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Warrington

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[54] **CUSHION POT ANVIL WITH MECHANICAL AND MOLDED JOINT**

[75] Inventor: **Henry G. Warrington,** Palm Beach, Fla.

[73] Assignee: **Vulcan Iron Works Inc.,** Chattanooga, Tenn.

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[52] **U.S. Cl.** **173/131,** 285/22, 403/267

[51] **Int. Cl.** **B25d 17/06,** E02d 7/14

[58] **Field of Search** ..... 173/131; 287/20.2 R; 285/21, 22; 403/267

[56] **References Cited**

UNITED STATES PATENTS

2,666,590	1/1954	Pryor	403/267 X
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Primary Examiner—Ernest R. Purser

[57] **ABSTRACT**

A cushion pot for holding cushioning material on a member such as a pipe cap driven by blows from a reciprocating driving ram of a pile driver comprising a grooved, circular recess formed in the pipe cap member providing a bottom surface of the cushion pot and an upstanding, annular ring having a lower end portion seated in the recess is provided, having an inside surface forming a side wall of the cushion pot. The ring has a tapered, outside surface adapted for centering engagement with the base of the pile driver. Key means is provided for interlocking the ring in the groove of the recess so that if the ring becomes damaged or broken it can be removed and replaced in the field in accordance with the method of the invention.

