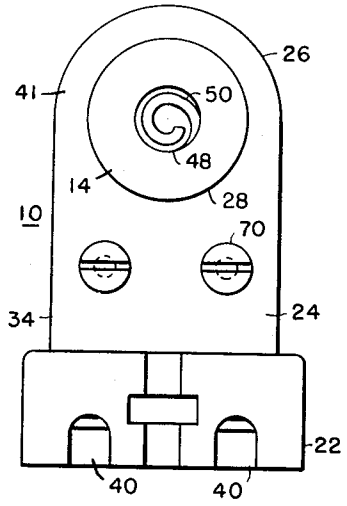


Fig. 1.

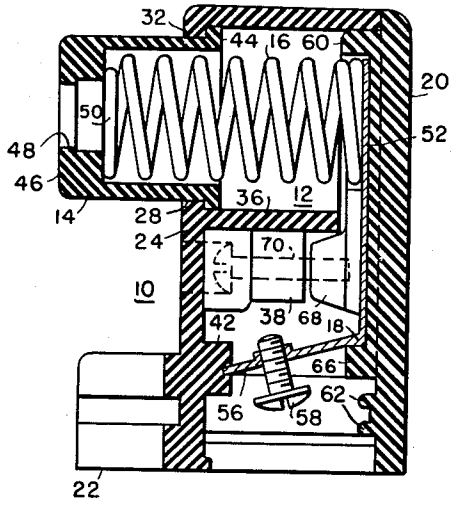
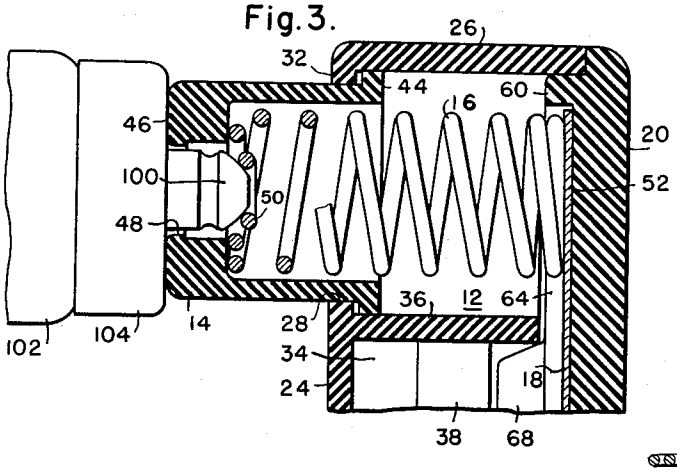


Fig. 3.



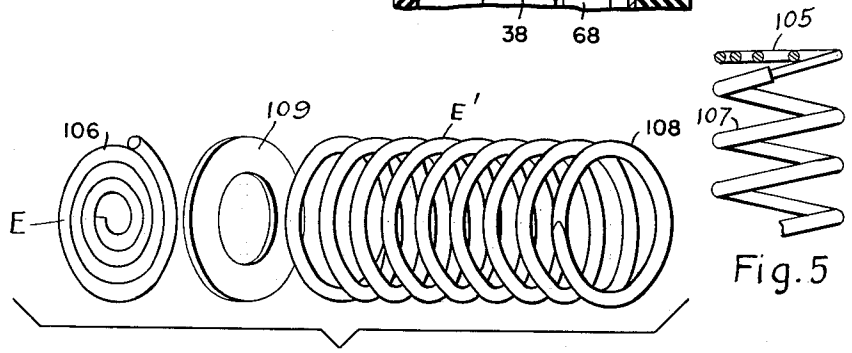


Fig. 5

Fig. 4.

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ELECTRICAL RECEPTACLE

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3 Claims. (Cl. 339—55)

My invention relates, generally, to electrical receptacles and, more particularly, to a lamp holder for use with tubular discharge devices, such as fluorescent lamps which operate at relatively high voltages.

