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SAFETY RELEASE ELECTRICAL PLUG

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Fig. 1.

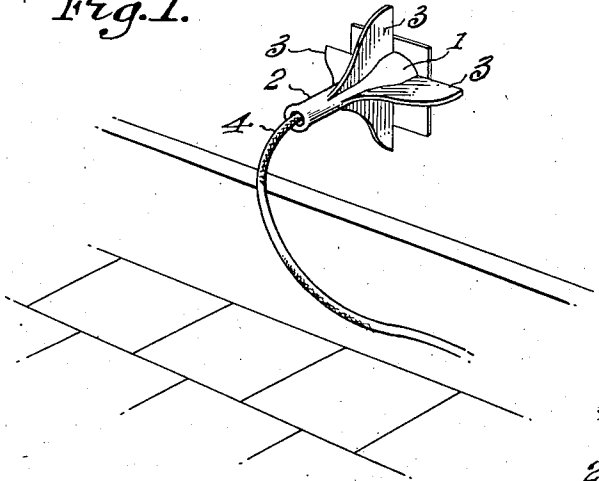


Fig. 2.

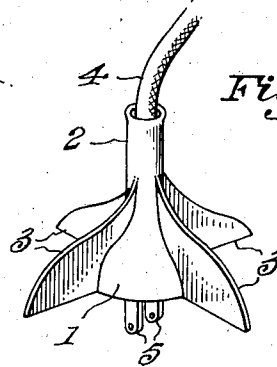


Fig. 4.

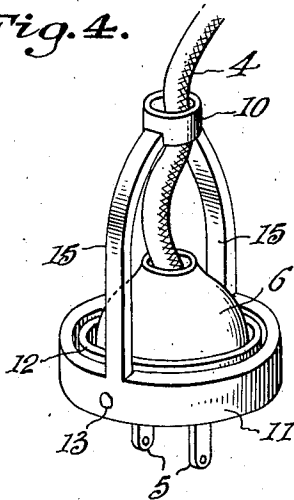


Fig. 3.

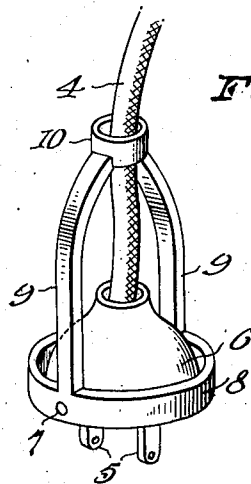
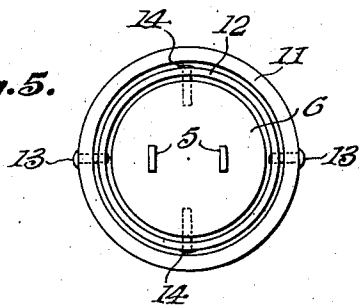


Fig. 5.



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SAFETY RELEASE ELECTRICAL PLUG

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2 Claims. (Cl. 339-45)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

The present invention relates to male electrical connecting plugs and more particularly to a means for removing such plugs from their receptacles through the cooperative action of the plug structure and the electrical service cord whereby moderate tension applied through the electrical service cord to the plug from any direction will lift the plug contacts out of firm engagement with the receptacle contacts and permit rotation of the plug out of the openings of the receptacle.

This invention satisfies a long existing but unfulfilled need for plugs on portable electrical equipment, such as floor cleaners, polishers, sanders, wherein personnel operating such equipment are frequently required to walk from the machine to the receptacle to disconnect the cord and then back to the machine, a distance which may be as much as fifty to one hundred feet. Such action is costly regardless of the type employee operating the machine. If the operator takes the time to walk back to disconnect the cord, time and effort are wasted and less work is accomplished. If the operator pulls on the cord to disconnect it rather than walk back to the receptacle, he frequently pulls at improper angles; therefore, even though he may have a reinforcement between the cord and the plug, as is known in the art, he will induce rapid wear and breakage of cord insulation near the plug, thus increasing maintenance costs and loss of equipment for use during time consumed in repairs. Such action also substantially increases the danger of short circuits and creates fire hazards.

