

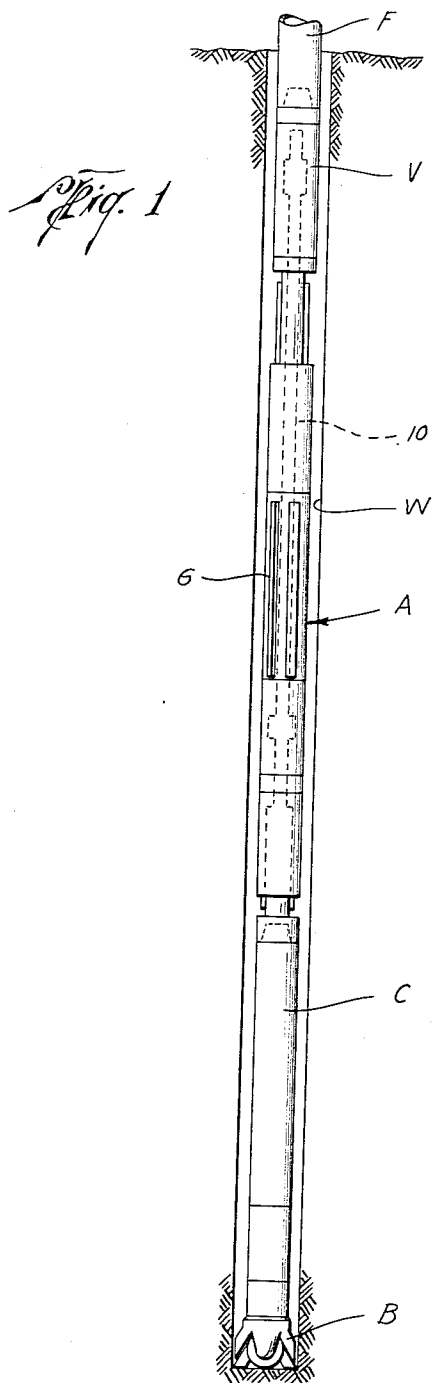
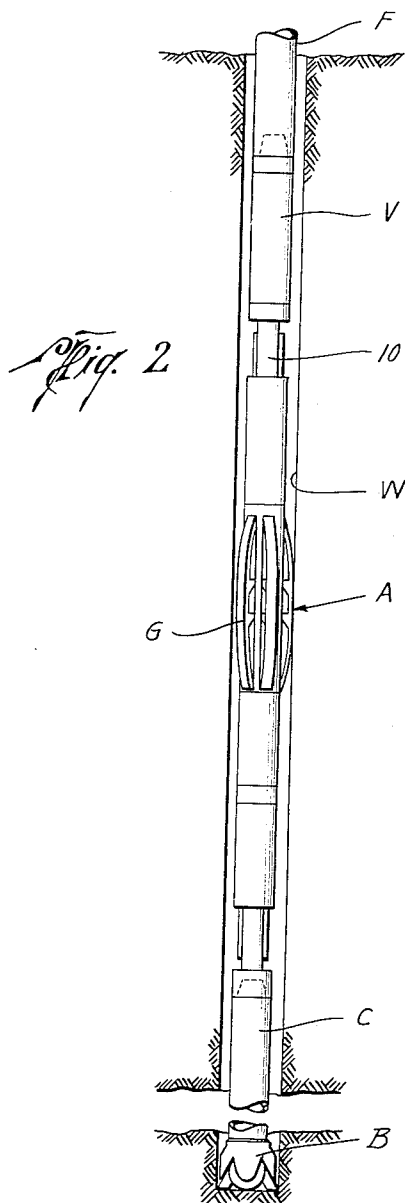
July 12, 1955

