United States Patent [19]

Wallo

[11] **3,723,949**

[45] **Mar. 27, 1973**

[54] **PHONO PLUG AND METHOD OF MAKING**

[75] Inventor: **William H. Wallo,** Chicago, Ill.

[73] Assignee: **Wall-Able Manufacturing Corporation,** Chicago, Ill.

[22] Filed: **July 2, 1971**

[21] Appl. No.: **159,269**

[52] **U.S. Cl.**.....**339/177 R,** 29/520, 29/510

[51] **Int. Cl.**.....**H01r 17/06**

[58] **Field of Search**.....29/510, 515, 520, 629; 339/177–183, 136, 142, 212, 220

[56] **References Cited**

UNITED STATES PATENTS

3,295,094	12/1966	DeLyon et al.	339/177 R
218,808	8/1879	Austin	29/510
1,570,320	1/1926	Serewicz	29/520
2,457,789	12/1948	Von Scheven	339/220 L
3,600,531	8/1971	Hoegerl	339/177 E

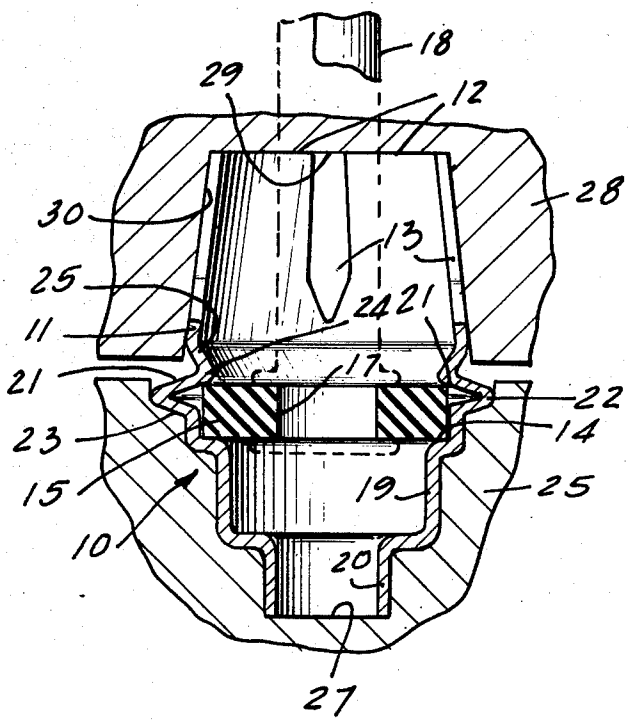
Primary Examiner—Joseph H. McGlynn
Assistant Examiner—Lawrence J. Staab
Attorney—Carlton Hill et al.

[57] **ABSTRACT**

A pin-carrying washer is seated on a shoulder facing toward the mouth end within and intermediate the length of the plug shell and is locked in place by a clamping shoulder crimped radially inwardly in the shell spaced from the seating shoulder. An annular radially outwardly projecting rib between the seating and clamping shoulders reinforces the shell and serves as a finger grip.

A method of making the phono plug comprises initially constructing the shell outwardly from the seating shoulder of a diameter slightly larger than the diameter of the washer, inserting the washer through the mouth end of the shell onto the seating shoulder, retaining the shell about the seating shoulder and therebelow against deformation, and collapsing material of the shell wall radially inwardly to provide the clamping shoulder, as by applying axial force to the shell wall toward the seating shoulder.