One object of the present invention is to provide means for removing an electrical plug from its receptacle by application of only moderate tension through the cord to the plug.

Another object of this invention is to accomplish removal of the plug by application of tension to the plug from any conceivable angle.

Still another object of the instant invention is to accomplish removal of the plug without exertion of undesirable stress on any part of the cord, plug, or receptacle.

Further objects and a more complete understanding of the invention may be obtained by referring to the following description and claims taken in conjunction with the accompanying drawings which show illustrative embodiments of the construction forming the basis of the invention and in which—

Fig. 1 shows one form of the device wherein the plug is inserted in a wall receptacle;

Fig. 2 is a perspective view of the plug of Fig. 1 in which leverage is obtained through use of fins to broaden the base of the plug;

Fig. 3 is a perspective view of another form of the invention in which leverage is obtained through a hinged base pressure ring;

Fig. 4 is a perspective view of another embodiment of

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the invention in which a gimbal ring is hinged to the base pressure ring; and

Fig. 5 is a view of the bottom of the device in Fig. 4.

Referring more particularly to Fig. 2, the body of the male electrical plug has an extension neck 2 and fins 3. When a moderate tension is applied at an angle to the longitudinal axis of the body 1 of the plug through cord 4 to remove the plug from a receptacle, the extension neck 2 acts as a lever and the points of one or more of the fins 3 in contact with the face of the receptacle act as a fulcrum to disengage the prongs 5 which describe an arc upon removal from the receptacle. A force applied to the plug 1 of Figs. 1 and 2, through the service cord 4 at a distance from the plug, other than axially of the plug, is resolved into components axially of the plug structure and normal to the axial component by contact of fins 3 with the adjacent surface of a cooperating receptacle (which includes a slight sliding action between fins 3 and surface of the receptacle, and a slight rotation of base 1 in a plane through the longitudinal axis of the plug). In some instances of tensile pull on service cord 4 to free the plug of Figs. 1 and 2 inserted in a cooperating receptacle (where the tolerances are close between the inserted prongs 5 and the receptacle opening), the prongs 5 are slightly flexed (bent), but not permanently bent or deformed in clearing the receptacle to effect future usefulness of the plug. For a common household plug, a desirable distance from the base of the body 1 of the plug to the open end of the extension neck 2 is three inches, and a desirable diameter for the circle connecting the outer points of the fins 3 is five inches. Although in Fig. 1 fins 3 are shown at right angles to each other, the arrangement of the fins may be modified so that they will not interfere with other plugs of similar construction or conventional plugs when used in a double receptacle outlet. In lieu of fins 3, various arrangements of extension base plates could be utilized. Also, an extension cone having a broad base with sides tapering gradually to a tip wherein the broad base of the cone would be the base of the plug and the electrical cord would pass upward through the tip of the cone, could be used. Furthermore, although the preceding description envisions an integral or built-in electrical plug, the invention may be embodied in the form of an adapter to fit over a conventional plug. Some additional forms of the invention are described below.

Referring to Fig. 3, the body 6 of the plug is similar to any common male electrical plug. Attached to the plug body 6 by hinge pins 7 is a release mechanism consisting of base pressure ring 8, lever elements 9 and cord collar 10. The cord 4 passes through cord collar 10 and may be securely fastened therein to eliminate stress at the electrical connections inside the body of the plug. Removal of the plug from a receptacle is accomplished by applying moderate pull on cord 4 at an angle to the plane containing both the longitudinal axis of the plug body and the axis of the hinge pins 7. When tension is applied as stated above, cord collar 10 transmits force to lever elements 9 and base pressure ring 8; base pressure ring 8 pivots on hinge pins 7, and the point at which base pressure ring 8 comes into contact with the face of the receptacle acts as a fulcrum so that the plug is disengaged from the receptacle. The pivot action of the base pressure ring 8 with respect to plug body 6 enables prongs 5 to remain in substantial alignment within typical tolerances of their respective receptacle recesses even though the diameter of the base pressure ring 8 is small. For a common household plug, a desirable diameter of base pressure ring 8 is one and one-half inches, and a desirable vertical distance from the bottom of plug body 6 to cord collar 10 is two and one-half inches.