R. H. CULLEN ET AL  
TORQUE ARRESTORS

2,712,920

Filed Feb. 16, 1953

4 Sheets-Sheet 1



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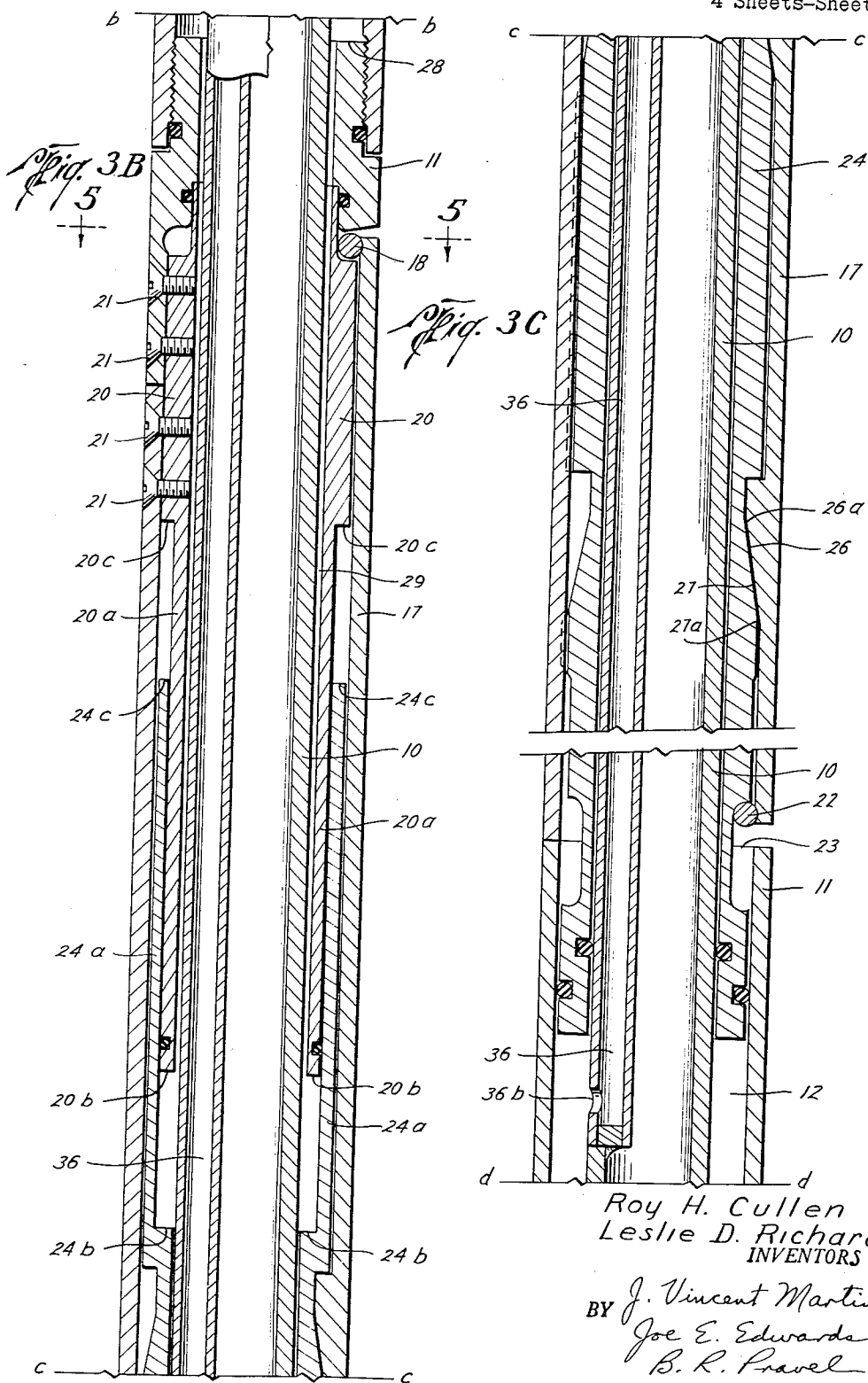
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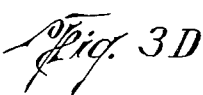
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## TORQUE ARRESTORS

