Dec. 1, 1936. W. W. FOSTER 2,062,705

FRICTION CONTROL FOR PULL LINES

Filed April 11, 1935 2 Sheets-Sheet 1

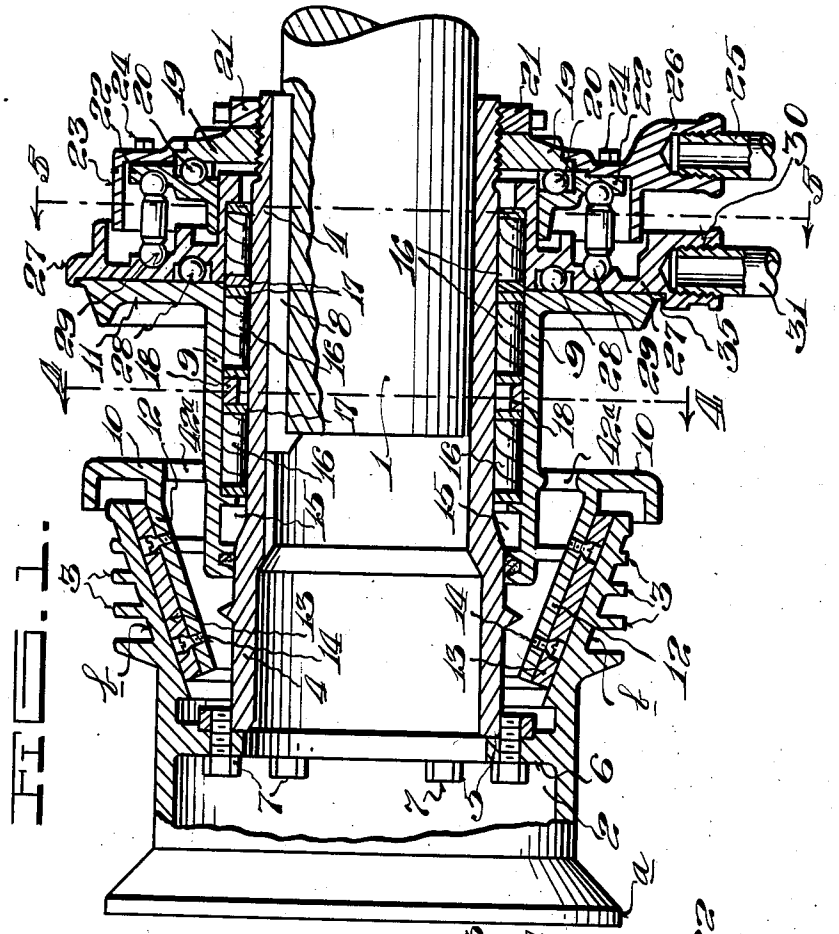


FIG. 1.

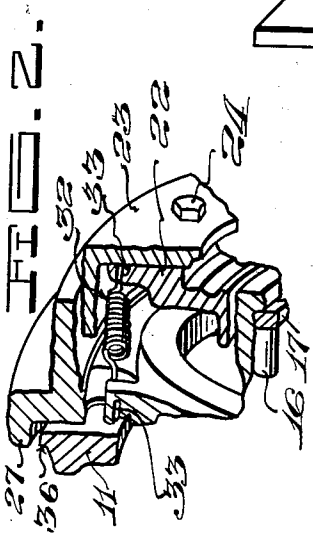


FIG. 3.

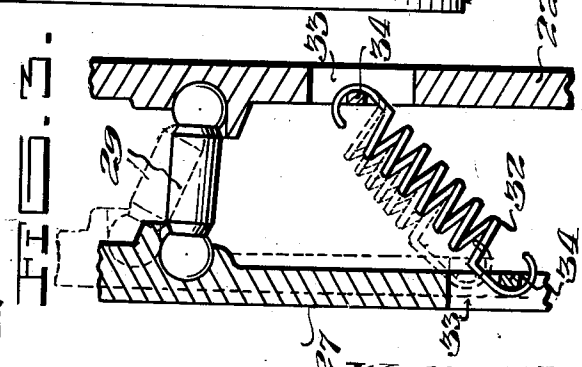


FIG. 2.