11 Claims, 5 Drawing Figures



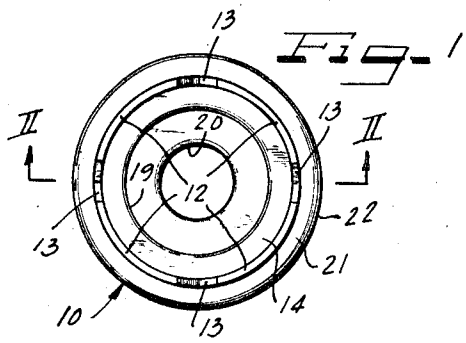


Fig. 1

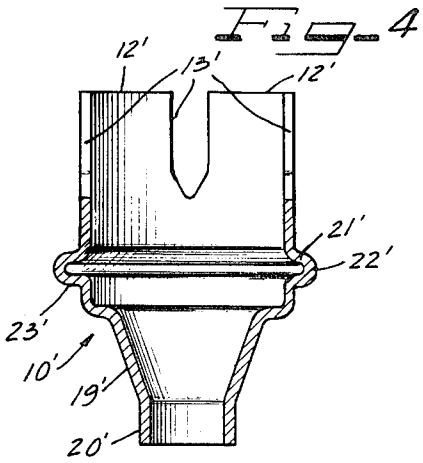


Fig. 4

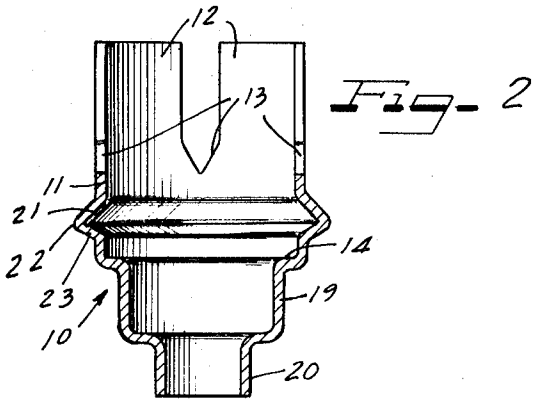


Fig. 2

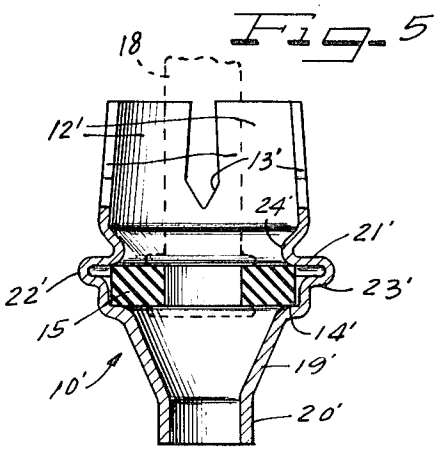


Fig. 5

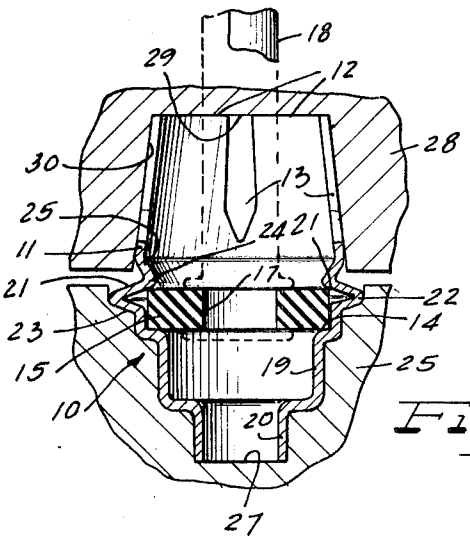


Fig. 3

INVENTOR.
WILLIAM H. WALLO

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

PHONO PLUG AND METHOD OF MAKING

This invention relates to phono plugs and a method of making the same, and is more particularly concerned with the type of phono plug in which an electrically conductive pin is carried by an insulating washer mounted within an electrical conductive shell which is adapted to engage frictionally about a jack into which the pin is inserted as a plug.

As heretofore constructed, phono plugs have had the insulating washer secured within the shell by press fit, bent over lugs, indentations in the shell wall gripping the washer perimeter, and the like. Problems have been encountered with the prior arrangement for several reasons among which may be mentioned excessive number of manufacturing steps, unsatisfactory retention of the washer, inaccurate assembly of the parts, failure to hold the washer and plug steady.

An important object of the present invention is to overcome the foregoing and other disadvantages, defects, inefficiencies, shortcomings and problems in prior structures and methods and to attain important advantages and improvements in the structure and method of making phono plugs, as will become apparent.

Another object of the invention is to provide a new and improved phono plug in which the pin or plug carrying insulating washer is positively locked in place.