4 Sheets-Sheet 3



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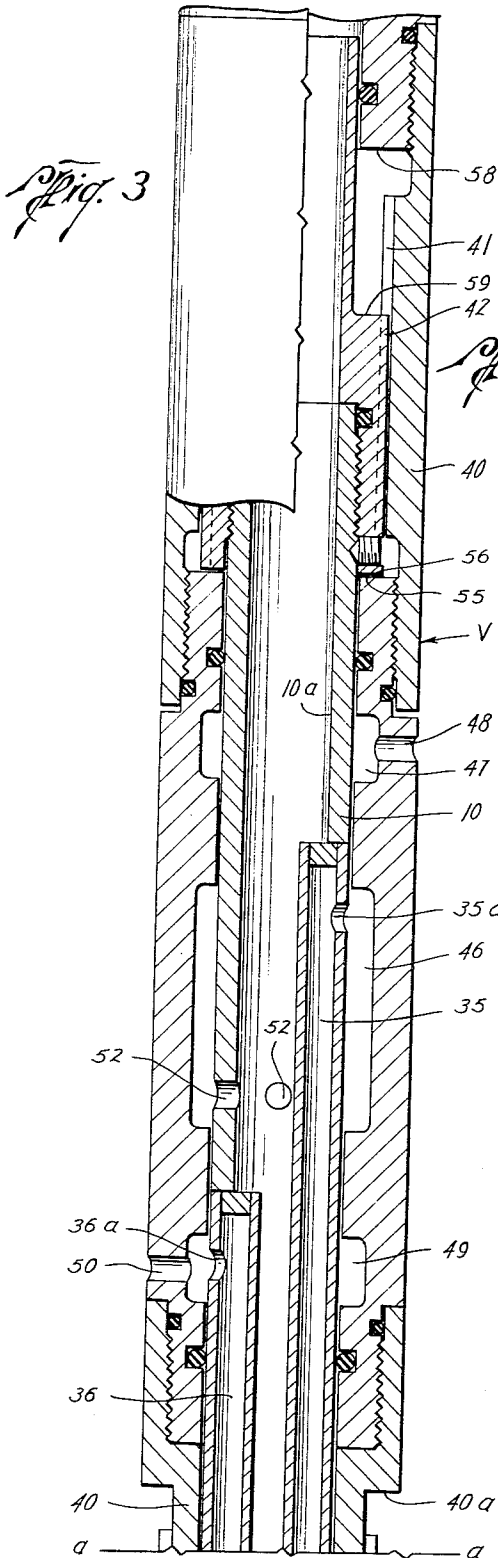
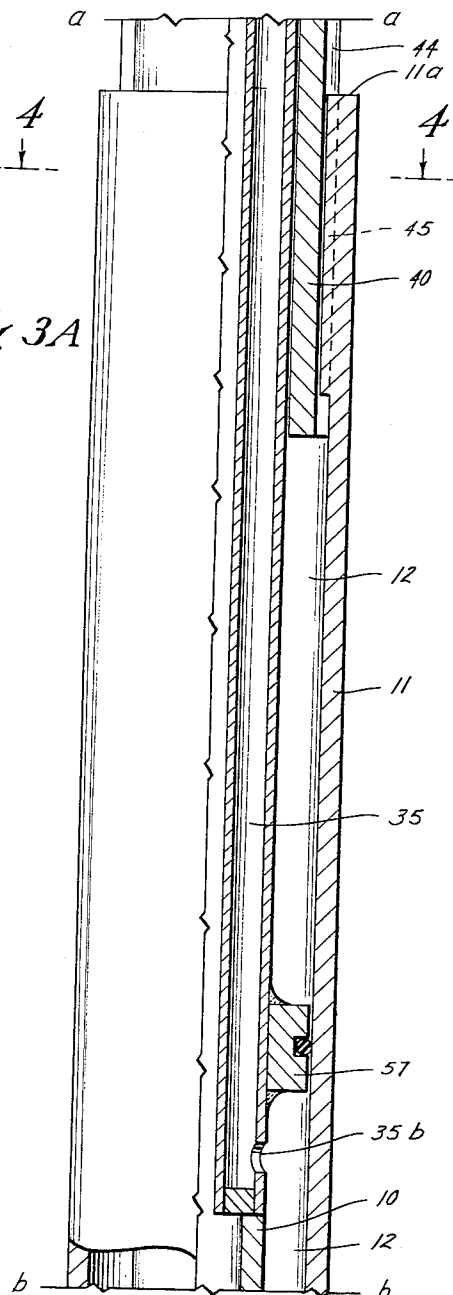
R. H. CULLEN ET AL

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TORQUE ARRESTORS

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4 Sheets-Sheet 4



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2,712,920

## TORQUE ARRESTORS

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Application February 16, 1953, Serial No. 337,197

10 Claims. (Cl. 255—4)

This invention relates to new and useful improvements in torque arrestors.

An object of this invention is to provide an improved torque arrestor for preventing the transmission of the torque or rotation from a rotary drill bit to a flexible support from which the drill bit is suspended to thereby prevent twisting, breakage or other damage to the flexible support while rotating the drill bit during the drilling of a well or the like.

An important object of this invention is to provide an improved torque arrestor which is actuated by fluid under pressure and which can be controlled by the raising and lowering of the support for the arrestor.

Another object of this invention is to provide a torque arrestor which is connected with a flexible support from which a rotary drill bit is suspended to prevent the rotation or torque of the drill bit from being transmitted to the flexible support, said drill bit being rotated by a fluid driven turbine which is operated by fluid under pressure supplied through said support, said arrestor also being actuated by the same fluid under pressure to engage with or release from the wall of the well bore being drilled by the bit, the engagement or release of the arrestor with the wall of the well bore being controlled by lowering or raising of the flexible support.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a reading of the following specifications and by reference to the accompanying drawing forming a part thereof, wherein an example of the invention is shown, and wherein:

Figure 1 is a longitudinal view of the drilling assembly including the torque arrestor of this invention, with the drill bit being positioned at the bottom of a well bore prior to the actuation of the torque arrestor into gripping contact with the wall of the well bore.

Figure 2 is a view similar to Figure 1 and illustrates the torque arrestor with its gripping members in contact with the wall of the well bore and after the drill bit has drilled downwardly with respect to the torque arrestor.

Figures 3, 3-A, 3-B, 3-C and 3-D are views, partly in section and partly in elevation, which illustrate the details of the torque arrestor of this invention, with Figure 3 illustrating the upper portion of the torque arrestor, and Figures 3-A, 3-B, 3-C and 3-D, respectively, illustrating the portion of the torque arrestor below the upper portion shown in Figure 3.

Figure 4 is a horizontal sectional view taken on line 4-4 of Figure 3-A and illustrates particularly the connection of the longitudinal fluid passage tubes in the mandrel.

