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LAMINATED SOLID WALL BEARING RETAINER
AND METHOD OF MAKING THE SAME
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FIG. 2.

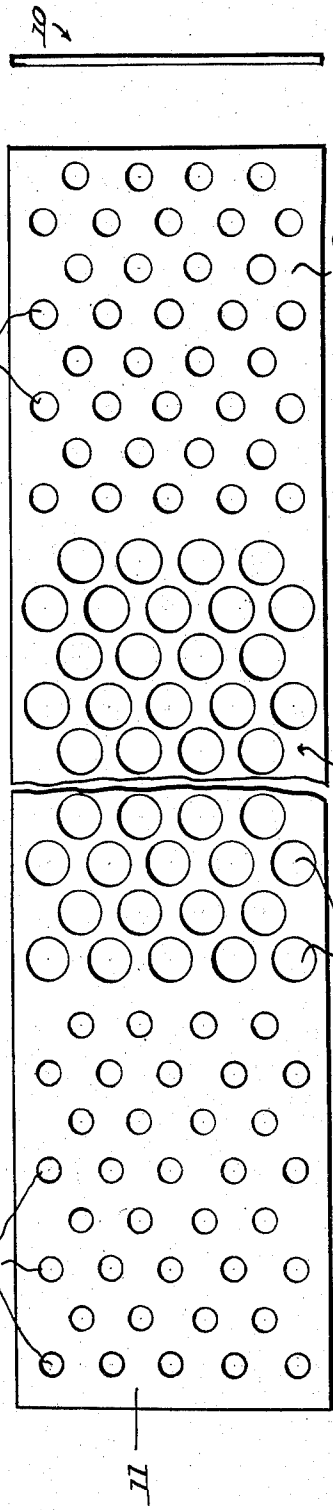


FIG. 1.

FIG. 4.

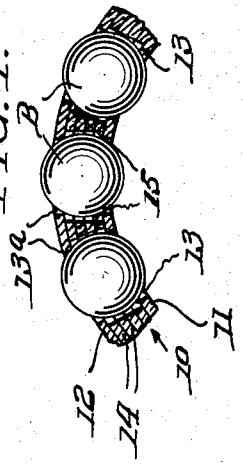
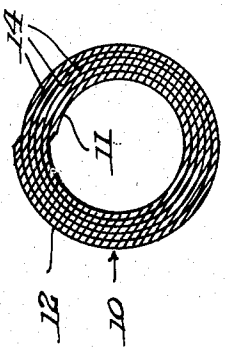


FIG. 3.



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LAMINATED SOLID WALL BEARING RETAINER AND METHOD OF MAKING THE SAME

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4 Claims. (Cl. 308—201)

This invention relates to bearing retainers, and has particular reference to cylindrical ball-element-holding retainers of the type employed in punch press die sets for the guidance and alignment of relatively movable punch and die sections.

Bearings of this general character are disclosed in the patent to Conner, No. 2,422,774, issued June 24, 1947. This patent sets forth the use of such bearings in die sets for guiding the movements of alignment-maintaining posts of punch presses and maintaining the separable die holders of such die sets in definite relationship to each other.

As heretofore constructed, such bearings have been formed to include cylindrical, solid wall, ball retainers of metallic composition. The manufacture of this conventional type of retainer, in which the ball elements are positioned in the individual openings or sockets thereof, has involved slow, tedious, and costly operations, particularly with respect to drilling the cylindrical walls of such retainers to produce therein the multiplicity of spaced, radially extending, ball-receiving openings or sockets.

It is a leading object of the invention to provide a cylindrical retainer of this type wherein the wall formation thereof is such as to enable the retainer to be more economically produced and assembled than has been possible with prior constructions.

Another object of the invention is to provide a retainer having a cylindrical wall composed of thin sheet material disposed in closely adjacent convolutions and producing a laminated structure in which a multiplicity of spaced openings are provided containing and confining rotatable ball elements.

A further object is to provide a retainer for die sets wherein the cylindrical wall thereof is formed from a single perforated strip wound upon itself and retained against displacement in the formation of a solid wall cylinder having radial perforations therein constituting ball-element-confining sockets.