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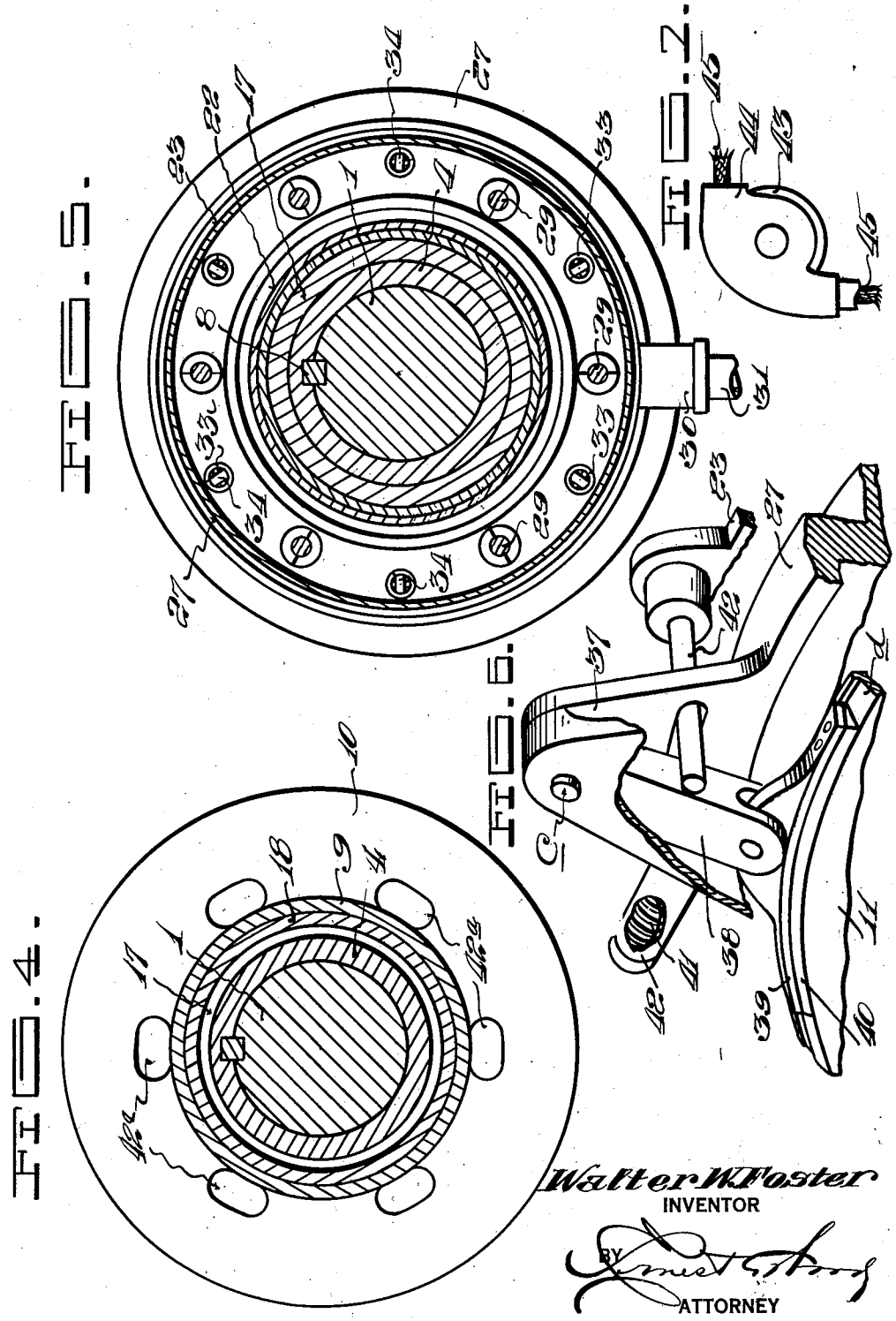
BY

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2,062,705

FRICTION CONTROL FOR PULL LINES

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Application April 11, 1935, Serial No. 15,919

10 Claims. (Cl. 254—187)

This invention relates to well drilling tools and equipment and it has particular reference to certain new and useful improvements in casing spinning apparatus.

The principal object of the invention is to dispense with the expensive and hazardous practice of making up and breaking out casing by the old method of winding a rope about the line shaft spool of the draw-works and thence about the casing joint to frictionally urge the same to rotate. This practice is hazardous inasmuch as workmen frequently become entangled in the line and it is likewise expensive due to the excessive frictional wear to which the rope is subjected.

The invention aims to provide a spinning device designed to operate only when needed and is actuated by a continuously revolving friction element which latter serves likewise in the capacity of a cathead.

Among the foremost objects of the invention is to provide means to urge the normally stationary element into frictional engagement with the revolving friction element to effect rotation also of the stationary element when it is desired to spin a joint of casing. Moreover, the invention provides for automatic return of the normally stationary element to inoperative position.

