May 3, 1932. E. E. GREVE 1,856,479

SLIP FOR ROTARY DRILLING MACHINES

Filed Dec. 19, 1929

Fig. 1.

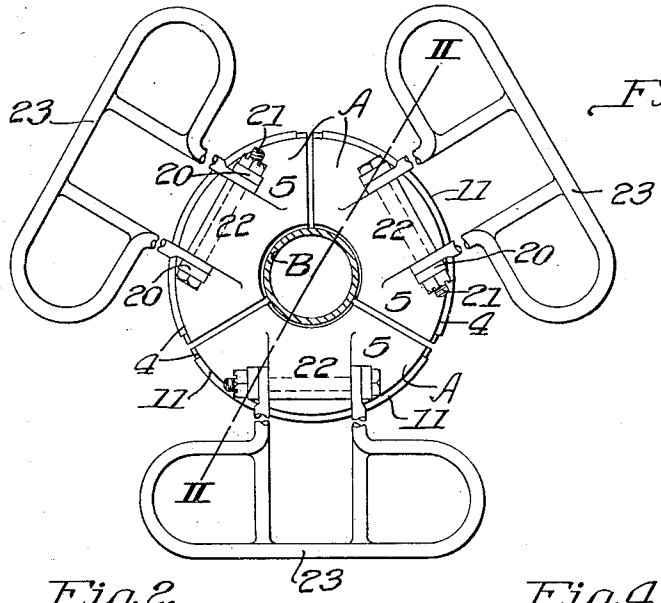


Fig. 2.

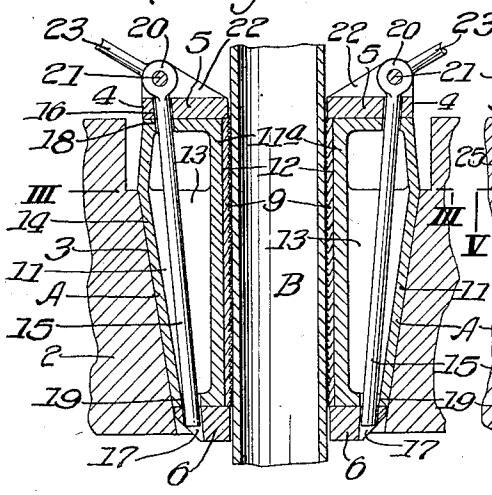


Fig. 4.

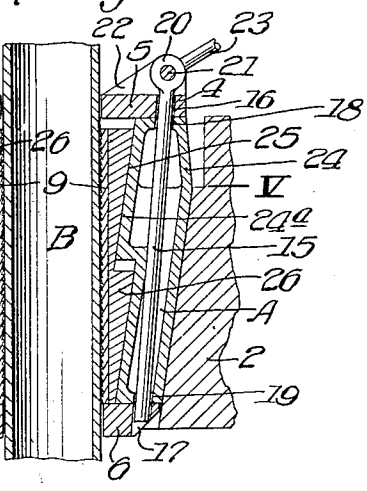


Fig. 3.

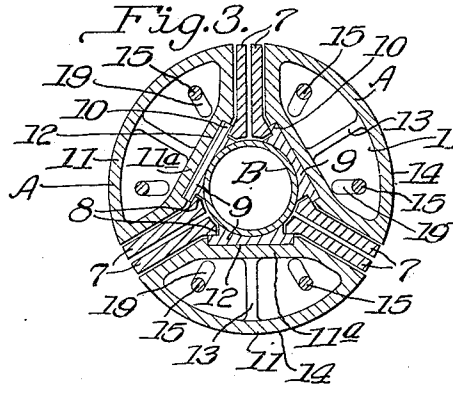
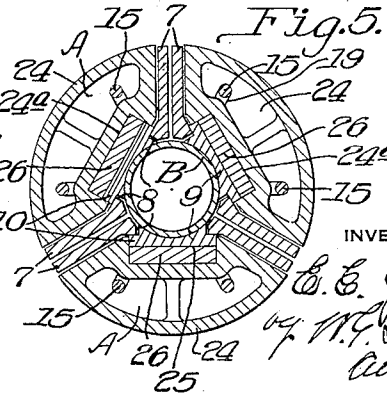


Fig. 5.