Figure 5 is a view taken on line 5-5 of Figure 3-B and illustrates particularly the pivotal connection of the gripping members to the torque arrestor body.

In the drawings, the letter A designates generally the torque arrestor of this invention which is part of a drilling

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assembly of the type illustrated in the co-pending U. S. patent application Serial No. 317,652, filed October 30, 1952, and which includes a rotary drill bit B which is rotated by a fluid-driven turbine C, the entire assembly being suspended by a flexible support or conduit (not shown) from the surface of the well bore W. In drilling a well bore with this type of construction, the fluid such as drilling liquid or mud is supplied through the flexible conduit from the surface of the well to the fluid-driven turbine C which drives the rotary drill bit B. The details of the turbine C and the drill bit B are not illustrated since they are of conventional construction and may take numerous forms. Likewise, the flexible conduit is not illustrated since it can be of various materials and construction, but is preferably of a rubber or rubber-like material.

In this invention, the flexible support (not shown) which extends from the surface of the well and supports the drilling assembly has connection at its lower end to drill collars F which in turn are connected to a valve means V. The valve means V is slidably connected to an inner mandrel 10 which extends downwardly from the valve means V through the gripping assembly G and has its lower end connected to the turbine C. As will be explained, the valve means V controls the admission of fluid to the gripping assembly G to actuate the gripping assembly G into contact with the well bore W (Figure 2) and to retract same, the fluid being supplied through the flexible conduit to the mandrel 10. The gripping assembly G when in contact with the wall of the well bore W prevents rotation of the mandrel 10 and due to the connection of the mandrel 10 with the valve means V and the flexible conduit through the drill collars F, rotation of the flexible support is prevented when the drill bit is rotated. By reason of this construction, the rotation or torque from the drill bit B is not transmitted to the flexible support, and the gripping assembly G is automatically moved downwardly by manipulation of the valve V which is controlled by raising and lowering the flexible support.

The details of the torque arrestor of this invention are illustrated in Figures 3-3D. The gripping assembly G of the torque arrestor A includes an outer body or housing 11 which is cylindrical or tubular in construction and surrounds the inner mandrel 10 with an annular space 12 formed therebetween. The housing 11 is keyed at its lower end to the mandrel 10 by longitudinal keys 14 which fit within longitudinal slots 15 on the internal surface of the housing 11, so as to prevent rotational movement of the mandrel 10 with respect to the housing 11, but to permit a relative longitudinal movement between the mandrel 10 and the housing 11. The body 11 has mounted thereon gripping members 17 which in the form of the invention illustrated in the drawing comprises a plurality of flexible elongate gripping bands. Each flexible gripping band 17 has its upper end pivotally connected to the housing 11 by laterally extending pivot pins 18 (Figure 5) which have projections 18a thereon which are confined inside of the housing 11 so as to prevent radial displacement of pivot pins 18 from the housing 11. The inward displacement of the pivot pins 18 is prevented by a sleeve 20 disposed in the annular space 12 and which is secured to the housing 11 by screws 21.

The lower end of each of the flexible gripping bands 17 has a lower pivot pin 22 which is identical in construction with the upper pin 18 and has similar end projections such as 18a which are confined within the housing 11 to prevent outward radial displacement of the end of each gripping band 17. These pins 22 are each disposed in a slot 23 on the external surface of a tubular expander sleeve 24 which is disposed in the annular space 12 below the sleeve 20. The upper end of the expander sleeve 24

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is of a reduced thickness and is indicated at 24a. Such reduced portion 24a on the upper end of the tubular expander sleeve 24 is disposed around a reduced portion 20a of the sleeve 20. By reason of the reduced portion 24a of the expander 24, an internal radial shoulder 24b 5 is formed which is spaced longitudinally with respect to the end 20b of the reduced portion 20a of the sleeve 20. Likewise, the shoulder 20c is spaced longitudinally with respect to the upper end 24c of the reduced portion 24a whereby the reduced portion 24a and the reduced portion 10 20a may telescope during the setting or expansion of the gripping members 17 as will be explained.