Another object of the invention is to provide means to prevent continued rotation of the normally stationary or spinning device when it is moved to inoperative position should it have a tendency to do so, due possibly to slight friction at some point in the assembly.

With the foregoing objects as paramount, the invention has particular reference to its salient features of construction and arrangement of parts which will become manifest as the description proceeds, taken in connection with the accompanying drawings, wherein:—

Figure 1 is an elevation in vertical cross-section, with portions partly broken away, showing a spinning device constructed according to the invention.

Figure 2 is a fragmentary perspective view, partly in section showing the specific means for returning the normally stationary element to inoperative position.

Figure 3 is a fragmentary section in elevation, showing the means for advancing as well as the means for returning the normally stationary element to inoperative position.

Figure 4 is a transverse section on lines 4—4 on Figure 1.

Figure 5 is a transverse section on lines 5—5 on Figure 1.

Figure 6 is a detail view with portions broken away, showing the braking means to prevent backward rotation of the normally stationary element, and

Figure 7 is a fragmentary detail view of a line sheath and pulley arrangement, ordinarily associated with the invention for directing the line around the driller's post on the derrick floor.

Continuing with a more detailed description of the drawings, reference is primarily made to Figure 1 in which 1 denotes the end of a conventional draw-works line shaft. During drilling operations, this shaft is continuously rotated and ordinarily carries a spool or cat-head which is keyed to the shaft. This cat-head is, in the present case replaced by the drum or spool 2, having a short outer flange *a* and a longer inner flange *b*, surrounded by fins or ribs 3. Since the inner surface of the flange *b* serves as a brake shoe, in the manner and for the purpose to be later described, it is subjected to friction, thus generating heat, hence the cooling fins 3, above set forth.

A sleeve 4 embraces the end of the shaft 1 and has a flange 5 on its outer end. To this flange is bolted the internal flange 6 of the spool 2 by means of the bolts 7. The sleeve 4, being secured to the shaft 1 by means of the key 8, it rotates therewith as does the spool 2.

A drum 9 surrounds the sleeve 4 and has flanges 10 and 11. The construction of this drum, which functions as the spinning drum, is such that a substantially truncated cone-shaped brake drum 12 is formed integrally with the outside of the flange 10, as shown and is conformably received by the similarly shaped flange *b* of the spool 2, which, as stated previously, functions as a brake shoe. The brake lining 13 is secured by screws or rivets 14 to the outer surface of the brake drum so as to be capable of frictional engagement with the brake shoe or flange *b* when it is desired to effect rotation of the spinner drum 9.

The relationship of the drum 9 and sleeve 4 is such that an annular space 15 is defined and in which are disposed roller bearings 16. Retainer rings 17 are provided at the ends of each group of rollers and a spacer ring 18 separates the retainer rings at the desired points. The bearing chamber 15 is intended also to contain a suitable lubricating medium for the bearings.

The end of the sleeve 4 opposite the spool 2 is exteriorly threaded to receive first, the flat ring 19, receiving the thrust of the ball bearings 20, and second, the retaining nut 21. Since the ring or plate 19 is secured to the shaft 1, it of course rotates therewith and serves as the outer race for the balls 20. The inner race for these balls is provided by the flanged ring 22, entirely enclosed by a flanged member 23 and the outer ball race 19. The flanged ring 22 is secured by bolts 24 to the outer flanged member 23.

The flanged member 23 is required to remain stationary to afford an abutment to receive the thrust when the drum 9 is moved to effect engagement thereof with the revolving element. Accordingly, an anchoring means in the form of a bar or pipe 25 is threaded into a socket 26 carried by the said member 23. The free end of this pipe is secured to some adjacent stationary object to prevent displacement of the member 23.

Spaced inwardly from the member 23 and flanged ring 22 is a peculiarly shaped and flanged element 27 which serves in a capacity similar to that of the ring 22, inasmuch as it affords one race for the ball bearings 28, as well as a socket for the round ended thrust pins 29, the function of which pins will be presently explained.

The element 27 is shown in Figure 1 as having an interiorly threaded socket 30 at some point around its circumference. Into this socket is threaded a pipe or handle 31 for the purpose of oscillating the said element 27. Displacement of element 27 need be but slight since the drum 9 is required to be axially moved only the small distance between the brake drum 12 and shoe to effect frictional engagement of the lining 13 with the shoe.