Heretofore electrical receptacles for tubular discharge devices have not been entirely satisfactory in that their construction has not obtained maximum rigidity in holding such devices, nor has their construction permitted such devices to rest securely against the receptacle. One difficulty which has been encountered is that the entire force for holding the discharge device in place has been exerted on its contact pin, and due to the magnitude of such forces, damage has often resulted to the contact pin of the discharge device when it is inserted. I provide an electrical receptacle where by its construction the objectionable instability of lamp and holder spacing is overcome and which does not damage the contact members of the discharge devices when inserted.

Accordingly, one object of my invention, generally stated, is to provide improved electrical receptacles for use with tubular discharge devices.

A more specific object of my invention is to provide an improved electrical receptacle which shall utilize a minimum number of component parts.

Another object of my invention is to provide an electrical receptacle in which electrical contact is established with no gap between the discharge device and the receptacle.

A further object of my invention is to provide an electrical receptacle having freely moving parts.

Another object of my invention is to provide an electrical receptacle having simplified and economical component parts.

Another object of this invention is to provide a lamp holder of the type which has a spring-biased retractable part to hold the lamp in place, with means for providing a minimum adequate contact pressure on the contact pin of the lamp and also providing a greater pressure on the lamp base to hold the lamp in place.

Another object of this invention is to provide a lamp holder of the type having a spring-biased retractable part engageable by one end of the lamp with means for exerting full spring pressure on the base of the lamp and a limited pressure on the contact pin of the lamp.

Still another object of this invention is to provide a lamp holder of the type having a spring-biased retractable part engageable by one end of the lamp with means for providing an adequate contact pressure on the contact pin of the lamp and limiting said pressure to a value less than that required to hold the lamp in place.

These and other objects of my invention will become more apparent upon consideration of the following detailed description of a preferred embodiment thereof, when taken in connection with the attached drawing, wherein:

Figure 1 is a side elevational view in section of an electrical receptacle in the form of a lamp holder embodying the principal features of my invention;

Fig. 2 is a front elevational view of the lamp holder of Fig. 1;

Fig. 3 is an enlarged side elevational view in section of the top portion of the electrical receptacle shown in Figs. 1 and 2 with one end portion of a discharge device shown in elevation and in engagement with the receptacle;

Fig. 4 is a perspective view of a modified spring construction for use in the receptacle shown in Figs. 1 to 3 and

Fig. 5 is an elevational view of a modified spring construction for use in the receptacle shown in Figs. 1 to 3.

The purpose of this particular type of lamp holder is to support and conduct current to one end of a fluorescent or other electrical discharge lamp **102** the other end of which is rigidly supported by a lamp holder of different construction and which does not form a part of this invention.

Referring to the drawing, the lamp holder shown as a preferred embodiment of my invention comprises, generally, a hollow insulating housing member **10** having an open back; a contact assembly **12** comprising a cup-shaped plunger **14**, a spring **16** and a contact strip **18**; and an insulating back cover plate **20** for the housing member **10**.

The housing member **10** is formed of an insulating material such as a molded insulating material having a hollow approximately U-shaped base **22** and a hollow approximately U-shaped upright portion **24** which terminates in a curved top portion **26**. A circular opening **28** is provided in the upright portion **24** of the housing member **10** adjacent to and substantially concentric with the curved top portion **26**. Opening **28** is located in the front face **41** of the upright portion **24** of the housing member **10** to receive a cup-shaped plunger **14**. In order to provide a restraining ring **32** to limit the outward travel of the plunger **14**, the diameter of the circular opening **28** is slightly smaller than the distance between the two side wall members **34** of the upright portion **24** of the housing member **10**. There is provided a curved integral rib **36** extending between the side walls **34** which, together with the inner surface of the curved top portion **26**, supports the plunger **14** during its travel. There is also provided on the inner face of the front wall **41** of the housing member **10**, integral bosses **38** below the curved rib **36** and adjacent to each side wall **34** to receive a fastening means which may also engage the removable back cover plate **20**. A slotted boss **42** is also integral with the inner surface of the front wall **41** of the housing member **10** and is located midway between the side walls **34** below the bosses **38** to support the lower end of the contact strip **18**. Access for electrical conductors to the terminals is provided by the grooves **40** in the base **22**.

