Sept. 17, 1963 B. BRISTOL III 3,103,836

TOOL FOR REMOVING A PLUGGED-IN ARTICLE FROM A PLUG-IN RECEPTACLE

Filed April 21, 1961

Fig. 1

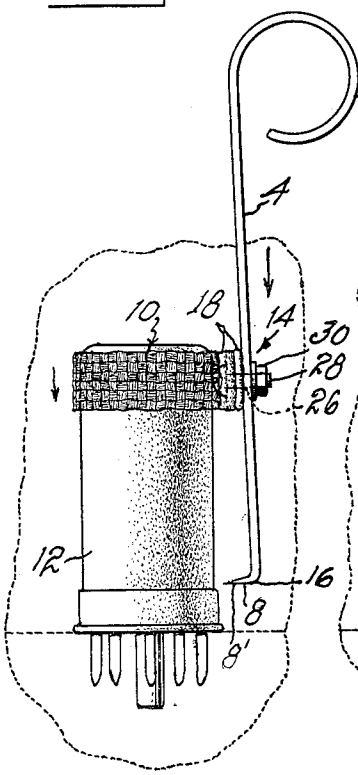


Fig. 2

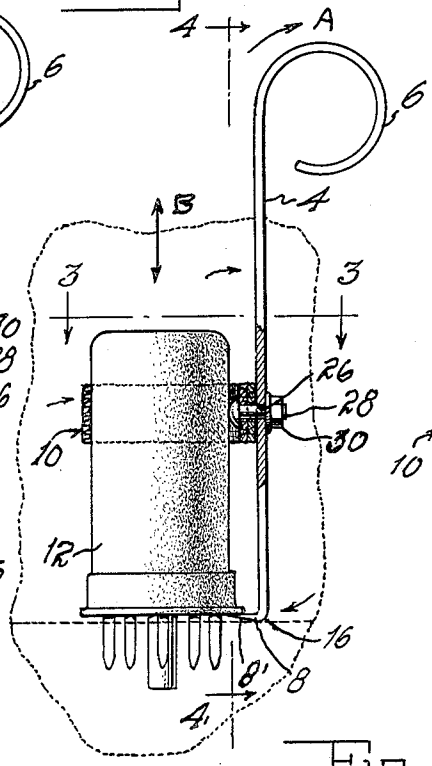


Fig. 4

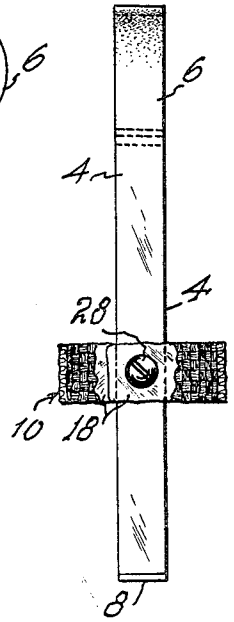


Fig. 3

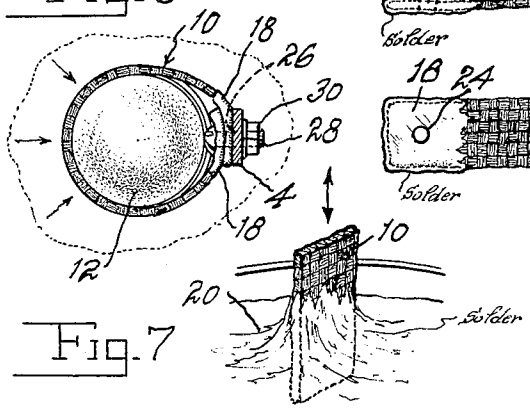


Fig. 5

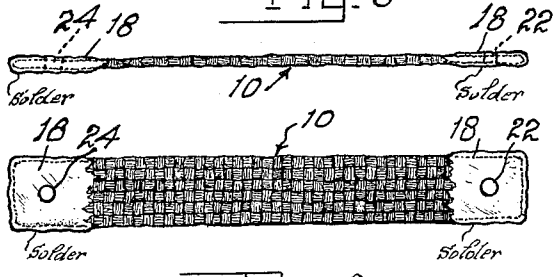


Fig. 6

Fig. 7

INVENTOR.
Benedict Bristol III
BY
Jacobi & Jacobi
ATTORNEYS

United States Patent Office 3,103,836 Patented Sept. 17, 1963

3,103,836

TOOL FOR REMOVING A PLUGGED-IN ARTICLE FROM A PLUG-IN RECEPTACLE

Benedict Bristol III, Morganton, N.C.

