This invention relates to a device for hanging a string of tubing in a well, especially an oil well. More particularly, the invention relates to such a hanger by the aid of which the tubing may be rotated about its axis.

Devices are known in the prior art, which support a string of well tubing for rotary movement about its axis. Such movement may serve to control a valve in the tubing strings, or to distribute wear or damage of the tubing, as caused, for example, by sucker rods in a pumping well, or by electrolysis, about the tubing wall, materially increasing the life of the tubing.

It is an object of this invention to provide an improved device of this character.

It is another object of this invention to provide such a device having a low overall height, whereby the installation of the device is simplified.

It is another object of this invention to provide such a device of simple, rugged construction and having few parts.

It is another object of this invention to provide such a device having an improved arrangement sealing against the escape of well fluid.

It is another object of this invention to provide such a device having a simple mode of operation.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawing:

Figure 1 is an elevation, partly in section, showing the tubing hanger of the invention, installed;

Figure 2 is a cross section, on a reduced scale, taken substantially as indicated by line 2—2 of Figure 1; and

Figure 3 is an enlarged, fragmentary detail section, taken substantially as indicated by line 3—3 of Figure 1.

Referring to the drawing, the rotatable tubing hanger is shown by way of example as incorporated in a tubing head cap, generally indicated by the numeral 1, serving as a closure for a conventional tubing head 2. Thus, the cap 1 includes a base member comprising a circular plate 5 adapted to be secured to the tubing head flange 2—2 by a plurality of bolts 6, and rendered fluid tight therein by suitable packing 7.

The base member 9 has a cylindrical well 8, formed therein as by a wall 9, secured to the base, as by welding 10. A circular opening 11, coaxial with the well 8, extends through the member 5, the opening 11 being of less diameter than the wall 9 so that an annular shoulder 12 is defined about the opening 11 by the wall 9.

A hanger member 14 of tubular form is provided, having a through opening 15 into the lower end of which the upper end of the tubing string T is threadedly secured. The hanger 14 has an intermediate circular flange 16, with cylindrical extensions or hubs 17 and 18 of reduced diameter, respectively above and below the flange 16, thus providing upwardly and downwardly facing surfaces 19 and 20 respectively on opposite sides of the flange 16.

The downwardly facing surface 20 of the flange 16 cooperates with the shoulder 12 to rotatably support the hanger 14 and the tubing string T secured thereto. Since the weight of such tubing is usually of the order of several tons, it is desirable to interpose an antifriction bearing 23 between the surfaces 12 and 20. This bearing 23 is preferably a combined radial and thrust bearing and is shown as comprising a lower race 24 of conventional form, seated within the wall 9 on the shoulder 12. The downwardly facing surface 20 is appropriately formed and hardened to provide the other race, a plurality of balls 25 being provided between the races.

The upper end of the well 8 is provided with a closure 26 secured as by having an annular extension 27 which threadedly engages the wall 9, and additionally, if desired, by welding 28. The lower face 29 of this extension 27 cooperates with the upper surface 19 of the flange 16 to appropriately restrict upward movement of the hanger 14.

The downwardly directed hub 18 of the hanger 14 extends through the opening 11 of the base 5; similarly the upwardly directed hub 17 telescopes within the annular extension 27 of the closure 26. Suitable sealing means, such as rings 30 having a circular cross section and formed for example of synthetic rubber, are provided between the hub 18 and the opening 11, being accommodated for example in grooves 31 in the hub 18. Similar rings 32 are provided to seal between the hub 17 and the extension 27. In this way, escape of fluid from the tubing T or the well casing at the tubing head is prevented, as is likewise the mingling of said fluids.
A ring 33, of similar type, provided in the well 8 and sealing between the outer portion of the surface 28 and the bearing race 24, serves to protect the bearing 23 against loss of lubricant and entrance of foreign matter such as grit or water.

The closure 26 has a tubular upward extension or boss 34, providing an outlet communicating with the passage through the hanger 14. The extension 34 is interiorly and exteriorly threaded for receiving an appropriate conduit or discharge member 35, as shown by way of example, as engaging the interior threads. A portion of the rod string for operating the well pump is shown at 36.

From the foregoing, it will be clear that the hanger 14 is accurately guided for rotation by the upper and lower hubs 11 and 18 and is supported by the anti-friction bearing 23. Thus, the hanger 14, together with the tubing suspended therefrom, can be rotated readily by appropriate operation of the hanger 14. The stationary closure 26 enables connection of the tubing to the discharge conduit or the like in a simple manner and serves additionally to restrain the hanger 14 against upward movement. Further, the overall height of the device is low so that a conventional Christmas tree or other control apparatus can be connected to the device without extensive modification.