4 Claims, 3 Drawing Figures

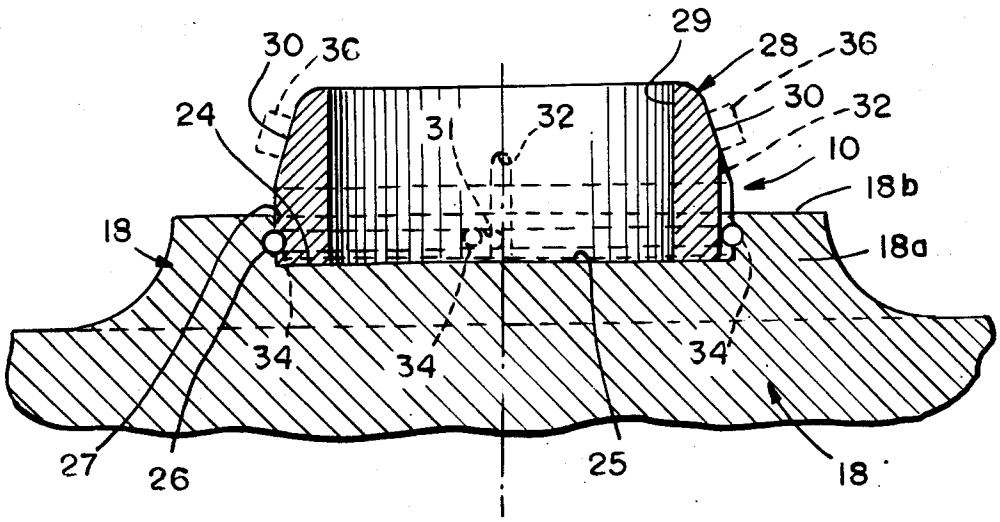


FIG. 1

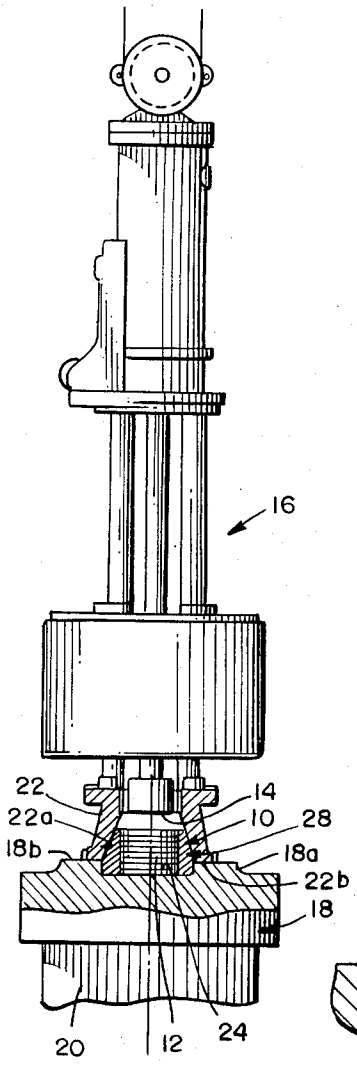


FIG. 3

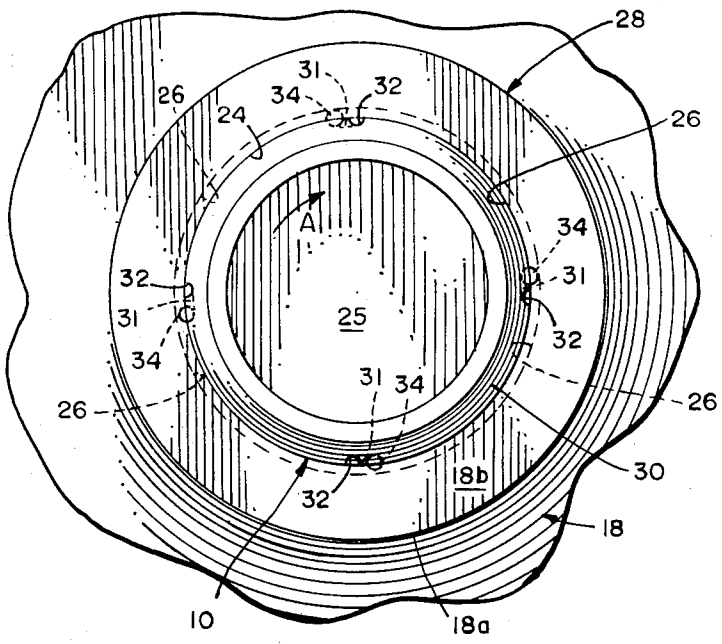
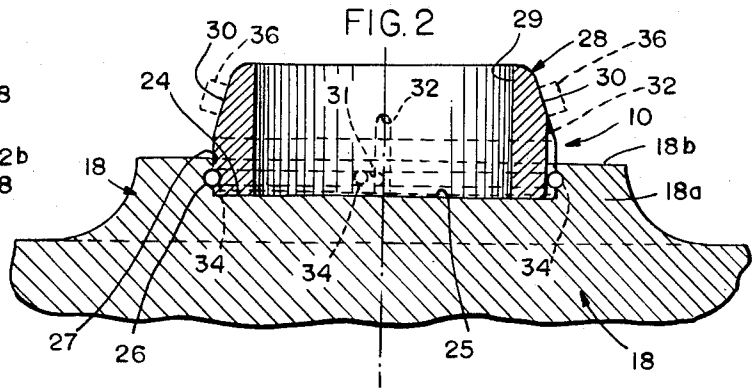


FIG. 2



CUSHION POT ANVIL WITH MECHANICAL AND MOLDED JOINT

The present invention relates to a new and improved cushion pot and method of making the same. The cushion pot is provided for holding or containing one or more layers of cushioning material on a member such as a pipe cap or the like mounted on the upper end of a pipe, pile or piece of shoring to be driven by the reciprocating ram of a pile driving apparatus or percussion hammer.

In accordance with the present invention, the cushion pot forms a cylindrical cup or receptacle for containing one or more layers of resilient cushioning material used for cushioning and distributing the force from the blows received from the ram point of a reciprocating ram of a pile driver or percussion hammer. The ring which forms the side wall of the cushion pot also serves to center or align the base of the pile driving tool on the pipe cap so as to properly align the longitudinal reciprocating axis of the ram with the longitudinal axis of the pipe, casing, or piling which is driven. In the past, pile driving caps have been provided with integrally cast cushion rings for containing the cushioning material and these rings are difficult to repair when they become broken or cracked because of fatigue or a misaligned blow from the ram or pile driver. Once a cushion ring is damaged beyond use, the whole pipe cap is discarded or extensive shop work is required.

