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C. J. ADAMS

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TOOL FOR HANDLING SMALL OBJECTS

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FIG. 1

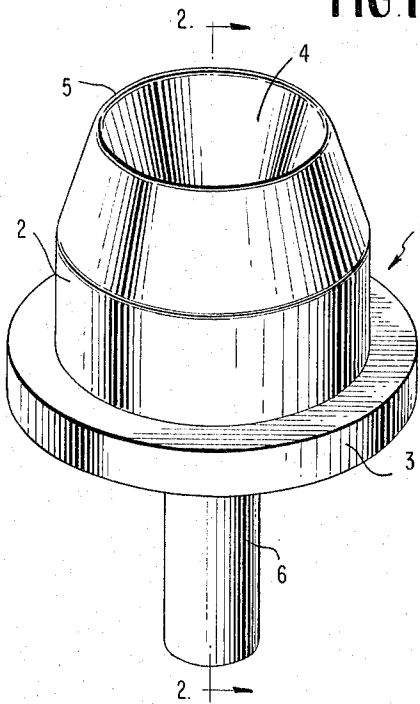


FIG. 2

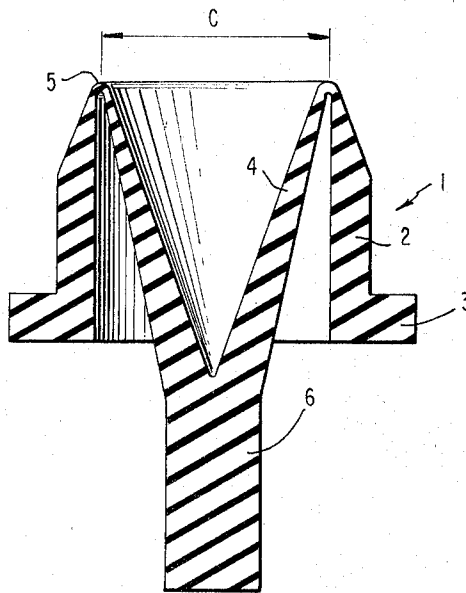


FIG. 3

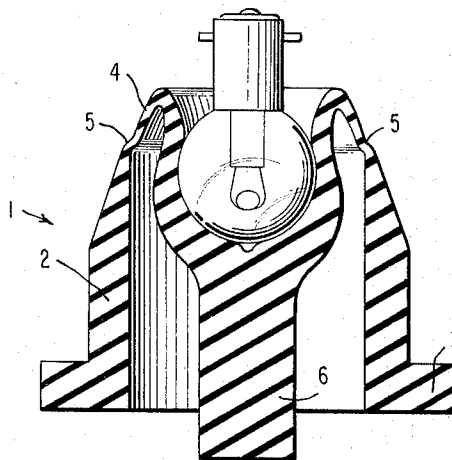
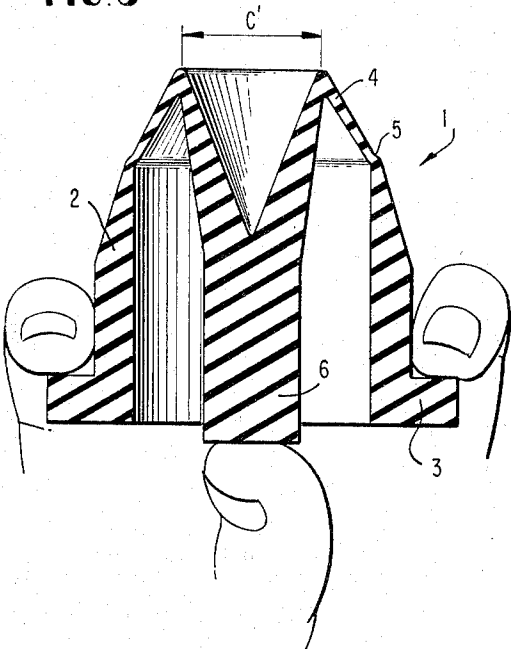


FIG. 4

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TOOL FOR HANDLING SMALL OBJECTS

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5 Claims. (Cl. 294-15)

This invention relates to a tool for handling small objects and, more particularly, to a unique tool which is adaptable for releasably engaging various size lamps during insertion and extraction into and out of a lamp socket. The specific application of the tool for replacing lamps serves as only one illustration of its intended use.