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UNITED STATES PATENT OFFICE

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SLIP FOR ROTARY DRILLING MACHINES

Application filed December 19, 1929. Serial No. 415,248.

This invention relates to improvements in slips particularly designed for use in rotary drilling machines for suspending drill pipe casing, tubing and the like.

As is well known in the art of rotary drilling, slips of the character to which this invention relates are employed in connection with a spider or bushing disposed in the rotary table of the rotary drilling machine, and in illustrating an application of my invention, I have shown a portion of a bushing or spider of a rotary into which the slips are introduced and from which they may be readily removed.

The suspended drill pipe or the like may be of enormous weight; consequently, the slips and cooperating parts must be very strong and durable. The present invention relates to that type of slips commercially known as separable liner slips, i. e., slips including a pipe contacting and/or gripping element that may be renewed or replaced when worn.

I am aware that replaceable liner slips are broadly old. As heretofore constructed, however, such slips have been the cause of considerable trouble when employed, due to many causes; for example, the manner of attaching the replaceable liner to the slip body, the construction of the slip body, the difficulty in applying and removing the liner from the body, and the troubles encountered due to the slips becoming stuck or wedged in the spider.

Among the objects of the present invention are; to provide a strong and efficient replaceable liner slip of the character specified; to provide a new and improved body construction; to provide a construction embodying simple means for detachably securing the liner element to the slip; and to provide a slip construction embodying means for aiding in effecting a removal of the slips from the bushing or spider.

Other objects and advantages of my invention will be hereinafter specifically stated or become apparent from the specification taken in connection with the accompanying drawings, wherein:

Fig. 1 is a top plan view of a series of slips embodying my invention, positioned around a section of tubing;

Fig. 2, a vertical section taken on the line II—II of Fig. 1, showing the slips arranged in a bushing or spider;

Fig. 3, a horizontal section taken on the line III—III of Fig. 2;

Fig. 4, a view similar to Fig. 2, showing a modified form of slip construction; and

Fig. 5, a horizontal section taken on the line V—V of Fig. 4.

Referring to the drawings, 2 designates a portion of a rotary bushing or spider having a downwardly tapering annular slip opening 3 therethrough for receiving a plurality of slips, generally designated A.

These slips, as illustrated and as preferred, are formed of a plurality of parts including, a cage element 4 comprising an open frame-like structure having a top 5, a bottom 6 and side portions 7, all preferably comprising an integral structure. The general configuration of the cage elements is segmentary, as will be readily understood, to enable the slips to be assembled around a section of tubing B or the like, as in Fig. 1. Vertically extending slip liner-receiving openings 8 are provided at the inner portions of the cage members for receiving serrated slip-liners 9, said liners when positioned on the respective cages extend between the top 5 and the bottom 6 of the cage members. Vertical extending lateral projecting flanges 10 are formed on the liners for seating the same in operative position against the side portions 7 of the cage members.

For retaining the slip liners 9 in place and for forming a part of the body of the slips, I provide back or filler elements 11, extending vertically between the top and bottom of the cage members and formed with inner walls 11*a* having vertical recesses 12 therein for receiving the backs of the slip liners 9. (See Fig. 3.) Said elements 11 are preferably hollow in construction and have strengthening ribs 13 and annular outer walls 14, the lower portions of the walls are tapered downwardly at the same angle of inclination as the walls of the opening 3 in the bushing or spider.

To assemble the slips and secure the parts thereof together, I provide a plurality of assembly rods or pins 15 adapted to pass downwardly of the slips through aligned openings 16 and 17 of the cage members 4, and openings 18 and 19 of the filler elements 11. The rods 15 are secured against vertical movement by means of apertured eyes 20 at their upper ends, and bolts 21 secured in bosses 22 projecting upwardly from the cage members 4, said bolts also functioning as a pivotal mounting for the slip handles 23.