Another method of forming cushion pots is to provide a separate, annual ring which is press and/or shrink fitted onto the pile driving cap. However, this arrangement requires considerable factory or machine shop work and is expensive and time consuming, especially when the piles, pipes or shoring members are being driven in remote offshore drilling locations or at relatively inaccessible geographical locations where shops are not readily available. Other means include attaching cushion pot rings to the pipe cap by welding but this method proved in practice to be unsatisfactory because the welding causes internal stresses to be developed in the components generally resulting in relatively earlier fatigue failure or breakage. The present invention provides a means whereby a cushion pot is readily repaired and/or renewed on the job site location with a minimum of cost and time loss.

It is therefore an object of the present invention to provide a new and improved cushion pot used for cushioning the blows from a reciprocating driving ram on a driven cap member or the like.

Another object of the present invention is to provide a new and improved method of making an improved cushion pot as described in the foregoing object.

Still another object of the present invention is to provide a new and improved cushion pot which will permit removal and replacement of the cushion pot ring at a remote job site without requiring the transport of the pipe cap and ring components back to a machine shop for extensive machine work.

Still another object of the present invention is to provide a new and improved cushion pot which enjoys a long useful productive life yet when failure finally does occur, permits ready repair and installation of a new cushion pot with a minimum of down time being required.

Briefly, in accordance with the present invention a new and improved cushion pot includes a grooved, circular recess forming means provided on a pipe cap or the like used for driving pilings, shoring or piping. A separate, upstanding annular ring forms a side wall of the cushion pot and includes a lower end portion adapted to seat in said recess in the pipe cap. The inside surface of the ring forms a side wall for containing the cushioning material of the cushion pot and an outside surface of the ring is tapered and adapted for centering and self-aligning engagement with the base structure of the ram driving means or percussion hammer. The ring is locked in place within the recess on the pipe cap by means of an interlocking key system comprising one or more keeper balls and babbitt metal which is hot poured into confronting grooves on the ring and side wall surface of the recess to form an interlocking key between the ring and pipe cap. When damaged or broken the ring is removed, the babbitt key and keeper balls are withdrawn and a new ring is put in place without welding or machining being required.

For a better understanding the present invention reference should be had to the following detailed description taken in conjunction with the drawings in which:

FIG. **1** is a side elevational view with portions and section showing a new and improved cushion pot in accordance with the present invention in conjunction with a percussion hammer and piling which is driven thereby;

FIG. **2** is an enlarged fragmentary vertical sectional view taken on a diameter through the cushion pot of FIG. **1**;

FIG. **3** is a top plan view looking downwardly on the cushion pot as shown in FIG. **2**.

Referring now more particularly to the drawings, therein is illustrated a new and improved cushion pot constructed in accordance with the features of the present invention and generally referred to by the reference numeral **10.** The cushion pot **10** is adapted to hold and contain one or more layers of resilient cushioning material **12** used for reducing the shock of blows received from the ram point **14** of a percussion hammer or pile driver **16.** The pile driver **16** may be of the type shown in U.S. Pat. No. 3,566,977, which patent is assigned to the same assignee as the present invention, but the cushion pot **10** is also useful with many other types of pile driving or percussion hammer apparatus.

The cushion pot is formed on the upper surface of a pipe cap or top member **18** which is seated on the upper end of a length of piling, piping or shoring which is to be driven by the pile driving apparatus **16.** The pipe cap **18** functions to spread and evenly distribute the driving forces received from the relatively small area ram point **14** and the cushioning material **12** contained in the cushion pot **10** helps distribute this driving pressure in an even, uniform manner over the cross section of the pipe cap **18** to the member being driven.

The percussion hammer or pile driver **16** includes an annular, support base structure **22** in coaxial alignment with the reciprocation axis of the ram **14.** The inside of the base **22** is formed with a frustro-conically tapered surface **22***a* which slopes inwardly and upwardly from a maximum diameter at the undersurface or foot **22***b* of the base.