Each of the gripping bands 17 has inwardly and upwardly inclined tapered surfaces 26 which co-act with similarly inclined surfaces 27 on the external surface of the expander 24. When fluid under pressure is supplied into the annular space 12 below the expander 24, the expander 24 is moved upwardly relative to the gripping member 17 and the inclined surface 27 acts as a wedge to force the gripping members 17 outwardly with the ends thereof pivoting. This results in a bowing or arching of the gripping bands 17 with the central portion of each band 17 being bowed outwardly while the ends are held by reason of the pivot pins 18 and 22. The pivot pins 22 are in contact with the upper ends of the slot 23 when the gripping bands 17 are retracted, but upon upward movement of the expander 24 the pins 22 will remain stationary and the lower ends of the slots 23 eventually will contact the pins 22. This contact of the pins 22 with the lower ends of the slots 23 occurs at about the same time that the lower end 27a of the inclined surface 27 reaches the upper end 26a of the inclined surfaces 26, so that continued upward movement of the expander 24 after the pins 22 have contacted the bottoms of the slots 23 will effect a continued arching or bowing of the gripping member 17 so that the expanding inclined surfaces 27 and 26 will separate and will move out of contact with each other. The extent of this arching or bowing of the gripping bands 17 will of course depend upon the size or diameter of the well bore and also upon the longitudinal distance between the shoulder 20c and the end 24c or the longitudinal distance of the end 20b and the shoulder 24b. The spacing longitudinally of the shoulder 20c and the end 24c as well as the shoulder 24b and the end 20b prior to their abutment can be varied depending upon the amount which the flexible bands 17 can be arched or bowed without breaking.

The expander sleeve 24 is moved downwardly to retract the gripping members 17 by the application of a fluid pressure on the shoulder 24b, with the fluid being supplied from the annular space 12 above an inwardly extending radial shoulder 28 on the housing 11 and through a reduced annular space 29 extending from such shoulder 28 downwardly inside of the sleeve 20. The fluid under pressure also acts on the shoulder 28 as will be explained, to force the entire housing 11 downwardly with respect to the mandrel 10, after the gripping members 17 have been retracted, and such downward movement of the housing 11 is continued until the stop 30 on the housing 11 contacts the stop shoulder 32 on the mandrel 10. It is in this position with the stop surface 30 contacting the stop shoulder 32 that the parts are in when the drilling assembly is lowered into the well bore. When the drill bit B reaches the bottom of the well bore W, the gripping members 17 are expanded into gripping contact with the wall of the well bore W and thereafter the mandrel 10 can move longitudinally relative to the housing 11 until the radially extending stop member 33 contacts the upper surface 34 of the stop member 31 on the housing 11. The details of operation of this structure will be explained hereinafter.

The fluid under pressure for actuating the gripping member 17 and for retracting same and also for moving the housing 11 downwardly relative to the mandrel 10 when the gripping members 17 are retracted, is supplied

through the flexible conduit (not shown) which is disposed above the drill collars F and which has communication with the bore 10a of the mandrel 10. The mandrel 10 has two longitudinal tubes 35 and 36 each of which is welded or otherwise secured to the mandrel 19 (Figure 4) or are integral or otherwise suitably affixed to the mandrel 10. These longitudinal tubes 35 serve as fluid passages for supplying or relieving fluid under pressure from the gripping assembly G and for this purpose, an upper opening 35a and a lower opening 35b 10 is provided in the external surface of the tube 35 while the upper and lower ends of such tube are closed. Similarly, the upper end of the tube 36 has a radial opening 36a and a lower radial opening 36b while its upper and lower ends are closed.

For controlling the flow of fluid from the interior or bore 10a of the mandrel 10 to the gripping assembly G through the fluid passages 35 and 36, the valve assembly V is provided which includes a valve housing 40 which is keyed or otherwise slidably connected to the mandrel 10. 15 As shown in the drawing, the internal surface of the valve housing 40 has slots 41 therein which receive keys 42 on the external surface of the mandrel 10. This connection with the slot 41 and the key 42 permits relative longitudinal movement between the valve housing 40 and the mandrel 10 while preventing rotational movement therebetween. It will also be observed that the lower end of the valve housing 40 is keyed to the upper end of the gripping assembly body 11 by a key 44 on the external surface of the valve housing and slots 45 on the internal surface of the upper end of the gripping assembly body 11. Thus, the valve assembly V is prevented from rotating relative to the housing 11, but relative longitudinal movement is provided therebetween.

The valve housing 40 has a fluid inlet chamber 46 in its internal surface which is an annular recess. The valve housing 40 also has an upper outlet fluid chamber 47 which is an annular recess and which communicates with an outlet radial port 48. The valve housing 40 also has a lower fluid outlet chamber 49 which is a radial recess and which communicates with a radial port 50 extending through the valve housing 40. The mandrel 10 has one or more radial ports 52 extending therethrough and communicating with the fluid inlet chamber 46.