Another object of the invention is to provide a phono plug in which the pin-carrying washer is held effectively against turning relative to the shell.

Still another object of the invention is to provide a new and improved phono plug in which the pin-carrying washer is carried in uniformly locked relation on a seating shoulder in the shell.

Yet another object of the invention is to provide a new and improved method of making phono plugs.

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawing, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts embodied in the disclosure, and in which:

FIG. 1 is a top plan view of a phono plug shell embodying features of the invention;

FIG. 2 is an axial sectional detail view taken substantially along the line II—II of FIG. 1;

FIG. 3 is a sectional view similar to FIG. 2 illustrating the method of making the phono plug;

FIG. 4 is an axial sectional view through a slightly modified form of the phono plug shell; and

FIG. 5 is a similar sectional view showing the completed phono plug assembly embodying the shell of FIG. 4.

On reference to FIGS. 1–3, an electrically conductive phono plug shell **10** is constructed as a one-piece member from suitable thin electrically conductive material such as brass or cold-rolled steel which can readily be die stamped, drawn and shaped to provide a tubular body of the desired configuration and then plated, as is customary, with nickel, cadmium, or as otherwise preferred. One end of the tubular shell **10** is constructed to provide a mouth within which is received a complementary receptacle or phono jack body which is frictionally gripped and retained by

means of mouth-end cooperating gripping fingers **12** separated by slots **13** which extend inwardly at uniformly spaced circumferential intervals from the mouth end tip of the body whereby to afford resilient relative flexibility so that the fingers can expand radially from a terminal convergence of the fingers as shown in FIG. **3** for receiving and gripping the jack body.

At a suitable location intermediate its length, the shell body **11** is provided with an internal annular shoulder **14** which faces toward the mouth end of the shell to receive and seat a plug or pin carrying insulating disk **15** which may be constructed from fiber, mica-filled hard rubber, phenolic material preferably reinforced, polypropylene, ceramic or the like, and is centrally apertured to mount a tubular electrically conductive, such as nickel-plate brass, plug or pin **18** desirably riveted thereto in the usual manner. As initially constructed, the shell body **11** together with the fingers **12** is of a slightly greater inside diameter from the mouth terminus to the shoulder **14** than the outside diameter of the disk **15** to be mounted thereon, to enable free and easy assembly. In forming the shoulder **14**, it is provided as an offset between the principal diameter of the body **11** and a reduced diameter shell body portion **19** extending in the opposite direction from which the shoulder **14** faces, that is longitudinally or axially away from the fingers **12** and terminating in a further reduced diameter terminal portion **20**, as is customary.

To lock the disk **15** on its seat shoulder **14**, the shell body **11** is provided with a preformed, uniform, annular locking shoulder flange **21** suitably spaced in the direction of the mouth end of the shell from the fixed shoulder **14** and initially clear of the maximum inside diameter of the shell body **11** to avoid any interference with free and easy assembly of the disk **15** through the shell mouth onto the seat **14**. After such assembly the locking shoulder flange **21** is bent inwardly into locking engagement with the adjacent margin or at least marginal edge of the disk **15** to clamp and retain the disk firmly, and desirably non-rotatably, on the shoulder **14**.

In order to facilitate moving the locking shoulder flange **21** from its initial position into the locking, clamping position with respect to the disk **15**, the flange **21** is initially formed as part of an annular radially outwardly projecting and radially inwardly hollow reinforcing rib **22** of which the flange **21** comprises an oblique generally radially inwardly extending wall portion which slopes toward the mouth end of the shell **10**. At its opposite side, the rib **22** is defined by a way flange **23** which joins a generally axially extending spacing portion of the shell body **11** intervening between the shoulder **14** and the rib **22** and desirably shorter than the thickness of the disk **15** so that when the disk **15** is initially mounted on the shoulder **14**, the shell mouth facing surface of the disk will be aligned with the shoulder flange **21**, and preferably adjacent to but spaced from the inner end of the shoulder flange in such relationship as to enable clamping, locking engagement of the disk upon only slight inward turning, bending displacement of the shoulder flange toward and against the disk. As will be observed, the shoulder flange **21** is sufficiently wider than the flange **23** such that when the flange **21** is displaced toward the disk **15** by bending of the flange **21** about a fulcrum at the apex