For imparting rotary movement to the hanger 14 and tubing T, the hanger flange 16 is provided with a plurality of equi-angularly spaced recesses 37, for receiving a bar or the like insertible through a slot 38 in the wall 9. The spacing of the recesses 37, together with the angular extent of the slot 38, serve to limit the angle by which the tubing is advanced in one operation. Thus, as shown, such advance is limited to increments of 45°.

Means are provided to insure that such angular movement is always in the same direction. Thus, an inclined hole 40 is provided in the annular extension 27, opening through the lower face 29 thereof. A ball 41, accommodated therein is urged downwardly against the upper surface 19 of the flange 16 by a light compression spring 42. When the member 14 is moved in a clockwise direction, as indicated by the arrows in Figures 1 and 3, the ball 41 is urged upwardly to the left in the hole 40, freeing the member 14. If the member 14 is moved slightly in the opposite direction, the ball 41 wedges between the surface 19 and the upper surface of the hole 40 preventing any substantial movement of the member 14.

Obviously, the tubing head cap 1 together with the tubing T may be lifted from the head 2 after removal of the bolts 6, by appropriate means engaging the member 35, or other suitable means secured, by either the internal or external threads on the boss 34, to the closure member 26. If desired, the cap 1 and the tubing may be lifted by an appropriate member (not shown) secured in the upper end of the bore 15 of the hanger 14, as by the threads provided for this purpose. In this way the connections between the structural parts of the cap 1 are not subjected to the weight of the tubing.

I claim:

1. In a hanger hanger: means forming a base with a through opening; means forming a circular well on said base, defining thereon an annular shoulder about said opening; a member rotatably supported on said shoulder, having a through opening adapted to have the upper end of the tubing secured therein, said member having an upwardly facing annular surface; means forming a closure for the upper end of said well, and cooperating with said surface to restrict upward movement of said member, said closure means having an opening communicating with the opening in said member, adapted for connection with a conduit; and means sealing about said member to prevent escape of well fluid, said flange having thereon means engageable to rotate said member, said circular well means having a passage through a wall thereof for driving means to engage said engageable means.

2. A structure as in claim 1 including rotating bearing means between said shoulder and said flange.

3. In a tubing hanger: means forming a base with a through opening; means forming a circular well on said base, defining thereon a shoulder about said opening; a tubular hanger member for supporting the tubing having an intermediate flange within said well, cooperating with said shoulder to rotatably support said member; closure means for the upper end of said well, cooperating with said flange to restrict upward movement of said member, said closure means having an opening communicating with said tubing through said member, adapted for connection with a conduit; and means engaging said flange for preventing reverse movement of said hanger member.

4. In a tubing hanger: means forming a base with a through opening; means forming a circular well on said base, defining thereon a shoulder about said opening; a tubular hanger member for supporting the tubing having an intermediate flange within said well, cooperating with said shoulder to rotatably support said member; closure means for the upper end of said well, cooperating with said flange to restrict upward movement of said member, said closure means having an opening communicating with said tubing through said member, adapted for connection with a conduit; and means engaging said flange for preventing reverse movement of said hanger member.

5. In a tubing hanger: means forming a base having a circular through opening; means forming a circular well on said base, defining thereon an annular shoulder about said opening; a member rotatably supported on said shoulder, having a through opening adapted to have the upper end of the tubing secured therein, said member having an upwardly facing annular surface; means forming a closure for the upper end of said well, and cooperating with said surface to restrict upward movement of said member, said closure means having an opening communicating with the opening in said member, adapted for connection with a conduit; and means engaging said flange for preventing reverse movement of said hanger member.

6. In a tubing hanger: means forming a base having a circular through opening; means forming a circular well on said base, defining thereon an annular shoulder about said opening; a mem-
ber rotatably supported on said shoulder, having a through opening adapted to have the upper end of the tubing secured therein, said member having an upwardly facing annular surface; means forming a closure for the upper end of said well, and cooperate with said surface to restrict upward movement of said member, said closure means having an opening communicating with the opening in said member, adapted for connection with a conduit; means sealing between said member and said base; means sealing between said member and said closure means; and engageable means provided on the peripheral wall of said rotatable member for rotation of the latter, said circular well having a passage opposed said engageable means for entrance of driving means to actuate the said engageable means and said rotatable member.

