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WELL DRILLING HEAD

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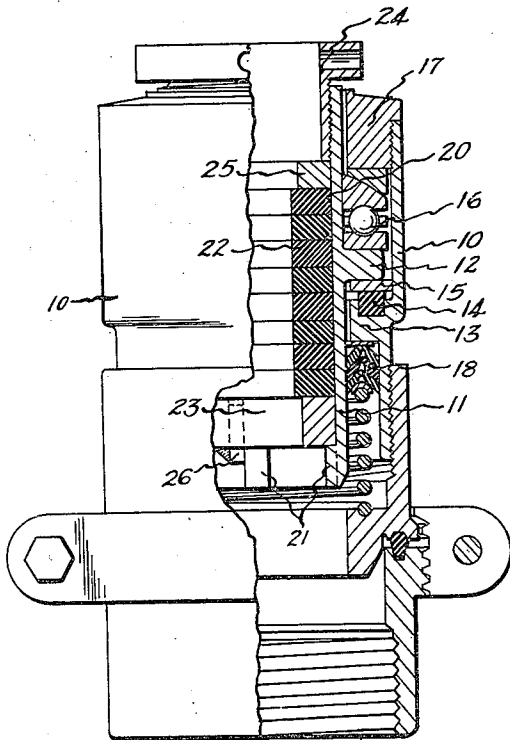


Fig. 1

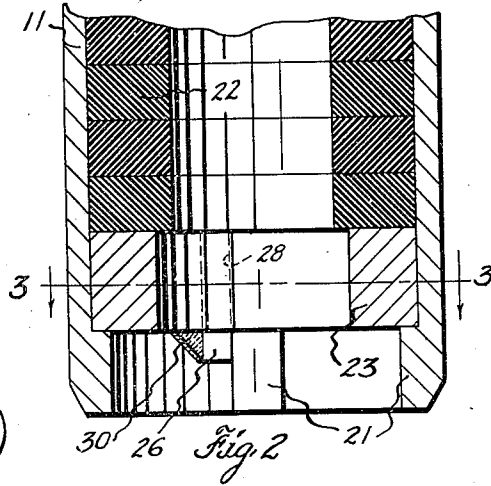


Fig. 2

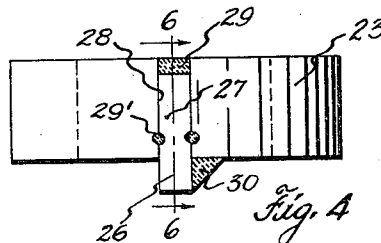


Fig. 4

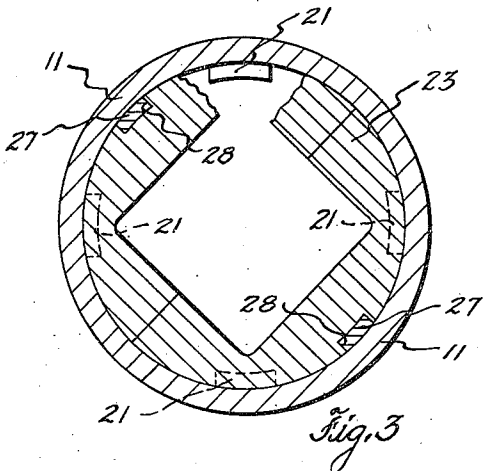


Fig. 3

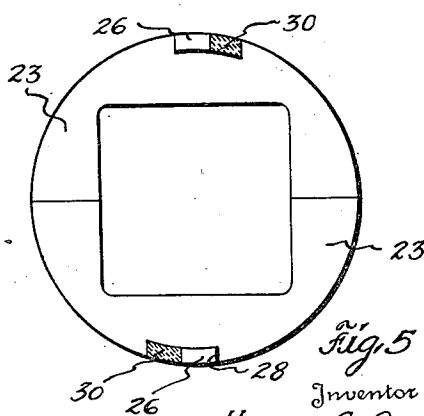


Fig. 5

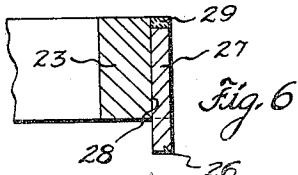


Fig. 6

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WELL DRILLING HEAD

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14 Claims. (Cl. 255—1)

This invention relates to new and useful improvements in well drilling heads.