The thrust pins 29 are normally inclined relative to the surfaces of the element 27 and flanged ring 22, between which the pins are longitudinally interposed in annularly spaced relationship, as shown in Figure 5. In the inclined position of the pins, the drum 9 is stationary and therefore inoperative but by urging the handle 31 to the position shown in Figure 1, the element 27 is oscillated or slightly rotated and since the ends of thrust pins 29 are held against displacement relative to their respective points of securement by sockets on the faces of element 27 and ring 22, the tendency of the pins is to move from the inclined to the horizontal plane as exemplified in Figure 3 and in so doing, the element 27 is urged away from the ring 22, carrying with it the drum 9. Accordingly, engagement is effected between the brake lining and shoe, whereupon the drum 9 revolves in unison with the spool 2, which, it will be remembered, continuously revolves.

The above described action takes place against the resistance of springs 32, whose relationship with the pins 29 is better shown in Figure 5. This figure shows only the apertures 33 in which the springs are connected but in Figures 2 and 3, the position of a spring relative to a pin as shown together with the means for securing the ends of the springs. This means consists of the apertures 33 in both the element 27 and flanged ring 22 and a cross member 34 over which the ends of the springs are looped. Obviously, when the pins urge the drum 9 to operative position, the springs 32 have a tendency to return the elements to inoperative position when the handle 31 is released or returned to its original position. In so doing, a rotative action in a direction opposite to the initial action on the element 27 is obtained, due to the angle at which the springs 32 are disposed.

When the lever is returned to its original position, the element 27 is likewise returned, bringing with it the drum 9, due to the overhanging lip 35, shown adjacent the operating lever or handle 31 in Figure 1. This lip is carried by the element 27 at some point around its circumference and overhangs the narrow annular flange 36, on the drum flange 11. This narrow flange may be seen in Figure 2.

There may be a tendency for the drum 9 and its associated elements to continue to rotate with the shaft 1 after having been returned to inoperative position. To eliminate this tendency, a temporary braking means such as shown in Figure 6 is provided and is comprised of a projecting housing 37, integral with or secured to some point around the circumference of the element 27. In the top of this housing is pivoted an arm 38, at *c* and which arm depends over the beveled periphery *d* of the flange 11 of the drum 9.

A brake shoe 39 carries a lining 40 which engages the beveled periphery *d* of the flange 11 when the spinner drum 9 is idle. This is due to the angularity of the arm 38 with respect to the axis of rotation of the drum flange 11. A spring 41, reposing in a sheath 42 bears upon the pivoted arm 38 urging it to operative position.

When the drum 9 is to be moved to operative position, a pin or other element 42, secured to a stationary part of the assembly, such as the flanged ring 23, affords a stop for the arm 38, which latter is urged to a position to relieve the friction between the shoe lining 40 and beveled periphery *d* of the flange 11. This action is against the resistance of spring 41.

Describing further the cooperative action of pin 42 and arm 38, it will be remembered that rotative movement of the element 27 is limited to a few inches, say the length of the slot in housing 37, (Fig. 6) through which pin 42 extends. When element 27 is rotated by handle 31 in a clockwise direction (Fig. 6), the pin 42, being stationary, will bear against the arm 38 causing it to swing on its pivot *c*, against the spring 41, thereby moving the brake shoe 39 out of frictional engagement with the flange 11 of the drum 9. Simultaneously, such movement of the element 27 will urge the pins 29 (Fig. 3) to relatively parallel positions to force the drum 9 axially toward the spool 2, the drum now being relieved of any braking action. Immediately upon return of element 27 to original position to release drum 9 and spool 2, spring 41 moves the arm 38 toward the vertical which causes the shoe 39 to advance again to engage the drum flange 11.

In securing the pull line to the drum 9, the flange 10 thereof is provided with a series of annularly spaced slots or apertures 42*a*. The end of the line or rope is inserted into one of these apertures and threaded through the remainder alternately and secured by providing a suitable enlargement of conventional design on the extended end. Thus, little strain is imposed upon the rope at its point of securement and it is less likely to break.

In Figure 7 is shown fragmentarily a device by which the pull or jerk line, which is wound upon the spinner drum 9, is directed around the driller's post to the point of operations. Ordinarily, the line extends from the cat-head, past the driller, to the point of operations. The driller and other workmen are often entangled in the line, should breakage occur or possibly due to slippage of the tong and serious injury results.

The device shown in Figure 7 is comprised of the sheave 43 and sheath 44 through which the line 45 is passed. The line comes directly off the drum 9, through the sheath 44 situated above the drum, thence through a similar arrangement at a point approximately midway of the derrick and the line is directed at right angles to the point of operations. Thus, should an accident occur,

the tong will not be jerked in the driller's direction but to one side.

Manifestly, the construction shown is capable of considerable modification and such modification as is considered within the scope and meaning of the appended claims is also considered within the spirit and intent of the invention.