The cup-shaped plunger **14** is also formed of an insulating material, such as a molded insulating material and is positioned so that it normally extends outwardly from the housing member **10**. Plunger **14** is biased outwardly at all times by means of the helical portion of spring **16** and its outward travel is limited by the engagement of the external circular flange **44** on the inner end of the plunger **14** with the restraining ring **32**. When any force sufficient to overcome the spring bias is exerted upon the front face **46** of the plunger **14**, the plunger **14** will move into the housing member **10** and spring **16** will be compressed. It will be noted that during such inward movement, the inner end of the plunger **14** is supported at all times by the engagement of the circular flange **44** with the upper surface of the integral curved rib **36** and the inner surface of the curved top wall **26** of the housing member **10**, while an outer part of the plunger **14** is supported by engagement of the outer surface of the plunger **14** with the inner edge

of the restraining ring 32. In order to permit electrical contact to be made within the housing member 10 with the spring 16, a circular opening 48 is provided in the front face 46 of the plunger 14. Inasmuch as the spring biasing force of the helical coils of spring 16 must be overcome before plunger 14 will start to retract, and such force increases as the spring is compressed, any discharge device which is placed in contact with the front face 46 of the plunger 14, such as the lamp holder base 104 of the lamp 102 (shown in Fig. 3), will be held securely at all times.

As has been pointed out, an important feature of this invention resides in the special form of spring 16 and its specific cooperation with parts of the housing member 10. In the form of the invention illustrated in Figs. 1 to 3, this spring 16 is of helical form and terminates at one end in a flat spiral spring portion 50. This flat spiral spring portion 50 is positioned directly behind the front wall 46 of the plunger, with the inner turn thereof behind circular opening 48 in the plunger 14, and it will be noted that when the contact member of an electrical discharge device such as the contact pin 100 of the lamp 102 (Fig. 3) is inserted into the circular opening 48, the electrical contact between the pin 100 and the spring 16 is established to the innermost coil of the spiral spring portion 50. Inasmuch as the spring bias of the flat spiral spring portion 50 must be overcome before the pin 100 can further enter the plunger 14, positive electrical contact will be maintained at all times. The travel or deflection of the flat spiral spring portion 50 is limited by the engagement of the base portion 104 of the lamp 102 with the front face 46 of the plunger 14. All further travel of the plunger 14 results solely in deflection of the helical coils of the spring 16, and all such force travels through the base portion 104 of the lamp 102. Thus, contact pin 100 is never subject to a greater force than the force required to deflect the flat spiral spring portion 50 through its limited travel. By this particular construction of spring 16, damage to contact pin 100 from excessive pressure is prevented.

As shown in Fig. 3, after the contact pin 100 is inserted into the circular opening 48 in the plunger 14 and pressure is exerted against the center of the flat spiral spring portion 50, this portion of the spring will be deflected relative to the helical part of spring 16 so that at least the center turn of the flat spiral spring portion 50 is moved inwardly relative to the outer end turn of the helical spring 16, causing the flat spiral spring portion to assume an inwardly dished form. By this coaction of the two parts of the spring 16, the plunger 14 is engaged by and held outward at all times by the helical portion of spring 16. Such an arrangement permits the plunger 14 to be securely positioned in engagement with the base 104 of the discharge device 102 at all times, and eliminates rocking of the plunger 14 which may occur when the coils of the helical spring are deflected inwardly out of engagement with the plunger 14. At the same time adequate contact pressure of the pin 100 and spring is obtained due to the deflection of the flat spiral portion 50 thereof, but this contact pressure is limited by the deflection of the spiral portion 50, so that the contact pin 100 will not be overstressed.

The contact strip 18 is formed of an electrical conducting metal, such as copper or brass, and is approximately L-shaped. In order to obtain electrical contact between the contact strip 18 and the spring 16, the upright portion 52 of the contact strip 18 is positioned behind, and contacts the inner end of the spring 16. The lower portion 56 of the contact strip 18 engages and is supported by the slotted boss 42, and is preferably wider than the upright portion 52 so that a contact screw 58 to which an electrical supply line may be connected is threaded into the lower portion 56.