The present tendency, as is well known, in oil well drilling practice is toward completion under well pressure. This practice necessitates some means of packing off around the drill stem at the surface to maintain the well under pressure during rotation of said stem.

The well drilling heads usually employed include a rotatable member mounted within a non-rotating support. The rotatable member is usually arranged to pack off around the square kelly or other angular drive member to prevent fluid leakage as the same is rotated. Of course, the space between the rotatable member and the stationary support is packed off to prevent fluid leakage therebetween.

This invention has particularly to do with improved drive means for drilling heads of the character described, and one object of the invention is to provide improved drive means for transmitting the rotative motion of the kelly or drill stem, or other angular drive member, to the rotatable member of the head, whereby said member is caused to rotate with and by the angular drive member.

An important object of the invention is to provide improved drive means for transmitting the rotative motion of an angular driving element to the rotatable member of a drilling head of the character described, and which is so constructed that it may be quickly and easily mounted in driving position in the rotatable member without the necessity of close fitting or the alinement of splines or abutments, thus making for simplicity, rapidity and ease of assembly and disassembly.

Another object of the invention is to provide improved drive means of the character described having depending protrusions or lugs adapted to freely engage in amplified recesses in the rotatable member, whereby freedom of movement of the protrusions or lugs within the recesses is provided, and which, while allowing limited lost motion between the drive means and the driven rotatable member, more particularly makes for ready entry of the protrusions or lugs into the said recesses. Such an arrangement has the advantage of permitting the drive means to be readily lowered into the rotatable member and a driving connection established without a tedious matching or registering of driving elements or close interfitting of such elements, as well as providing for rugged structure and rough and fast handling of the parts.

A further object of the invention is to provide

drive means which may be in the form of a collar or bushing having an angular bore to receive an angular driving member, and provided with depending driving elements thus permitting the periphery of said bushing to remain continuous and free of projections or recesses, together with a rotatable head member having a recessed support or spaced supports therein on which the bushing is carried whereby its depending driving elements, freely entering the recesses or between said supporting projections, contribute rotation to said member; and the bushing is relieved of keyed or splined connection with the rotatable member, said bushing and its driving elements having such a loose engagement in the rotatable member as to remove any necessity for aligning or closely matching the parts.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, in which an example of the invention is shown, and wherein:

Figure 1 is a view, partly in elevation and partly in section, of a bushing constructed in accordance with the invention mounted in a well drilling head,

Figure 2 is an enlarged transverse vertical sectional view of the bushing in position in the rotatable member,

Figure 3 is a horizontal cross-sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a side elevation of the bushing,

Figure 5 is an underside view of the same, and

Figure 6 is a partial transverse vertical sectional view taken on the line 6—6 of Figure 4.

In the drawing, the numeral 10 designates a housing or shell forming the stationary member of a drilling head. This housing may be suitably supported or mounted in accordance with the drilling conditions under which it is used. A rotatable driven member or body 11 is mounted within the shell 10, said body being formed with an external annular flange 12 located at substantially mid-height thereof. This flange overhangs an internal flange 13 formed within the bore of the shell 10 and having an embedded elastic packing ring 14 in its upper surface. The flange 12 on the body rests upon a metallic anti-friction ring 15 supported upon the packing 14, whereby the body is suspended within the shell. A bearing assembly 16 is supported on the upper surface of

the flange 12 for permitting free rotation of the body within the shell, being held in place by a gland 24 which is screw-threaded into the upper end of the shell. Any suitable means, such as the packing rings 18, may be employed for packing off the annular space between the lower end of the body and the shell.

While a particular type of drilling head is shown in the drawing, it is to be understood that the invention may be applied to any drilling head for which it is suitable.