What is claimed is:

1. A drum and friction control for pull lines including a revolving drum and a normally stationary drum capable of axial movement in the direction of said revolving drum and carrying said pull line, friction means carried jointly by said drums for engagement when said latter drum is actuated, stationary flanged means spaced apart on one side of said latter drum, thrust pins interposed longitudinally between said flanged means on a normally inclined plane, means for urging said pins to a position parallel with the axes of said drums collectively to exert pressure on said normally stationary drum to axially move the same and means resisting the action of said thrust pins for returning said drum to its normal position.

2. A drum and friction control for pull lines including a rotatable and a normally stationary drum carrying a pull line and capable of movement into operative frictional engagement with said first drum, a stationary flange spaced from said normally stationary drum, a plurality of annularly spaced and normally inclined thrust pins operatively disposed between said latter drum and said flange, means for displacing said pins collectively to exert a moving force against said latter drum, means for returning said drum to normal position and means to restrain movement of said latter drum when in normal inoperative position.

3. A casing spinning apparatus including a member constrained against other than rotative movement and a drum capable of rotative and longitudinal movement, a stationary flange spaced from said drum, a series of thrust pins operatively disposed between said drum and flange, means for changing the positions of said pins collectively to exert a moving force on said drum to effect frictional engagement of said drum with said rotatable member, means to return said drum to normal position and means to restrain said drum against rotation subsequent to its return to normal position.

4. A casing spinning apparatus including a pair of drums, one of which normally rotates and the other being capable of both rotative movement and axial displacement, the drum displacing means comprising a flange spaced from said latter drum, a series of thrust pins having their ends operatively connected to said flange and said latter drum, means for actuating said pins to relatively parallel positions to exert a force against said drum to effect frictional engagement of said drums and means to effect return of said axially displaceable drum to normal position.

5. In a friction control apparatus, a revolving member and a normally stationary member capable of rotative and axial movement, said members respectively carrying correlated friction means, a stationary flange spaced from said latter member, an oscillatable element interposed between said flange and said latter member, a plurality of thrust pins interposed between said flange and oscillatable element and normally at an angle relative to the rotating axes of said members, means to move said oscillatable element to urge said pins collectively to a position parallel with the axes of said members to effect operative engagement of said friction means and means to return the displaced member to normal position.

6. In a friction clutch, a control means comprising in combination with rotatable members, one of which is normally stationary and capable of axial displacement, a stationary flange and an oscillatable element bearing operatively against said axially displaceable member, annularly spaced and normally inclined pins having their ends connected to said flange and oscillatable element to bear operatively against said axially displaceable member and capable of collective displacement whereby to bring their axes into parallel alignment with the rotating axes of said members to urge said displaceable member into frictional engagement with the companion member for common rotation therewith and means to return said displaceable member to inoperative position.

7. A friction control for pull lines including a normally rotating member and an adjacent member capable of rotative and longitudinal movement, friction means carried jointly by said members for relative engagement to effect rotation of both of said members, an oscillatable and axially movable flange bearing against said longitudinally movable member, a stationary flange, a plurality of normally inclined elements disposed between said flanges and capable of collective displacement to exert a moving force against said axially movable flange to move said longitudinally movable member to bring about engagement of said friction means.

8. A friction control for pull lines including a member constrained against other than rotative movement and a drum capable of rotative and longitudinal movement, a stationary flange spaced from said drum, an oscillatable and axially movable flange disposed between said flange and movable drum to bear against said drum, a series of thrust pins operatively disposed between said drum and oscillatable flange and means to actuate said oscillatable flange for changing the positions of said pins collectively to exert a moving force on said drum to effect frictional engagement of said drum with said rotatable member.

9. A drum and friction control for pull lines including a normally rotating member and a normally stationary member capable of advancement to frictional engagement with said rotating member and carrying a pull line, a stationary flange and a movable flange adjacent said normally stationary member, a plurality of thrust pins having their ends movably connected to said flanges, means for holding said pins in normally inclined position, and means for collectively moving said pins to relatively parallel position to operatively move said movable flange and said normally stationary member.

10. A drum and friction control for pull lines including a normally rotating drum and a normally stationary drum carrying a pull line, an oscillatable flange and an axially movable flange, a series of thrust pins interposed between and spaced annularly about the axis of said flanges, means for normally holding said thrust pins at an angle relative to the axis of said flanges, and means to actuate said oscillatable flange to collectively move said thrust pins to relatively parallel position to move the companion flange and said normally stationary drum, thereby to effect operative engagement of the latter with said normally rotating drum.

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