The upper surface of the pipe cap **18** is formed with an annular boss or upward projection **18***a* having a flat, annular, upper ring face or floor surface **18***b* for sup-

porting the lower end face 22*b* of the pile driver base structure 22 when the pile driver 16 is centered in coaxial alignment with the longitudinal axis of the pipe, shoring or piling 20 to be driven.

In accordance with the present invention, the bottom portion of the cushion pot 10 is formed by a circular recess 24 provided in the upwardly projecting boss 18*a* of the pipe cap 18. The recess includes a circular bottom wall 25 which forms the bottom pressure surface of the cushion pot. The recess includes a cylindrical side wall 27 having an annular groove 26 spaced approximately midway between the bottom wall surface 25 and the upper face 18*b* of the boss. The side wall of the cushion pot 10 comprises a separate annular ring member 28 having a lower end portion adapted to be seated within the circular recess 24 in the pipe cap. The outer diameter of the lower end of the ring is dimensioned to fit snugly within the circular side wall 27 of the recess. The ring is formed with a cylindrical inner bore 29 which provides a side wall containment for the cushioning material 12 in the cushion pot.

In order to guide, align and center the base structure 22 of the pile driving tool or percussion hammer 16 with respect to the pipe cap 18, the upper portion of the outside surface of the annular ring 28 is frusto-conically tapered as at 30. The slope of the tapered surface 30 is the same as that of the frustro-conical inside wall surface 22*a* on the base structure 22 of the pile driver. When the pile driver or percussion hammer 16 is lowered into place on the pipe cap 18 to drive the pile 20, the interfitting frusto-conical inside surface 22*a* and the ring surface 30 insure precise coaxial alignment between the longitudinal axis of the driving tool and the driven pile or pipe member.

In accordance with the present invention, the lower end portion of the ring 28 is formed with a plurality of relatively short circumferentially extending, spaced apart grooves 31 which are aligned on a common radial plane and are adapted to directly confront the annular groove 26 formed in the side wall 27 of the circular recess 24 in the pipe cap. In addition to the short, circumferential grooves 31 the ring 28 also includes a plurality of longitudinally extending grooves 32 on the outside surface, each one of which intersects at right angles of a short circumferential groove 31, as best shown in FIG. 2. The longitudinal or filler grooves 32 are parallel of the central axis of the ring 28 and are equilaterally spaced around the periphery of the ring. The upper end of each filler groove 32 is open and intersects the lower portion of the frustro-conically tapered surface 30. The lower end of the filler grooves 32 are open and communicate with the bottom wall 25 of the recess 24. The annular ring 28 is fixed and keyed to the pipe cap 18 by means of a plurality of spherically shaped keys or keeper balls 34, which balls are dimensioned to closely fit within the confronting grooves 31 on the ring member 28 and the continuous groove 26 formed in the side wall 27 of the recess 24. Preferably the grooves 26, 31 and 32 are semicircular in transverse cross section and are dimensioned with a diameter slightly larger than the diameter of the spherical keys or keeper balls 34 to permit easy insertion of the balls in the grooves.