The body 11 is provided with a vertical cylindrical bore 20. Within the lower end of the bore of the body are formed a plurality of short internal vertical ribs 21 spaced a substantial distance apart. Located within the bore of the body and spaced above the ribs 21 are a plurality of superimposed elastic packing rings 22. The lowermost packing ring is supported upon a metallic drive bushing or collar 23 which rests on the upper ends of the ribs. The packing rings are held in place by a flanged collar 24 which is screw-threaded into the upper end of the body and engages an annular split metal follower ring 25 resting on the uppermost packing ring. The packing rings and drive bushing are formed with a square or angular bore to snugly engage the surface of a square kelly joint (not shown) or other angular drive element which extends through the body, while the follower ring has an annular bore, permitting its rotation. The bushing and rings are preferably split, whereby they may be more readily engaged around the drive element.

In order to maintain the sealing or packing relation in the head as the kelly is rotated, it is necessary that the body 11 also be rotated. For providing a positive drive for the body, the bushing 23 is equipped with downwardly extending lugs 26 which are arranged to engage the ribs 21 on said body, as is best shown in Figure 2. It will be seen, therefore, that since the angular drive element engages the angular bore of the bushing, rotation of the drive element will, by means of the lugs engaging the ribs, cause rotation of the body within the shell.

The lugs 26 are preferably formed by securing short bars 27 of very strong metal, such as steel, within vertical grooves 28 provided in the outer periphery of the bushing. The bars are so positioned that they extend beyond the lower surface of the bushing to form the lugs, and are welded or otherwise secured within the grooves. It is also preferred that the bars 27 be mounted in the mid-portion of the periphery of each section of the bushing as shown in Figure 3. As best shown in Figures 4 and 5, the bars terminate short of the upper end of the groove and metal welds 29 fill the remainder of the groove and secure the upper ends of the bars within the grooves. Recesses 29' are provided in the contiguous outer surfaces of the bars and bushing for receiving welding material whereby the lower portions of the bars are secured within the grooves. The depending portion of each bar is strengthened by angular braces or fillets 30 formed by welding metal on the side of the bar opposite that normally engaging the ribs 21, thus strengthening the lugs 26 against shearing strain. It is to be noted, however, that the lugs may be formed integral with the bushing if desired.

In assembly, the bushing is placed around the kelly joint and slipped downwardly within the bore 20 of the body. Due to the fact that the ribs 21 are relatively widely spaced within the

bore of the body, it will be seen that the lugs on the bushing can be quickly and easily inserted therebetween, requiring no tedious and accurate alignment or matching of parts in such assembly. The bushing rests upon the upper ends of the ribs and is held in position thereon by means of the packing rings and gland 25.

It will be seen that the arrangement of the lugs and ribs makes for ruggedness and economy in manufacture since it is not necessary to provide accurately fitting parts. Obviously, a sturdy, efficient and positive drive is provided for rotating the body within the shell.

While the body 11 is shown as having four ribs, and the drive bushing is shown with two depending lugs, it is to be understood that any structure suitable for the purpose may be employed.

It is preferable, however, that the number of spaces provided on the rotatable body, for receiving the lugs depending from the drive bushing, be greater than the number of lugs on said bushing. Such an arrangement permits ready entrance of the lugs into the spaces, yet reduces the rotative motion of the bushing before it engages the ribs to rotate the body.

By embedding the bars 27 in the cylindrical surface or face of the bushing its periphery is made continuous and this permits the bore of the body to be made continuous and free from recesses or projections opposite the face of the bushing, which makes for easy and free positioning of the bushing within the bore of the body. The ribs 21, being spaced a considerable distance apart, form recesses therebetween which are of such size as to provide ample room for the entrance of the lugs 26, and usually the lugs will miss the tops of the ribs when the bushing is inserted into the bore of the body, thus permitting the bushing to be engaged within the body over a wide amplitude of rotative angular variation. The elimination of key fitting or splined engagement between the bushing and the rotatable body is essential as it avoids intricate machining and weakening of the structure, as well as the necessity of aligning the keys or splines with their seats.

When the kelly or drive member is raised, the collar or sub at its lower end strikes the underside of the bushing. Since the bushing is held in position by the elastic packing rings thereabove, it will be seen that an upward movement or yielding of the bushing may take place when so engaged or struck by the drive member, thus providing a shock-absorbing or cushioning effect.

What I claim and desire to secure by Letters Patent is:

1. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving medium for said member engaging in the bore of the member and provided with a bore for receiving a driving element which is slidable through said medium, and projections depending from said medium and freely engaging in the amplified recesses of the rotatable member, whereby said medium may be freely engaged in said member over a comparatively wide amplitude of angular variation.

2. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving medium for said member engaging in the bore of the member and having a loose mounting therein and provided with a bore for receiving a driving element which is slidable through said medium, and projections depending from said medium and freely engaging in the

amplified recesses of the rotatable member, whereby said medium may be freely engaged in said member over a comparatively wide amplitude of angular variation.

3. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving medium for said member engaging in the bore of the member and having a loose mounting therein above the recesses thereof and provided with a bore for receiving a driving element which is slidable through said medium, and projections depending from said medium and freely engaging in the amplified recesses of the rotatable member, whereby said medium may be freely engaged in said member over a comparatively wide amplitude of angular variation.

4. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving medium for said member engaging in the bore of the member and having a loose mounting therein above the recesses thereof and provided with a bore for receiving a driving element which is slidable through said medium, and widely spaced projections depending from said medium and freely engaging in the amplified recesses of the rotatable member, whereby said medium may be freely engaged in said member over a comparatively wide amplitude of angular variation.

5. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving bushing for said member engaging in the bore of the member and having a loose mounting therein above the recesses thereof and provided with a bore for receiving a driving element which is slidable through said bushing, and widely spaced projections depending from said bushing and freely engaging in the amplified recesses of the rotatable member, whereby said bushing may be freely engaged in said member over a comparatively wide amplitude of angular variation.

6. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving bushing for said member engaging in the bore of the member and having a loose mounting therein above the recesses thereof and provided with a bore for receiving a driving element which is slidable through said bushing, and widely spaced lugs depending from said bushing and freely engaging in the amplified recesses of the rotatable member, whereby said bushing may be freely engaged in said member over a comparatively wide amplitude of angular variation.

7. The combination with a rotatable drilling head member having amplified recesses in its bore, of a driving medium for said member engaging in the bore of the member and provided with a bore for receiving a driving element which is slidable through said medium, and projections depending from said medium and freely engaging in the amplified recesses of the rotatable member, whereby said medium is free to undergo a limited rotative movement in said member.

8. The combination with a rotatable drilling head member having spaced ribs within its bore, of a driving medium for said member engaging in the bore of the member and provided with a bore for receiving a driving element which is slidable through said medium, and widely spaced projections depending from said medium and freely engaging in the space between the ribs on the rotatable member, whereby said medium may be freely engaged in said member over a comparatively wide amplitude of angular variation.

9. The combination with a rotatable drilling head member having spaced ribs within its bore, of an annular bushing loosely fitting in the bore of the member and resting on the ribs, and widely spaced lugs depending from said bushing, said lugs being considerably less in width than the spaces between the ribs on the rotatable member and freely engaging in the space between said ribs, whereby said bushing may be freely engaged in said member over a comparatively wide amplitude of angular variation.

10. As a sub-combination in a drilling head a drive bushing including, an annular member having an angular bore and a continuous cylindrical face, and widely spaced lugs depending from the underside of said member.

11. As a sub-combination in a drilling head a drive bushing including, an annular member having an angular bore and a continuous cylindrical face, and widely spaced lugs depending from the underside of said member within the circumference of the member.

12. As a sub-combination in a drilling head a drive bushing including, an annular member having an angular bore and having widely spaced grooves formed in its peripheral face, and bars mounted in the grooves and extending below the underside of said member to form depending lugs, said bars being so positioned within the grooves as to have their outer surfaces substantially flush with the face of the annular member whereby a continuous surface is formed.

13. As a sub-combination in a drilling head a drive bushing including, a split annular member having an angular bore and having widely spaced grooves formed in its peripheral face, bars mounted in the grooves and extending below the underside of said member to form depending lugs and having their outer surfaces flush with the face of said member, and bracing fillets welded against one side of each lug and the underside of the member.

14. The combination with a rotatable drilling head member, of a driving medium mounted in the bore of said member and having driving connection therewith, said medium having an angular bore for receiving a driving element and a yieldable packing mounted in the bore of the rotatable member for engaging a driving element and sustaining the upward thrust of the driving medium when the latter is raised by the driving element.

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