A still further object of the invention is to provide an improved method of making such retainers by spirally wrapping a strip of flexible sheet material upon itself to form a solid cylindrical wall and wherein the strip prior to being so wrapped or folded is formed to include longitudinally spaced groups of openings, each group containing openings of the same diameter with an intermediately placed group having openings larger in diameter than the remaining groups, whereby to enable the portions of the strip containing first and intermediate groups of openings to be shaped to cylinder formation and ball elements deposited in aligned openings of the first and intermediate groups present therein, thereafter, the portion of the strip containing a third group of openings being wrapped around the cylinder formation and united therewith to confine the ball elements against displacement.

Other objects, advantages and features of construction and formation of the invention will be understood by reference to the following description and accompanying drawings, wherein:

Fig. 1 is a view of the perforated strip from which the preferred form of the retainer constituting the present invention is made;

Fig. 2 is an edge elevational view thereof;

Fig. 3 is a vertical transverse sectional view taken through the strip when spirally wrapped to produce the retainer wall;

Fig. 4 is a fragmentary transverse sectional view disclosing the ball element socket construction of the retainer wall.

Referring more particularly to the drawings, the die set bearing retainer, as illustrated in Figs. 1 through 4, is formed from a sheet **10** of metal, such as brass, aluminum or mild steel, or it may be formed from one or more of the so-called plastics or plastic-impregnated fibrous material or webbing. The sheet **10** is shown herein as possessing an elongated, rectangular form, having its opposite end regions **11** and **12**, which may be referred to in the completed product as the first and last laps, formed respectively with a multiplicity of relatively closely positioned, spaced openings **13** and **13***a*, the later being of uniform diameter.

The intermediate portions or laps **14** of the sheet are provided with a similar group of openings, as indicated at **15**, the latter being spaced and arranged in the same manner as the openings **13** and **13***a* except that the openings **15** possess a substantially greater diameter than the openings **13** and **13***a*.

In the formation of the retainer, the sheet **10** is first rolled about a cylindrical form, not shown, of desired diameter with the end region or first lap **11** engaged with the form and rolled to correspond with the shape thereof. The intermediate region or lap is then spirally wound thereabout. With a form of proper diameter and the openings **13** and **15** disposed in predetermined relative order, the wrapping or winding of the sheet about the form will cause the larger openings **15** to be brought into transverse axial registry with the openings **13** at the time of such wrapping, the successive laps may be joined by spot-welding, the use of adhesives or by mechanical fasteners before the outer or last lap is folded into cylinder-producing formation. With the outer lap in a flat state, a ball bearing element B is deposited in each aligned pair of openings **13** and **15**. These elements are slightly smaller in diameter than the openings **15** of the intermediate laps but larger than the diameter of the openings **13** of the first lap. After such bearing deposit, the outer or last lap **12** is rolled over and secured in cylinder-forming order on the outermost of the intermediate laps by any suitable means indicated above, thereby confining the ball elements in the sockets provided in the spirally wrapped convolutions of the sheet material comprising the retainer wall structure. The ball elements each possess a diameter in excess of the wall thickness, so that said elements, in the use of the retainer in a press punch and die set, project beyond the inner and outer wall surfaces for simultaneous contact with guide post and bushing surfaces arranged in concentric relation thereto.

In view of the foregoing, it will be evident that the present invention provides a fabricated, multiple layer, cylindrical wall formation for use as an improved bearing retainer in various capacities, as in guide devices for die sets of machine presses. The perforated and laminated wall formation enables the ball elements to be easily, accurately and rapidly inserted in the receiving sockets provided therefor in the wall-forming sheet materials, eliminating the slow and relatively costly process now commonly practiced in the formation of such cylinders, wherein solid-wall metal cylinders are drilled radially to produce openings receiving the bearing elements, the later being then retained in the drilled openings by "stak-

ing" or punching the enlarged outer ends of the openings to deform the material about the same in producing laterally projecting, element-confining fins thereon. Retainers formed in accordance with the present invention may be made from relatively lightweight, inexpensive materials and yet be entirely satisfactory in providing durable devices of ample strength capable of imparting long and satisfactory service. It will be understood that various other constructions and methods of manufacture may be employed within the scope of the following claims.