In accordance with the present invention, when assembling the annular cushion pot ring 28 on the pipe cap 18, the keeper balls are first mounted in place at equilaterally spaced intervals in the groove 26 and are held in place by means of epoxy cement. Each keeper balls is aligned with one of the longitudinal filler grooves 32 in the ring 28 and when the ring member 28 is inserted axially into the recess 24, the balls 34 guide the ring downwardly until the lower end of the ring seats on the bottom surface 25 of the recess. After being fully seated as described, the ring 28 is rotated about its central axis in the direction of the arrow "A" in FIG. 3. Until the keeper balls 34 are forced against the blind end of the circumferential grooves 31, which blind ends are opposite the end intersected by the longitudinal filler grooves 32. When this locking action is finished, the keeper balls 34 key and positively hold the ring 28 in place in the recess 24 of pipe cap 18 to form the completed cushion pot 10 having a cylindrical side wall 29 and a bottom wall 25. Rotation of the ring 28 in the direction of the arrow "A" as aforesaid is aided by a pair of temporary radial lugs provided on the ring 36 for engagement with a wrench or tool used to apply torque to the ring. After the ring is locked in place, the lugs are removed by grinding or the like and the adjacent surface is smoothed so that the guiding surface 30 for aligning the engagement of the pile driver base structure 22 is not hampered. After the ring 28 is inserted and locked in place by rotation as set forth, fluid material in the form of hot babbitt metal is poured into the upper, open end of the several longitudinal filler grooves 32. This molten material flows downwardly in the grooves 32 into the intersecting short circumferential grooves 31 in the ring 28. From these grooves the material flows into the confronting continuous, outer groove 26 formed in the side wall 27 of the recess 24 in the pipe cap forming an almost continuous annular key ring of babbitt metal. When the babbitt metal hardens or solidifies, the keeper balls 34 are locked in position and the babbitt filler material in the filler grooves 32 normally prevents rotation of the ring 28 relative to the pipe cap 18. The babbitt filler in the grooves 26 and 31 prevents upward withdrawal of the ring 28 from the pipe cap 18 unless a force of high magnitude is exerted to shear the keeper balls and filler.

In the event that the ring 28 becomes broken or damaged during usage, the damaged ring may be removed by twisting the ring to shear the babbitt keys and align the balls 34 with the vertical grooves 32. The ring is then removed by an axial force exerted upwardly which shears the babbitt keys. A new ring is then inserted in place in the field without requiring the pipe cap to be returned to the shop or factory. Once the broken or damaged ring is removed from the recess 24, any remaining fragments of babbitt material are cleaned out of the grooves and a new or repaired ring is reinserted in accordance with the method just described. Because babbitt material has a relatively low melting point, it can readily be heated to a molten state for housing on job site location by a welding torch or the like. The torch can also be used to aid in cleaning out the old babbitt fragments of the previous key ring before a new or repaired ring 28 is installed. The babbitt keys are relatively low in shear stress and permit a damaged ring to be removed without the excessive forces required by a press fit arrangement. From the foregoing it will be seen that a cushion pot in accordance with the present invention provides many advantages over an integrally cast cushion ring or a ring attached by welding. Moreover, removing, installing and repairing the cushion pot can be accomplished on the job site in a short time and

thus does not require extensive down time or machine shop work.

Although the present invention has been described with reference to a single illustrative embodiment thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A cushion pot for holding cushioning material on a cap member driven by blows from a reciprocating driving ram, said cap member including a cylindrical recess having a circular bottom wall for said pot and an upstanding side wall with an annular groove therein spaced above said bottom wall, an upstanding annular ring forming a side wall of said cushion pot and having a lower end portion seated in said cylindrical recess, said ring having an outside wall surface adapted for centering engagement with a ram driving means, and having at least one groove of short length formed therein to face in abutting relationship with said groove in said cap member to form a key slot of circular cross section, at least one upstanding filler groove in said outer surface of said ring angularly intersecting said short length groove and open at its upper end, and key means for interlocking said ring in said recess including one or more spherical balls seated in said key slot against one end of said short length groove and holding means in said key slot for maintaining said ball against said one end of said short length groove.

2. A cushion pot as set forth in claim 1 wherein said holding means comprises metal filler means poured into said key slot from the open end of said upstanding groove in liquid form for hardening in holding engagement against said ball.

3. A cushion pot as set forth in claim 2 wherein said ring is formed with a plurality of said upstanding grooves circumferentially spaced apart, and a plurality of said short length grooves aligned on a common center plane with said groove of said cap member and sapced apart end to end each of said upstanding grooves intersecting one of said short length grooves at an end opposite said one end thereof.

4. A cushion pot as set forth in claim 3 wherein said outside centering surface of said ring is frustroconically tapered, said upstanding grooves extending between said open end defined on said frustro-conically tapered surface and a radial lower end surface of said ring.

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