When the drilling assembly is being lowered into a well bore, prior to the time that the drill bit B hits or lands upon the bottom of the well bore, the weight of the mandrel 10 and the parts connected therebelow, such as the turbine C and the drill bit B, move the parts including the mandrel 10 downwardly relative to the housing 40 50 which is suspended from the flexible conduit extending to the surface of the well. The extent of downward movement of the mandrel 10 with respect to the valve housing 40 is limited by the contact of a radial stop shoulder 55 on the mandrel 10 which abuts against a radial inwardly extending shoulder on the inside of the valve housing 40, such shoulder being designated by the numeral 56. Thus, the mandrel and the parts therebelow hang from the valve body 40 and thus from the flexible conduit during the lowering of the assembly into the well bore. When the parts are in this position, that is, with the radial shoulder 55 of the mandrel 10 hanging on the shoulder 56 of the valve housing 40, the radial opening 52 is in position shown in Figure 3 and is near the lower end of the fluid inlet chamber 46 of the valve housing 40 while the upper opening 35a in the fluid tube 35 is also aligned with the fluid inlet chamber 46. Fluid may therefore be passed downwardly from the flexible conduit into the bore of the mandrel 10 to pass outwardly through the radial ports 52 to the inlet chamber 46 and thence through the opening 35a into the bore of the tube 35. The fluid then continues downwardly through the tube 35 and passes outwardly through the lower opening 35b into the annular space 12 below a radial member 57 and above the shoulder 28. This fluid under pressure therefore 75

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acts on the upper shoulder 28 and passes downwardly through the reduced annular space 29 to act downwardly also on the inwardly radially extending shoulder 24b of the expander 24 so that the gripping members 17 are maintained in a retracted position and the housing 11 is maintained at its lower position with the shoulder 30 resting on the outwardly extending shoulder 32 of the mandrel 10.

It will be observed that when the valve housing 40 is in its lower position with the stop shoulder 55 resting on the stop shoulder 56, and while the tube 35 is in communication with the fluid inlet chamber 46 to retract the gripping member 17, the fluid inlet chamber 36 is positioned with its lower opening 36b in communication with the annular space below the expander 24 and its upper opening 36a in communication with the lower outlet port of chamber 49 and port 50, whereby any fluid which is displaced upon the downward movement of the expander 24 can be forced outwardly through the lower opening 36b and thence upwardly through the tube 36 for discharge through the lower fluid outlet chamber 49 and port 50. It will be appreciated of course that when the drilling assembly is initially lowered into the well bore, the gripping members 17 will not be expanded so that there will actually be no displacement of fluid through the port 50 during such initial lowering.

After the drill bit has reached the bottom of the well bore, the downward movement of the mandrel 10 is likewise stopped and the flexible conduit is continued in its downward movement until the upper radial shoulder 58 on the inside of the valve housing 40 contacts the outwardly radially extending shoulder 59 on the external surface of the mandrel 10. When the valve housing 40 reaches this position, the valve housing 40 has moved downwardly relative to the mandrel 10 so that the opening 35a of the fluid tube 35 is disposed opposite the upper outlet fluid chamber 47, while the opening 36a of the tube 36 is aligned with the fluid inlet chamber 46. The openings 52 in the mandrel 10 move upwardly near the upper end of the fluid chamber 46, but are still in communication therewith. With the openings aligned in such position, the fluid supplied through the bore 10a of the mandrel 10 passes radially outwardly through the openings 52 of the mandrel and into the fluid inlet chamber 46 and thence into the fluid tube 36 through the upper fluid opening 36a. The fluid under pressure continues downwardly through the tube 36 and is discharged into the annular space 12 through the lower opening 36b of the tube 36 to act upwardly on the bottom end of the tubular expander 24. As was previously explained, this upward movement of the tubular expander 24 effects a co-action between the inclined surface 27 on the expander 24 and the inclined surface 26 on the gripping members 17 to effect a bowing or arching of the gripping members 17 into engagement with the wall of the well bore W. When the expander 24 is moved upwardly, the fluid in the annular space 12 above the expander 24 will be forced or displaced upwardly through the inlet lower opening 35b of the tube 35 and thence upwardly through the tube 35 for displacement outwardly through the upper opening 35a into the upper outlet chamber 47 and thence outwardly through the discharge port 48. With the gripping assembly G set with the gripping members 17 engaging the wall of the well bore W, the mandrel 10 is moved downwardly relative to the gripping assembly G by imposing the weight of the drill collars and the flexible conduit on the mandrel 10 and rotating the drill bit B, such downward movement continuing until the shoulder 33 abuts the shoulder 34. The amount that the mandrel 10 moves downwardly with respect to the gripping members depends upon the length of the mandrel which can be varied as desired. Considering that the gripping members have been set with the shoulder 30 resting on the shoulder 32, the length of the mandrel from the radially extending shoulder 33 to the inwardly radially

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extending stop member 34 of the housing 11 will determine the length of travel of the mandrel 10 with respect to the housing and thus will determine the stroke for each setting of the gripping assembly at a selected point in the wall of the well bore. Also, the mandrel 10 will have substantially the same distance between the radial piston member 57 and the shoulder 28 and between the shoulder 40a on the valve housing and the upper end 11a on the gripping assembly body 11. In other words, with the radial shoulder 30 resting on the radial stop member 32, the longitudinal space between the shoulder 33 and the shoulder 34 will be substantially equal to the longitudinal space between the piston member 57 and the radial shoulder 28 and the distance between the radial projection 40a and the upper end 11a of the housing 11, although the distance between the shoulders 33 and 34 is preferably slightly less than the other two distances so that the stop will be effected by the abutment of the shoulder 33 with the shoulder 34. It will be observed that the shoulder 30 will abut with the shoulder 32 prior to the time that the lower end of the housing 11b contacts the upper end 60 of the turbine C or a coupling connecting the turbine C to the mandrel 10 so that the impact will be taken by the stop members 30 and 32 rather than by the end 11b and the shoulder 60 which might damage the spline connection 14 and 15.