of the annular rib 22, the disk-engaging end portion of the flange 21 will move inwardly to a smaller diameter than the initial inside diameter of the shell body 11. To accommodate such inward displacement, the immediately adjacent annular portion of the body 11 is displaced correspondingly radially inwardly providing a radially inwardly projecting annular reinforcing rib 24, strengthening the locking shoulder and providing, in effect, an annular strut 25 precluding opening or disk-releasing deflection of the shoulder flange 21 but retaining it positively in its locking, clamping condition. By virtue of its radially outward projection, the rib 22 serves as a convenient finger grip surface used for pushing the phono plug into assembly with a jack, but also for pulling the phono plug when separating the same from the jack.

After the disk 15 carrying the pin 18 as a unit therewith is assembled through the mouth of the shell 10 onto the seat 14, locking, clamping of the disk is adapted to be effected easily, positively, with substantial accuracy, and expeditiously by axial pressure applied to the shell to collapse the shoulder flange 21 from its initial clearance position relative to the inside diameter of the shell wall 11 into the disk locking and clamping position. Conveniently this is adapted to be effected in a simple die structure comprising a holding die member 25 having a cavity 27 which is complementary to and receives the base or terminal end portion of the shell 10 conformable to its outside contours, inclusive of the rib flange 23 and the crest of the rib so that the rib will be firmly supported against spreading and all portions of the shell from the rib to and including the terminal 20 and especially the shoulder 14 will be firmly held to shape and against deformation when relative axial compression is applied to the shell by and between the die member 25 and a cooperating die member 28. Within the die member 28 is a forming cavity 29 operatively aligned with the cavity 27 and having a frusto-conical outwardly opening shaping wall 30 dimensioned to size the fingers 12 from an essentially cylindrical initial shape as shown in FIG. 2 into the relatively convergent relationship shown in FIG. 3 to enable efficient frictional resilient gripping of a jack body. Further, the cavity 27 is of a depth such that on completion of the finger shaping, the tips of the fingers will engage the root surface defining the cavity 29 and enable axis compression thrust to be imparted to the shell 10 by and between the die members 25 and 28 to effect collapsing displacement of the clamping and locking flange shoulder 21 inwardly onto the disk 15, accompanied by the inward displacement of the rib 24 and the strut flange 25. As such axial compression occurs, the die member 25 holds the rib 22 firmly against spreading to thereby assure proper, intended inward displacement movement of the flange 21 and the annular portion of the body 11 which forms the inward rib 24 and the strut 25.

In the slightly modified structure of FIGS. 4 and 5, essential features are substantially the same as in the form already described and assembly of the parts is effected in the same manner so that description of and in respect to one form will suffice for the other. Accordingly, primed reference numerals have been applied to FIGS. 4 and 5 and the description of the designated elements can be considered the same except as to the slight modifications to be pointed out. Thus, in FIGS. 4 and 5 the shell 10' has the portion 19' between the shoulder 14' and the terminal 20' of generally frusto-conical shape rather than the generally cylindrical shape shown in FIGS. 2 and 3. By having the rib 22' initially of a more rounded or radius crest formation, the clamping and locking shoulder 21' may assume a position generally normal to the axis of the assembly in the clamping and locking position, as shown in FIG. 5. This may be advantageous for clamping and locking the disk 15 onto the shoulder 14' where extreme care must be taken not to overstress the material of the disk due to brittleness or other factors. As will be observed the clamping pressure may thus be imposed by the shoulder flange 21' more nearly in a direction normal to the plane of the shoulder 114', as compared to the more biased direction of clamping pressure that may be imposed on the disk margin in the form of FIG. 3.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a phono plug structure:
   - a tubular one-piece electrically conductive shell body having a mouth at one end defined by jack-body-gripping fingers and having a terminal at its opposite end;
   - an integral intermediate internal pin-disk-seating shoulder on said body facing toward said fingers;
   - an annular radially outwardly projecting and radially inwardly opening hollow rib integral with said body and having one wall in part comprising a shoulder flange; and
   - a spacing portion of the body intervening between the shoulder and a second wall of the rib which joins said intervening portion; whereby to enable clamping, locking engagement of the disk against said shoulder upon only slight inward displacement of said shoulder flange.