Filed Apr. 21, 1961, Ser. No. 104,745
1 Claim. (Cl. 81—3)

This invention relates generally to tools, and more particularly to a tool adapted for removal of plugged-in articles such as vacuum tubes, tubular condensers, vibrators, and similar objects, from plug-in receptacles.

Various types of "tube-puller" tools have heretofore been suggested. While some of such tools have performed satisfactorily under limited conditions, workers in the art have long felt a need for an efficient "tube-puller" which is inexpensive in manufacture, and which provides for positive engagement and support of the tube, or similar article during removal thereof from an operating plug-in receptacle or socket.

Accordingly, the primary object of the present invention is to provide a "tube-puller" (*a*) which serves to grasp and remove a tube by mechanical rather than frictional means; (*b*) which employs no moving parts in the construction thereof, thus reducing manufacturing costs; (*c*) which utilizes means effecting a snug and safe enclosure for the tube until complete removal has been effectuated, and (*d*) in addition, which is particularly adapted for effecting removal of plug-in articles from a confined or "tight" space.

A further primary object of the present invention is to provide a tool conforming with the preceding object, and permitting the quick and efficient removal of a tube or other plugged-in article, through mechanical means, without allowing the hand of the user to come into contact with the article.

Yet other, additional, and more specific objects of the present invention are: (*a*) to provide an improved "tube-puller" in accordance with the preceding general objects, which "tube-puller" can be easily formed from available components and materials; (*b*) to provide such a "tube-puller" incorporating a handle member having a foot at one end thereof, a finger engaging loop at the other end thereof, and a tube encircling band intermediate the ends thereof, whereby the band may be placed in encircling relation with the tube and the foot passed thereunder to effect removal of the tube; (*c*) to provide such a "tube-puller" wherein the band is formed from a flexible metallic braided strip provided with a stiffening agent at the ends thereof, and wherein the stiffened ends are coupled with the handle portion or member of the puller so that there is positive support of the band adjacent the handle portion yet flexibility of the band to allow for passing the same about a tube; and (*d*) to provide such a "tube-puller" wherein the tube encircling band thereof is disposed in spaced relation to the foot thereof so that the band engages the upper portion of a tube or other article to be removed while the foot portion of the puller engages the base of the tube or other article to be removed, thus allowing for pivoting of the tool about the foot and positive support and engagement of the tube or other article by the puller during a removal operation.

The invention lies in the construction, arrangement, and assembly of the various components which serve to provide the improved "tube-puller," as will become apparent after consideration is given to the following detailed description. Such description refers to the annexed drawings presenting the preferred and illustrative embodiments of the invention. In the drawings:

FIGURE 1 is a side-elevational view presenting a tool constructed in accordance with the present invention as the same would appear while initially being positioned over a conventional vacuum tube;

FIGURE 2 is a side-elevational view similar to FIGURE 1, but presenting the tool in the position which the same would occupy while the initial removing operation is being performed;

FIGURE 3 is a sectional view taken on the line 3—3 on FIGURE 2 and showing the cooperating relationship between the band portion of the tool, the handle portion of the tool, and a tube being removed;

FIGURE 4 is a sectional view taken on line 4—4 of FIGURE 2 and presenting in some detail the manner in which the band portion of the tool is coupled with the handle portion thereof;

FIGURE 5 is a side-elevational view of a band member adapted to be incorporated in a tool constructed in accordance with the present invention;

FIGURE 6 is a plan view of the band member shown in FIGURE 5; and,

FIGURE 7 is a fragmental detailed view illustrating one method in which a stiffening agent may be applied to the ends of a band member utilized in the tool provided by the present invention.

If more specific reference is now made to the several views of the drawing, it will be noted that the device provided for removing a plugged-in article, or "tube-puller" as it is more conventionally known, is generally designated by the numerals **4** and **10**. The device tool comprises an elongated rod member **4** which is bent at the upper end thereof to form the finger engaging loop or handle projecting laterally from one side thereof, namely, projecting to the right side as shown in FIGURES 1 and 2. The rod member **4** carries at the opposite end thereof a foot **8** which is preferably formed integrally with the rod member **4**. The foot **8** extends laterally of the elongated rod member **4** projecting from the left side thereof. Thus, the foot member projects from one side of the elongated rod member **4** and the handle or finger engaging loop **6** projects from the opposite side of such elongated rod.

A flexible band member **10** adapted to encircle the article to be removed, which is shown as a tube **12**, is disposed in spaced relation to the foot **8** and means generally designated by the numeral **14** are provided for coupling the band member to the elongated rod member **4**.