Although it is believed that the operation of the device is obvious from the foregoing explanation, the operation is briefly described again. When the drilling assembly is lowered, it is supported from the flexible conduit (not shown) which is connected above and to the drill collars F which serves to add weight in the drilling operation. The mandrel 10 and the parts connected therebelow such as the turbine C and the drill bit B will hang from the valve housing 40 by the contact of the shoulder 55 on the mandrel 10 with the inwardly extending shoulder 56 on the valve housing 40. During the lowering therefore, the fluid inlet chamber 46 is aligned with the outlet 35a so that fluid passing downwardly through the flexible conduit to the bore 10a of the mandrel 10 passes radially outwardly through the radial ports 52 into the fluid inlet chamber 46 and into the tube 35 through the upper opening 35a and thence downwardly through the tube 35 for discharge through the lower opening 35b into the annular space 12. The weight of the mandrel 10 and the parts connected therebelow prevent the upward movement of the mandrel 10 even though the fluid pressure acts against the piston like member 57 which forms the upper end of the piston chamber. The fluid acts downwardly on the inwardly extending radial shoulder 28 of the housing 11 and passes downwardly through the reduced annular space 29 to act on the inwardly extending radial shoulder 24b of the expander sleeve 24 so that the gripping members 17 are held in a retracted position and the housing 11 is maintained in its lower position with the lower shoulder 30 resting on the shoulder 32 of the mandrel 10. When the drill bit B reaches the bottom of the well bore, the downward movement of the bit is of course stopped and this stops the downward movement of the mandrel 10 so that the valve housing 40 can be lowered relative to the mandrel 10 by a continued lowering of the flexible conduit until the shoulder 58 contacts the shoulder 59 on the mandrel 10. When this occurs, the upper opening 36a is aligned with the valve chamber 46 and the upper opening 35a of the tube 35 is moved above the inlet chamber 46 and is aligned with the upper outlet chamber 47. The fluid from the bore of the mandrel 10 then passes radially outwardly through the ports 52 into the inlet chamber 46 and through the opening 36a downwardly through the tubes 36 for discharge into the annular space 12 through the lower opening 36b to force the expander sleeve 24 upwardly. This effects a co-action between the inclined surface 27 on the tubular expander 24 and the similarly inclined tapered surfaces

26 on the gripping members 17 to bow or arch such gripping members 17 radially outwardly into contact with the wall of the well bore to grip same and prevent rotational movement of the housing 11. Since the valve housing 40 is keyed to the mandrel 10 and to the housing 11 and the housing 11 is likewise keyed to the mandrel 10, the gripping of the wall of the well bore with the gripping members 17 prevents rotational movement of all of these parts, but does not prevent longitudinal movement of the mandrel 10 with respect to the housing 11. Neither does it prevent longitudinal movement of the valve housing 40 with respect to the mandrel 10.

Once the gripping members 17 have been set at a particular point in the well bore, then the rotation of the drill bit B by the fluid which drives the turbine C effects a drilling of the well bore downwardly and likewise effects a downward movement of the mandrel 10 and the flexible conduit thereabove relative to the gripping assembly G. The valve V remains in position with the shoulder 58 resting on the shoulder 59 during the downward movement of the mandrel 10 and the flexible conduit. In Figure 2, it can be seen that the gripping assembly G has been set and the drill bit has moved downwardly a portion of the distance of its maximum stroke. The stroke or length of downward movement which can be effected with the gripping assembly set at a particular point in the well bore is determined by the length of the mandrel as previously explained. When the shoulder 33 abuts against the stop member 34 on the housing 11, further downward movement of the drill bit and the mandrel 10 is prevented and it becomes necessary to move the gripping assembly G downwardly to a lower point in the wall of the well bore to effect a further downward drilling. This is accomplished by lifting or raising the flexible conduit to raise the valve housing 40 connected thereto until the shoulder 56 on the valve housing 40 abuts against the shoulder 55 on the mandrel 10. When such abutment occurs, the openings are again aligned with respect to the fluid in the chamber 46 in the position shown in Figure 3 for the release of the gripping member 17 and the downward movement of the housing 11 until the stop member 30 abuts against the shoulder 32. Thus, there is an automatic release of the gripping members and a movement of the entire gripping assembly G downwardly to a lower position at the bottom of the stroke simply by raising up slightly on the flexible conduit to shift the position of the valve housing 40. The gripping assembly G after having reached its lower position with the radial shoulder 30 contacting the shoulder 32, then is in a position to be reset in gripping contact with the wall of the well bore and the cycle of operations can be continued for so long as it is desired to drill downwardly in the well bore. During such lifting or raising of the flexible conduit and the resetting of the assembly G, the drilling with the bit B will actually be stopped instantaneously by raising the bit B temporarily off the bottom of the well bore W, or suspending it in light contact therewith; or, if desired, the pressure of the fluid supplied through the flexible conduit may be reduced so that the bit B is not rotated at all, or only slowly.