In compact electronic and related equipment which employ small components including various size lamps, it is frequently necessary to replace a burned-out lamp positioned in a relatively inaccessible area of the equipment. To obviate the necessity of dismantling the equipment to replace the lamp, a tool is required which is small, easily operated preferably by one hand, and which is insertable into relatively inaccessible areas of the equipment to engage and extract the lamp, and for engaging and inserting a new lamp. Particularly where plug-type lamps and sockets are employed, it is necessary to firmly engage the lamp during insertion and extraction.

Previous attempts have been unsuccessful in producing a tool which is effective in firmly engaging lamps and objects of a variety of sizes and which may be held and operated by one hand while being introduced into relatively inaccessible areas of compact equipment. The tools devised thus far for replacing relatively accessible objects, such as exposed lamps, have been cumbersome and require two hands to manipulate.

The present invention enables firm engagement of various size objects for positioning the objects into and out of relatively inaccessible areas of compact equipment.

It is therefore an object of this invention to provide a novel and improved small tool for releasably engaging lamps and objects of a variety of sizes.

Another object is to provide a tool capable of being held and operated by one hand for firmly engaging lamps and similar objects.

Still another object is to provide a tool of easily manufacturable, one-piece construction.

In carrying out this invention in one form thereof, a tool is constructed of a flexible material, such as rubber, and comprises a hollow cylinder having a flange at one end thereof so that the cylinder may be conveniently held between two fingers. The opposite end of the cylinder has a decreasing taper in the wall thickness and the cylinder wall is folded radially and axially inwardly to form a reverse fold at the area of minimum thickness. The wall is thereafter extended toward an apex to form a flexible conical wall, within the cylinder, which has a thickness increasing from the fold toward the apex and which defines an object-receiving opening of variable size.

A plunger extends axially from the apex of the conical wall and projects outwardly through the flanged end of the hollow cylinder to enable thumb pressure to be exerted thereon for effecting relative axial movement between the plunger and the cylinder. The flexible conical wall is thereby flexed to vary the size of the opening for wrapping around and frictionally engaging various size objects therein and for holding the same.

For a better understanding of this invention, reference is made to the accompanying drawing in which:

FIGURE 1 is a perspective view of the tool for manipulating small objects.

FIGURE 2 is a sectional view taken along lines 2-2 of FIGURE 1.

FIGURE 3 is a sectional view, similar to FIGURE 2, wherein the tool is illustrated with the conical wall flexed.

FIGURE 4 is a sectional view similar to FIGURE 3 showing a lamp firmly engaged within the flexed conical wall.

Referring to FIGURE 1, a perspective view of the tool of this invention is illustrated. The tool 1 is comprised of a hollow cylinder 2 made of resilient rubberlike material which has a flange 3 extending radially outwardly therefrom at one end. A conical wall 4 is disposed within the cylinder and is attached thereto preferably as an integral part thereof.

The position of the conical wall 4 relative to the hollow cylinder 2 may be better appreciated by referring to FIGURE 2 which is a sectional view of FIGURE 1 along the line 2-2. The wall thickness of the cylinder 2 has a decreasing taper at the end opposite the flange 3. The decreasing taper in the cylindrical wall thickness forms a thin wall section 5 at which the wall is folded in a reverse fold radially and axially inwardly into the center of the hollow cylinder 2. The distance between diametrically opposed portions of the folded cylindrical wall decreases in an axial direction toward the flanged end of the hollow cylinder 2 so that the folded cylindrical wall forms a conical wall 4 which is coaxially disposed within the hollow cylinder 2 and which normally defines a conical lamp-receiving opening *c*. The thickness of the conical wall 4 increases from the thin wall section 5. A plunger 6, preferably formed as an integral part of the conical wall 4 at the apex thereof, projects axially relative to the cylinder 2.

The tool may be made from a one-piece member constructed of rubber or a similar flexible material and, as can readily be appreciated, may be fabricated by molding or a similar process.

In accord with the invention, the size of the lamp-receiving opening is readily varied to permit reception of various size objects. This is accomplished simply by effecting relative axial movement between the cylinder 2 and wall 4. Considering the operation of the tool, normally, the reverse fold between the cylinder 2 and the conical wall 4 tends to remain at the thin wall section 5. The fold remains at this position because the stresses created by a fold tend to resist the creation thereof and are directly proportional to the thickness of the folded material. Since the taper of the conical wall thickness and the taper of the cylinder wall thickness both increase in a direction away from the thin wall section 5, increased resistance to the fold is encountered by movement of the fold in either direction so that the fold tends to remain at the thin wall section 5.