It should be understood that while reference is made to the elongated rod member **4** hereinabove, the same in effect serves as a handle which is provided with the finger loop **6** at the upper end thereof. The loop **6** comprises a bent over end portion of the rod **4**.

In operation, the device is placed over the tubular article to be removed and the foot **8**, as shown in FIGURE 2, is passed under the lower peripheral edge of the article. To facilitate passing the foot under such edge, the same is beveled as at **8'**. This beveling, as explained in more detail below, serves in addition to provide a pivot point **16** which allows for applying force in the direction of the arrow A of FIGURE 2 to effect removal of the tube.

The band member **10** is preferably formed from a braided metallic strip having the ends thereof impregnated with a suitable stiffening material such as the solder **18**. The stiffening operation can be achieved by dipping the ends of the band **10** into a solder bath **20** as shown schematically in FIGURE 7.

After the band has been provided with the stiffening agent at the ends thereof, the same is folded to provide a ring with the solder impregnated ends thereof disposed in overlapping relation as shown in FIGURE 4. Suitable apertures **22** and **24** (FIGURE 6) are provided in each of the solder impregnated ends, and these apertures are adapted to register with one another and with a suitable aperture **26** provided in the elongated rod member **4**. A bolt **28** is passed through the apertures and a nut **30** is tightened on the threaded end of the bolt to positively

secure the band member to the elongated rod member **4**. Thus, the means coupling the band member to the rod member comprises a shaft element carrying enlarged securing heads at opposite ends thereof, one head being defined by the bolt head itself, and the other head being defined by the nut **30**.

The provision of the solder impregnated ends on the flexible band member **10** insures positive and fixed coupling of the band member to the elongated rod member, yet permits flexing of the central portion of the band member to accommodate the article to be removed.

It will be understood that when the "tube-puller" **2** is positioned as shown in FIGURE 2, and force is applied in the direction of arrow A, the article to be pulled, or tube **12**, is initially moved upward slightly under the pivoting action of the "tube-puller" about the pivot point **16**. After this initial action, the tube is sufficiently loose in the socket, and upward force applied in the direction of the arrow B by a finger engaged in the loop **6** will effect removal of the tube. The construction is such that positive support is provided for the tube during the whole removal operation, the band member **10** encircling and engaging the tube, and the foot **8** being disposed under and engaging the base of the tube.

As appreciated by those of ordinary skill in the art, plug-in receptacles or sockets permit a certain amount of lateral flexing of plug-in articles held thereby. Thus, the sockets do not restrict the initial pivoting removing action discussed above. At the same time, such pivoting action does not cause sufficient lateral displacement to in any way damage the plug-in receptacle or socket.

While the materials of construction may vary depending on the particular use, without departing from the scope and spirit of the invention, the preferred embodiment prescribes forming the elongated rod element **4** from steel and the band member **10** from braided copper strands. It has been found that the steel handle provides adequate support and that the copper insures the required flexibility.

Moreover, like the materials used in construction, the dimensions of the "tube-puller" provided by the invention may vary depending on the particular tubes or other

articles to be removed. However, the foot **8** should be sufficiently short, or project inwardly by a sufficiently short distance, so as to not make electrical contact with tube pins or connections during a removal operation. If the foot is so dimensioned, then the tool may be used for removal of tubes from operating circuits without danger of shock or equipment damage.

After reading the foregoing detailed description of the illustrative and preferred embodiment presented in the annexed drawings, it should be apparent that the objects set forth at the outset of this specification have been successfully achieved. Accordingly, what is claimed is:

A device for removing a plugged-in article from a plug-in receptacle, said device comprising an elongated rod member, said rod member being bent at one end to form a finger loop projecting laterally from one side thereof; said rod member carrying at the opposite end a foot extending laterally from the other side thereof and terminating in a beveled tip; a flexible band member adapted to encircle the article, said band member comprising a metal braided strip having means thereon for stiffening the ends thereof, said ends meeting and overlapping adjacent said rod member; and means coupling said band member to said rod member with said band member being disposed in spaced relation to said foot and projecting laterally of said rod member from said other side thereof, said means coupling said band member to said rod member comprising a shaft element carrying enlarged securing heads at opposite ends thereof, said shaft element passing through said ends of said band member and said rod member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,320,043	Merkle	May 25, 1943
2,325,841	Faber	Aug. 3, 1943
2,576,262	Morehead	Nov. 27, 1951

FOREIGN PATENTS

2,793	Great Britain	of 1909
711,169	Great Britain	June 23, 1954