This entire assembly is maintained in position and enclosed to prevent accidental contact, by means of the back cover plate 20 which is formed of an insulating material, such as a molded insulating material. In order to position the back cover plate 20 with respect to the housing member 10, an integral plateau 60, which has the same outside contour as the inner contour of the housing member 10, is provided on the inner surface of the back cover plate 20 to engage the inner surface of the housing member. As the plateau 60 is offset from the outer edge of the back cover plate 20 a distance preferably equal to the thickness of the side walls 34 of the housing member 10, and as the outer edges of all exposed parts are rounded, the lamp holder has a smooth, unitary outer appearance.

Integral ribs 62 extending between the side members of the base 22 of the housing member 10 are provided upon the inner surface of the back cover plate 20 to position the lower portion of the back cover plate 20 relative to the housing 10 and to provide greater creepage distance to ground. The inner surface of the back cover plate 20 is preferably formed with an approximately keyhole shaped slot 64 in the middle of the plateau 60. The lower portion of this slot 64 is sufficiently wide to receive the lower portion of the upright portion 52 of the contact strip 18 and prevents the contact strip 18 from moving sideways. The upper portion of the upright portion 52 of the contact strip 18 extends into the upper area of the keyhole slot 64. This upper portion of the keyhole slot 64 is circular in form to receive and support the inner end of the helical spring 16. It is to be noted that the bottom of the keyhole slot 64 is preferably above the plane of the inner surface of the back cover plate 20 so that when the back cover plate 20 is secured to the housing member 10 the length of the helical spring may be kept to a minimum with the spring held slightly compressed. By this means, positive electrical contact between the helical spring 16 and the contact strip 18 is maintained at all times. To further ensure that such positive electrical contact is maintained, an integral boss 66 is provided immediately below the keyhole slot 64 on the inner surface of the back cover plate 20 to support the contact strip 18 and prevent the contact strip 18 from slipping downward. As shown in this particular modification of my invention, internally threaded bosses 68 are provided upon the inner surface of the back cover plate 20, which are positioned opposite the integral bosses 38 of the housing member 10 so that fastening means, such as machine screws 70, may be used to secure the entire assembly together.

It may readily be observed that the electrical circuit through the lamp holder is from the supply line secured by terminal screw 58, through the contact strip 18, from the contact strip 18 through the spring 16, and from this spring to the contact pin 100 of an electrical discharge device.

Although this spring 16, as herein described, has performed satisfactorily in actual use, a separate spiral spring 106 and a separate helical spring 108 may, if desired, be provided as shown in Fig. 4, in place of the single spring 16. This form of the invention provides for a greater range of pressures on the contact pin 100, while maintaining adequate pressure on the lamp base. This range is obtainable by utilizing, as shown in Fig. 5, a spiral spring 105 having a smaller wire diameter than the wire diameter of the helical spring 107, so that the two springs have a different modulus of elasticity. In Fig. 4 the wire in spiral spring 106 although shown as substantially of the same diameter as the wire of spring 108, has a different modulus of elasticity or resiliency E from the modulus of elasticity or resiliency E′ of the helical spring 108. It will be noted that when two separate springs are used in place of spring 16 that only the contact pin 100 of the electrical discharge device 102 will cause the spiral spring 106 to deflect, and only the base 104 of the lamp 102 will cause the helical spring 108 to deflect. Inasmuch as only the

contact pin **100** will cause the spiral spring **106** to deflect and various spiral springs may be selected to precisely determine the spring pressure on the contact pin **100**, damage to the contact pin due to excessive pressure may be prevented. In a similar manner, the physical components of the helical spring **108** may be selected to determine the pressure which will be exerted upon the base **104** of the lamp **102**.