However, the fold is forcibly advanced along the conical wall 4 and, thereby, the normal size of the conical opening *c* is reduced by effecting relative movement between the cylinder 2 and the plunger member 6 axially in the direction indicated in FIGURE 3. To this end the plunger 6 may be advanced along the longitudinal axis of the cylinder 2 by thumb pressure on the end of the plunger 6 while the cylinder 2 is held between two fingers which simultaneously exert an axial force on the flange 3 as indicated in FIGURE 3. Of course, such relative movement can be accomplished also by displacing the cylinder 2 relative to the member 6. The reduced conical opening *c'*, as indicated in FIGURE 3, is placed over a lamp for extracting the same from its socket. After the reduced conical opening *c'* is placed over the lamp, the pressure on either the flange member 3 or the member 6 is released, allowing the conical wall 4 to flex and wrap around the lamp while the fold in the conical wall moves toward the thin walled section 5 as indicated in FIGURE 4. The conical wall flexes and wraps around the lamp by virtue of the fact that the fold in the conical wall tends to move in a direction of least resistance, namely, in a direction of decreasing wall thickness. After the

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conical wall has flexed about the lamp, the wall frictionally engages the lamp with such force that the lamp may be withdrawn from the socket by manipulating the cylinder. Since the conical wall has actually wrapped around the lamp, push-in and pull-out insertion and extraction of plug-in lamps may be accomplished.

The lamp is discharged from the tool by applying axial pressure against the end of the plunger 6 while simultaneously applying axial pressure in the opposite direction against the flange member 3, so as to decrease the conical opening by forcing the fold in the conical wall 4 to move forward the apex of the conical portion. A new lamp may be placed into the tool and inserted into the socket by repeating the above procedure in reverse.

Although the present invention has been described as applied to inserting and extracting electric lamps, this invention is also clearly applicable for handling a variety of small objects which must be inserted and extracted into and out of relatively inaccessible areas.

While a specific embodiment of this invention has been shown and described, it is not intended that the invention be limited to the particular construction shown and described, and it is intended by the appended claims to cover all modifications within the spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A tool for inserting and extracting objects into and out of relatively inaccessible areas comprising:

- (a) a hollow cylinder with means thereon for holding said cylinder between two fingers,
- (b) a flexible conical wall within said cylinder, said conical wall being a folded continuation of the walls of said cylinder and defining an object-receiving opening, and
- (c) actuation means attached to said conical wall for flexing said conical wall relative to said cylinder by thumb pressure on said actuation means to vary the size of said opening to permit engagement and disengagement of various size objects in said opening.

2. A tool for inserting and extracting objects into and out of relatively inaccessible areas comprising:

- (a) a hollow cylinder,
- (b) a flexible conical wall within said cylinder, said conical wall being a folded continuation of the walls of said cylinder and defining an object-receiving opening,
- (c) actuation means on the apex of said conical wall enabling said conical wall to be flexed relative to said cylinder by pressure on said actuation means to vary the size of said opening to permit engagement and disengagement of various size objects in said opening.

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3. A tool for inserting and extracting objects into and out of relatively inaccessible areas comprising:

- (a) a hollow cylinder having a radially outwardly extending flange at one end thereof, and a tapered, flexible thin-wall section at the opposite end thereof,
- (b) a flexible conical wall axially disposed within said cylinder, said conical wall being formed by a folded continuation of said thin-wall section of said cylinder and defining an object-receiving opening, said conical wall having increasing wall thickness from said thin-wall section,
- (c) a relatively rigid plunger extending axially from the apex of said conical wall for flexing said conical wall relative to said cylindrical portion to vary the size of said opening to permit engagement and disengagement of various size objects in said opening.

4. A tool for inserting and extracting lamps into and out of lamp sockets comprising:

- (a) a hollow cylinder having a radially outwardly extending flange at one end thereof, and a tapered, flexible thin-wall section at the opposite end thereof,
- (b) a flexible conical wall axially disposed within said cylinder, said conical wall being formed by a folded continuation of said thin-wall section of said cylinder and defining an object-receiving opening, said conical wall having a decreasing diameter, increasing wall thickness, and decreasing flexibility from said thin-wall section, and
- (c) a rigid plunger extending axially from the apex of said conical wall for flexing said conical wall relative to said cylindrical portion when said flange is held between two fingers and thumb pressure is exerted on said plunger to vary the size of said opening to permit engagement and disengagement of various shaped lamps in said opening during insertion and extraction of the lamps into and out of lamp sockets.

5. A tool as recited in claim 4 wherein said cylinder, said conical wall, and said plunger comprises a single integral member constructed of resilient rubberlike material.

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