We claim:

1. A bearing retainer for die sets, comprising: a cylindrical body composed of a spirally convoluted rectangular strip of perforate sheet material, the perforations in said material being so disposed as to provide in the cylindrical body formed thereby a multiplicity of axially aligned openings, the latter forming open-ended, radially extending, ball element-receiving sockets, the perforations formed in the inner and outer convolutions of said strip being smaller in diameter than the perforations contained in the intermediate convolutions thereof, whereby to cause said sockets to be smaller at their ends than intermediately thereof, and a ball element rotatably carried in each of said sockets, each ball element having a diameter less than the diameter of the perforations formed in the intermediate convolutions of said strip and greater than the diameter of the perforations formed in the inner and outer convolutions of said strip and having peripheral segments thereon extending radially inwardly and outwardly from said body, said ball elements being retained against radial removal from said sockets by the edges of said inner and outer convolutions adjacent the perforations formed therein.

2. A ball bearing retainer for die sets comprising a tubular cylindrical body composed of a single spirally wound strip of sheet-like material defining at least three, substantially concentric, radially superposed laminations including an inner lamination, an outer lamination and at least one intermediate lamination disposed radially of said body, each of said laminations being of the same thickness and each being formed substantially throughout its full extent with a multiplicity of relatively spaced circular openings with each opening of each lamination disposed in axial registry with openings of the other laminations, whereby to provide in said body a multiplicity of ball-receiving sockets disposed in circumferential rows and opening radially inwardly and outwardly of said body, the openings formed in the inner and outer laminations of said body being of smaller diameter than the openings of the intermediate lamination; and a spherical ball element rotatably positioned in each of said sockets, each of said ball elements having a diameter slightly less than the diameter of the openings of said intermediate lamination but greater than the diameter of the openings formed in said inner and outer laminations and having peripheral segments thereon extending radially outwardly and inwardly from said body, the edges of said inner and outer laminations defining the openings formed therein serving to retain said ball elements against radial removal from said sockets.

3. The method of making a tubular cylindrical ball bearing retainer which comprises perforating an elongated rectangular strip of sheet-like material to form throughout substantially the full area of said strip a multiplicity of relatively closely spaced cylindrical openings, the openings formed in the opposite end regions of said strip being of smaller diameter than the openings formed in the intermediate region thereof; spirally winding one end region within the intermediate region of said strip to form a tubular, cylindrical, laminated body with the openings formed in said one end region disposed in axial registry with corresponding openings formed in the intermediate region of said strip and with the said one end region of said strip defining the inner wall of said body; placing a spherical ball element having a diameter greater than the diameter of the openings formed in the end regions of said strip, but less than the diameter of the openings in said intermediate region, within the axially registering openings of said one end region and said intermediate region; then winding the opposite end region of said strip around said intermediate region to bring the openings formed in said opposite end region into axial registry with the openings of said first-named end region and said intermediate region and around the ball element positioned therein; and thereafter securing the wound end and intermediate regions together to provide a unitary tubular cylindrical structure with said ball elements held therein against radial removal.

4. The method of making a bearing retainer which comprises perforating a relatively thin rectangular strip of sheet metal to form in the opposite end portions thereof a multiplicity of relatively spaced, cylindrical openings of a predetermined diameter; correspondingly perforating the intermediate portion of said strip between said end portions to provide therein a multiplicity of openings of greater diameter than those formed in said end portion; shaping said perforated strip to form therefrom a tubular cylinder with one end portion of the strip comprising the inner wall formation of said cylinder, the other end portion comprising the outer wall of said cylinder and the intermediate portion of said strip constituting an intervening wall of said cylinder disposed between the inner and outer walls thereof; bringing the openings of said end portions into axial alignment with the openings of said intermediate portion to form in said cylinder a multiplicity of open-ended ball-receiving sockets; placing a spherical ball element of greater diameter than the openings of said end portions, but of lesser diameter than the openings of said intermediate portion, within each of said sockets; and thereafter connecting the end portions of said strip to the intermediate portion thereof to provide a unitary structure and to retain said ball elements therein against radial removal from said cylinder.

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