Another form of the invention is illustrated in Fig. 4

wherein base fulcrum ring 11 is rigidly attached at right angles to lever portions 15 and attached to inner ring 12 by hinge pins 13 and inner ring 12 is attached to plug body 6 by hinge pins 14. The axis of hinge pins 13 is in the same plane as, but at right angles to, the axis of hinge pins 14. In removing the plug from its receptacle, tilting base ring 11 contacts the facing surface of a cooperating electrical receptacle (not shown) and the operation of the device is similar to that described in connection with Fig. 3 except that with the addition of inner ring 12 and the arrangement of hinge pins 13 and 14, tilting base pressure ring 11 will contact or respond equally about 360 degrees of its circumference effectively to a force transmitted to said ring through cord 4 even though the cord 4 is thus aligned with the elements 15.

As previously explained, each of the plugs is removed from the receptacle through the cooperative action of the base extension of the plug provided by the fins 3 or base pressure rings 8 and 11, extension neck 2, lever arms 9 or elements 15 and the force applied to the service cord. This cooperative action results in the plug contacts being lifted out of firm engagement with the receptacle contacts by the axial component of the force applied to the cord and the normal component of the applied force is effective to rotate the plug contacts out of engagement with the openings of the receptacle in an arc of such large radius that with normal tolerances bending of the prongs 5 of the plug is avoided.

In lieu of lever arms 9 and 15, a solid piece or sheet of material may be used and molded in attractive and convenient configuration. It is obvious that all materials used in all forms of the invention should be of substantial rigidity.

Although certain preferred forms of this invention have been described, the principles herein taught may be embodied in other forms of construction of the lever-fulcrum arrangement within the scope of this invention.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. An electrical plug having an electrical cord attached thereto, comprising a body portion having a planar base surface and projecting contact members, an inner ring encircling the base of the plug in spaced relation and pivotally attached to said body portion at diametrically opposite points, a tilting base ring encircling said inner ring in spaced relation and pivotally attached to said inner ring at diametrically opposite points at right angles to the pivotal attachment of said inner ring to said body portion, and lever means rigidly affixed substantially perpendicularly to said tilting base ring and extending from

said tilting base ring to a cord collar secured to said lever means, said cord collar encircling the cord attached to the plug at a point remote from said base ring; said tilting base ring, inner ring and lever means establishing a fulcrum in response to tension applied to said lever means by said cord to permit said tilting base ring to rotate about a point of contact with the facing surface of a cooperating receptacle as said base ring and lever means is tilted by pull of said cord in any portion of 360 degrees of arc with respect to the longitudinal axis of said body portion to separate said plug contact members out of engagement with said receptacle.

2. A construction for an electrical plug having an electrical cord attached thereto, comprising a body portion having electrical terminal members, a tilting base ring encircling said body portion and circumferentially spaced therefrom, said base ring being pivotally secured at diametrically opposite pivot points to said body portion, said base ring having a surface substantially coplanar with the base of said body portion, lever means integrally connected to said tilting base ring for simultaneous movement therewith, said lever means extending in a direction remote from said terminal members, said lever means including a passage for receiving the electrical cord and maintaining it substantially parallel to the longitudinal axis of said body portion when there is no lateral tension on said cord, said tilting base ring and said lever means coacting with the electrical cord and being effective upon application of a tensile force through the electrical cord at an angle to a plane containing both the longitudinal axis of the body portion and the axis of the pivot points on the plug to produce a lifting and rotational motion of said lever and base ring about the moving point of contact between said tilting base ring periphery and facing surface of a cooperating receptacle; said tilting base ring, pivot point and body being so related that as the plug terminal members are removed from the receptacle said point of contact moves inwardly toward the electrical terminal members to separate the plug and receptacle electrical contacts.

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