From the foregoing description it will be apparent that the slips may be assembled or taken apart for the purpose of renewing the liners 9 by manipulation of the rods or pins 15. When assembled the slips are positioned in or withdrawn from the bushing or spider by means of the handles 23.

To prevent sticking of the slips in the bushing or spider and to facilitate withdrawal therefrom, I have shown a modified slip construction in Figs. 4 and 5 of the drawings. The filler elements 24 thereof are of substantially the same construction and configuration as the filler elements 11, with the addition of a substantially deeper vertically extending recess 24*a*, one wall of which is provided with a downwardly extending divided taper 25, the angle of inclination of said taper being slightly greater than the angle of inclination of the taper of slip-receiving opening 3 of the bushing or spider. Slidably mounted on said taper I provide secondary slip members or supplemental filler members 26, these members are of wedge form and the inner faces are straight to form a backing for the renewable slip liners 9.

It will be noted that the vertical length of the slip members 25 and the liners 9 is slightly less than the distance between the top and bottom portions of the cage members 4, to permit a relative motion between said members and liners and the filler elements 24.

Should the slips become stuck in the spider, a release of the slips from the bushing or spider may be effected by raising the tubing B, thus moving the liners 9 and the members 26 upwardly until the tapers of said members become disengaged from the tapers of their respective filler elements 24, thereby releasing the outward pressure of the slips upon the walls of the bushing or spider opening 3 to permit withdrawal therefrom.

I claim:

1. In a slip of the character described, a body including a cage element and a filler element, and a replaceable liner positioned between and maintained in position between the cage and the filler element, said cage element comprising an open frame-like structure having top, bottom and side portions.

2. In a slip of the character described, a body including a cage element and a filler element, a replaceable liner positioned between and maintained in position between the cage and the filler element, said cage element comprising an open frame-like structure having top, bottom and side portions, and an assembly rod extending through the filler element and engaging the top and bottom portions of the cage.

3. In a slip of the character described, a body including a cage element and a filler element, a replaceable liner positioned between and maintained in position between the cage and the filler element, said cage element comprising an open frame-like structure having top, bottom and side portions, an assembly rod extending through the filler element and engaging the top and bottom portions of the cage, and connecting means on the top portion of the cage to which the assembly rod is connected.

4. In a slip of the character described, a body including a cage element and a filler element, a replaceable liner positioned between and maintained in position between the cage and the filler element, said cage element comprising an open frame-like structure having top, bottom and side portions, an assembly rod extending through the filler element and engaging the top and bottom portions of the cage, connecting means on the top portion of the cage to which the assembly rod is connected, and a handle pivotally secured to said connecting means.

5. In a slip of the character described, a body including a cage element and a filler element, a replaceable liner for engaging tubing positioned between and maintained in position between the cage and filler elements, and cooperating taper means between the liner and filler element for releasing the slip upon an upward movement of the tubing.

6. In a slip of the character described, a body including a cage element and a filler element, a replaceable liner for engaging tubing positioned between and maintained in position between the cage and filler elements, and cooperating taper means between the liner and filler element for releasing the slip upon an upward movement of the tubing, said taper means including a wedging element.

7. In a slip of the character described, a plurality of segmental cage members, each provided with a mounting for a slip liner, a slip liner mounted on each cage member, and a filler element in each cage member for backing the slip liner.

8. In a slip of the character described, a plurality of segmental cage members, each provided with a mounting for a slip liner, a slip liner mounted on each cage member, a filler element in each cage member, and means for releasably securing each filler element in

position in its respective cage member for backing the slip liner.

9. In a slip of the character described, a plurality of segmental cage members, each provided with a mounting for a slip liner, a slip liner mounted on each cage member for engaging tubing, a filler element in each cage member for backing the slip liner, and a tapered element co-operating with each slip liner whereby the slip releases upon an upward movement of the tubing.

In testimony whereof I affix my signature.

EDGAR E. GREVE.