In assembling springs **106** and **108** in the lamp holder, the spiral spring **106** is placed against the inner face of the plunger **14**, and it has a maximum coil diameter approximately equal to the inner diameter of the plunger **14**. The helical spring **108** also has an outside coil diameter approximately equal to the inner diameter of the plunger **14** and is positioned directly over the spiral spring **106** in order to establish both electrical contact with and to securely hold the spiral spring **106** in position. As the outer turn of the helical spring **108** biases the outer coil of the spiral spring **106** against the inner face of the plunger **14**, the said outer coil of the spiral spring **106** is inactive when the plunger **14** is moved inwardly into the housing member **10** and functions only to transfer the force exerted upon the front face **46** of the plunger **14** to the helical spring **16**. Also, the outer coil of the spiral spring **106** being inactive, it may be considered as fixed with regard to deflection of the flat spiral spring **106** providing the flat spiral spring **106** does not require a deflection force equal to or greater than the force required to deflect the helical spring **108**. Inasmuch as the deflection of the flat spiral spring **50** is limited by the distance through which the contact pin **100** may enter plunger **14**, a suitable flat spiral spring **106** may be selected to prevent any transferal of force exerted by the contact pin **100** to spring **108** which would cause appreciable deflection of the helical spring **108**. If desired, a flat washer **109**, shown in Fig. 4, having a center opening diameter slightly smaller than its outside diameter may be placed between the two springs **106** and **108** to provide a larger bearing surface. Or if desired, as shown in Fig. 5, the two separate springs **105** and **107** may be permanently secured together in any suitable manner such as brazing. In all other respects, the other elements of the lamp holder function as herein described.

In view of the foregoing description of preferred embodiments of my invention, it will be apparent that I have provided an electrical receptacle of extremely simple construction which may be readily assembled and disassembled, and which functions to provide the necessary degree of personal safety. It should be noted that by this construction there is a minimum of parts and that such parts are simple in design and do not require any retaining rings, lugs, or depressions. It will also be noted that all moving parts are securely supported at all times and that the lamp holder is structurally sound.

It is, therefore, to be understood that various structural changes and modifications may be made in the particular examples of my invention, shown and described, without departing from the spirit of the invention.

Accordingly, this invention should not be limited to the specific form thereof described above, but is of broader scope limited only as required by the prior art.

I claim as my invention:

1. An electrical receptacle comprising a hollow housing having an opening through one wall thereof, a cup-shaped hollow plunger having its open end retractable into said housing through said opening and having a relatively small contact receiving opening extending through its outer end, spring means located within said housing and said plunger for normally biasing said plunger outward from said housing, means on said plunger engageable with said housing for limiting the outward movement of said plunger, one end of said spring means being wound in a plurality of spiral turns which are normally in a stress-free state and located, except for at least one innermost turn, in contact with and free from the inner surface of the outer end wall of said plunger, and at least said one turn of said spiral end extending across the inner end of said contact receiving opening so that said one turn of its spiral form is engageable by a contact inserted through said contact receiving opening.

2. An electrical receptacle comprising a hollow housing having an opening through one wall thereof, a cup-shaped hollow plunger having its open end retractable into said housing through said opening and having an outer end with a flat inner surface with a relatively small contact receiving opening extending therethrough, spring means located within said housing and said plunger for normally biasing said plunger outward from said housing, means on said plunger engageable with said housing for limiting the outward movement of said plunger, one end of said spring means being wound in a plurality of flat spiral turns which are normally in a stress-free state and located, except for at least one innermost turn, in contact with and free from said flat inner surface of the outer end wall of said plunger, and at least said one turn of said spiral end extending across the inner end of said contact receiving opening so that said one turn of its spiral form is engageable by a contact inserted through said contact receiving opening.

3. An electrical receptacle comprising a hollow housing having an opening through one wall thereof, a cup-shaped hollow plunger having its open end retractable into said housing through said opening and having a relatively small contact receiving opening extending through its outer end, helical spring means located within said housing and said plunger for normally biasing said plunger outward from said housing, means on said plunger engageable with said housing for limiting the outward movement of said plunger, spiral spring means having a plurality of turns which are normally in a stress-free state and located, except for at least one innermost turn, in contact with and free from the inner surface of the outer end wall of said plunger, said helical spring means being formed to so support said spiral spring means, and said spiral spring means extending across the inner end of said contact receiving opening so that at least said one turn of its spiral form is engageable by a contact inserted through said contact receiving opening.

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