7. In a tubing hanger: means forming a base having a circular through opening; means forming a circular well on said base, defining thereon an annular shoulder about said opening; a member rotatably supported on said shoulder, having a through opening adapted to have the upper end of the tubing secured therein, said member having a downwardly directed hub accommodated in said circular opening and an upwardly facing annular surface; means forming a closure for the upper end of said well, and cooperate with said surface to restrict upward movement of said member, said closure means having an opening communicating with the opening in said member, and adapted for connection with a conduit; means sealing about said hub in the said circular opening; means sealing between said member and said closure forming means; and engageable means provided on the peripheral wall of said rotatable member for rotation of the latter, said circular well having a passage opposed said engageable means for entrance of driving means to actuate the said engageable means and said rotatable member.

8. In a tubing hanger: means forming a base having a circular through opening; means forming a circular well on said base, defining thereon an annular shoulder about said opening; a member rotatably supported on said shoulder, having a through opening adapted to have the upper end of the tubing secured therein, said member having an upwardly directed hub of reduced diameter forming an upwardly facing annular surface; means forming a closure for the upper end of said well having a circular bore for accommodating said hub, as well as an annular face directed downward and cooperating with said annular surface to provide bearing means to restrict upward movement of said member, said closure means having an opening communicating with the opening in said member, and said closure means being adapted for connection with a conduit; sealing means disposed between the outer wall of said hub and the inner wall of said bore; and means sealing between said member and the base.

9. A structure as in claim 8 including engageable means provided on the peripheral wall of said rotatable member for rotation of the latter, said circular well having a passage adjacent said engageable means for engagement of driving means with said engageable means to move said rotatable member.

10. In a tubing hanger: means forming a base having a circular through opening, means forming a circular well on said base defining thereon an annular shoulder about said opening; a tubular member adapted for connection with the upper end of the tubing, having an intermediate circular portion accommodated within the well and cooperating with said shoulder to rotatably support said member, said member having oppositely extending upper and lower hubs of reduced diameter forming upwardly and downwardly facing annular surfaces on the intermediate portion, the downwardly directed hub extending through said opening, said shoulder and downwardly facing annular surface providing cooperating bearing means to position said hanger member; a closure member secured to the upper end of said well, and having a downwardly facing bearing surface cooperating with the upwardly facing surface to restrict upward movement of said member, said closure member having a vertical bore extending upwardly from said downwardly facing bearing surface and receiving the upwardly directed hub, said closure member having an opening communicating with said tubular member; and means sealing between the outer wall of the lower hub of said tubular member and the inner wall of the circular opening through the outer wall of said upper hub of said tubular member and the inner wall of the bore in said closure member.

11. A structure as in claim 10 including engageable means provided around the outer wall of said tubular member for rotation of the latter, said circular well having a passage adjacent said engageable means for reception of actuating means to rotate said tubular member.

12. In a tubing hanger: means forming a base having a circular through opening; means forming a circular well on said base, defining thereon an annular horizontal shoulder about said opening; a tubular member adapted for connection with the upper end of the tubing having an intermediate circular portion with oppositely extending hubs thereon, forming on said intermediate portion, upwardly facing horizontal and downwardly facing annular surfaces, the downwardly facing surface cooperating with said annular shoulder to rotatably support said member; closure forming means for said well providing an annular horizontal shoulder cooperating with the upwardly facing horizontal surface to restrict upward movement of said member, as well as a bore for receiving the upwardly directed hub, said downwardly directed hub extending through said opening, said closure forming means having an opening communicating with said tubing through said member; and sealing means between the outer walls of each of said hubs and the adjacent inner walls of said bore and circular opening.

13. A structure as in claim 12 including engageable means provided around the outer wall of said tubular member for rotation of the latter, said circular well having a passage adjacent said engageable means for reception of actuating means to rotate said tubular member.

14. In a hanger device for tubing; a horizontal base having a central opening; an upstanding well member secured to said base around said opening and leaving a shoulder between said opening and said well member; a tubular hanger member having a body rotatably borne on said shoulder and disposed within said well member, a lower hub for attachment and suspension of said tubing; said lower hub depending on the end of said opening, and an upper hub extending from said body; a closure secured to the upper portion of said well member and having a bore within which said upper hub is disposed, said closure also hav-
ing a downwardly directed face overlying a portion of said body to retain said hanger member on said shoulder, and said closure having attachment means extending above said upper hub for attachment of upper tubing, the interior of said body being in direct communication with said upper tubing and said suspended tubing; packing means disposed between the inner surface of said bore and the outer surface of said upper hub; and packing means between the inner wall of said central opening and the outer surface of said lower hub, said packing means sealing off the bearing between said body member and shoulder from the interior of said hanger member.

15. A hanger device as in claim 14 including engageable means on said body for rotating said hanger member, said well member having an opening therethrough for access of driving means to engage said engageable means to rotate said hanger member.

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