2. A structure according to claim 1, wherein said shoulder flange extends at least initially in slanting relation to said second wall and generally obliquely toward said fingers.

3. A structure according to claim 1, said flange and said one wall being wider than said second wall whereby the shoulder flange will overhang said shoulder for clamping the disk thereto.

4. A structure according to claim 1, having in combination therewith an insulating disk seated on said shoulder and carrying a plug pin, said shoulder flange engaging against the disk and thereby clamping and locking the disk onto said shoulder, and a generally radially inwardly directed strut flange integral with said body and reinforcing said shoulder flange.

5. In a phono plug structure:
   - a tubular one-piece electrically conductive shell body having a mouth at one end defined by jack-body-gripping fingers and having a terminal at its opposite end;
   - an integral intermediate internal pin-disk-seating shoulder on said body facing toward said fingers;
   - an insulating disk seated on said shoulder and carrying a plug pin;
   - an annular integral shoulder flange on said body facing toward said shoulder and engaging against the

disk and clamping and locking the disk onto said shoulder;

an annular radially outwardly projecting rib joining said shoulder flange to the body adjacent to said shoulder; and

the portion of the body between said shoulder and said rib being shorter than the thickness of said disk.

6. A structure according to claim 5, in which said shoulder flange extends substantially parallel to the disk.

7. In a phono plug structure:

a tubular one-piece electrically conductive shell body formed from thin material will a mouth at one end defined by jack-body-gripping fingers and having a terminal at its opposite end;

an integral intermediate internal pin-disk-seating shoulder on said body facing towards said fingers;

an insulating disk carrying a plug pin and seated on said shoulder;

said body having an annular generally axially extending portion thereof about said disk and including a radially outwardly projecting hollow reinforcing rib axially spaced from said shoulder by said annular portion; and

a radially inwardly crimped shoulder portion of said reinforcing rib clamping the disk against the seating shoulder.

8. In a method of making a phono plug structure:

assembling a pin-carrying insulating washer onto an internal shoulder intermediately in a tubular electrical conductive shell;

displacing an integral annular flanger in said body from a clearance relation to said shoulder into clamping locking engagement with said disk and thrusting toward said shoulder; and

shaping and sizing gripping fingers on said shell body from a normally generally cylindrical position into generally convergent relation as an incident to applying endwise compression to the shell for displacing said shoulder flange into the clamping and locking position.

9. In a method according to claim 8, retaining a generally radially outwardly projecting annular rib on said shell between said shoulder and said shoulder flange to size, and displacing an annular reinforcing rib radially inwardly in the body along a generally radially inwardly projecting end portion of said shoulder flange overlying the disk.

10. In a method of making a phono plug structure:

shaping a one-piece shell from a suitable thin electrically conductive material to provide a tubular body with gripping fingers at one end;

shaping an internal seating shoulder intermediately in said body with an axially extending portion of the body extending from said shoulder;

shaping an integral radially outwardly extending hollow rib on said tubular body, said hollow rib being spaced a limited distance from said shoulder by said axially extending portion;

assembling a pin-carried insulating washer onto said shoulder and having a thickness greater than said axially extending portion between said shoulder and said rib; and

crimping in said body adjacent to said fingers a radially inwardly extending rib with a flange common to said radially outwardly extending rib into clamping locking engagement with the disk thrusting it toward said shoulder.

11. A method according to claim 10, including shaping and sizing the gripping fingers from a normally generally cylindrical position into generally convergent relation incident to shaping said radially inwardly extending rib.

* * * * *

Dedication

3,723,949.—*William H. Wallo*, Chicago, Ill. PHONO PLUG AND METHOD OF MAKING SAME. Patent dated Mar. 27, 1973. Dedication filed Jan. 13, 1975, by the assignee, *Wall Able Tool & Die Corp.*

Hereby dedicates to the Public the remaining term of said patent.

[*Official Gazette April 8, 1975.*]