Although this invention has been illustrated with a particular type of gripping mechanism including the gripping flexible bands 17, other types of gripping members could be used, or the gripping bands themselves could have thereon gripping teeth or rollers or similar structure for engaging the wall of the well bore.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. A torque arrestor adapted to be connected to a flex-

ible support from which is suspended a rotary drill bit to prevent transmission to the support of rotation or torque of the drill bit during the drilling of a well bore, comprising an inner mandrel, a gripping assembly surrounding said mandrel including gripping members for gripping the wall of a well bore and expander means for expanding said gripping members into gripping contact with the well wall, means connecting said gripping assembly to said mandrel to prevent rotational movement therebetween while permitting relative longitudinal movement therebetween, said mandrel having fluid passage means for establishing fluid communication between the bore of the mandrel and the gripping assembly for supplying fluid under pressure to below said expander means to expand said gripping members into gripping contact with the well wall, said mandrel having other fluid passage means to supply fluid above said expander means to retract same to thereby retract said gripping members from said gripping contact, and a valve means on said flexible support and surrounding said mandrel above said gripping assembly for controlling the flow of fluid between the bore of said mandrel and said gripping assembly upon a longitudinal manipulation of said flexible support to control the expansion and retraction of said gripping members.

2. The structure set forth in claim 1, wherein the gripping assembly includes a tubular body surrounding said mandrel with an annular space formed therebetween, and said expander means includes a tubular expander member disposed in said annular space for co-action with said gripping members upon the application of the fluid under pressure to the expander member.

3. In a drilling assembly having a flexible conduit supporting a fluid-driven turbine and a rotary drill bit therebelow which is rotated by said turbine to drill a well bore, the improvement residing in a torque arrestor mounted between the lower end of the flexible conduit and the turbine, said arrestor comprising an inner hollow mandrel for carrying fluid from said conduit to said turbine, an anchoring assembly surrounding said mandrel and having a slidable non-rotative connection therewith, said anchoring assembly including fluid-actuated gripping members adapted to engage the wall of the well bore and expander means for expanding said gripping members into gripping contact with the well wall, said mandrel having a fluid passage establishing fluid communication between the interior of said mandrel and said anchoring assembly to supply fluid under pressure to said expander means to actuate said gripping members into gripping contact with the wall of the well bore and said mandrel having another fluid passage to supply fluid under pressure to said expander means to retract same to thereby retract said gripping members from said gripping contact.

4. The structure set forth in claim 3, including a valve sleeve surrounding said mandrel above said anchoring assembly for controlling the flow of fluid between the interior of said mandrel and said anchoring assembly to thereby control the actuation of said gripping members, and means for moving said valve sleeve relative to said mandrel to effect such fluid control.

5. The structure set forth in claim 3, including a valve sleeve surrounding said mandrel above said anchoring assembly for controlling the flow of fluid between the interior of said mandrel and said anchoring assembly to thereby control the actuation of said gripping members, said valve sleeve having connection with said flexible conduit for longitudinal movement therewith whereby the control of the fluid flow for actuating and retracting said gripping members is effected by longitudinal movement of said flexible conduit.

6. A torque arrestor adapted to be suspended from a flexible conduit comprising, a valve sleeve having connection with said conduit for longitudinal movement therewith, an inner mandrel depending from and extending into said valve sleeve, means connecting said valve

sleeve to said mandrel to permit limited relative longitudinal movement therebetween, an anchoring assembly surrounding said mandrel below said valve sleeve, means connecting said anchoring assembly to said mandrel to permit relative non-rotative longitudinal movement therebetween, said anchoring assembly including fluid-actuated gripping members for gripping the wall of a well bore while said mandrel is moved downwardly relative to the anchoring assembly, said mandrel having a first fluid passage means for supplying fluid from the interior of said mandrel to said anchoring assembly to actuate said gripping members into gripping engagement with the well wall, said mandrel having a second fluid passage means for supplying fluid from the interior of said mandrel to said anchoring assembly to retract said gripping members out of contact with the well wall, said valve sleeve being movable longitudinally relative to said mandrel by longitudinal movement of said conduit to control fluid flow from the interior of the mandrel to said anchoring assembly through either said first fluid passage means or said second fluid passage means to thereby control the gripping or release of the well wall with said gripping members.

7. The structure set forth in claim 6, wherein said anchoring assembly includes a body surrounding said mandrel with an annular space formed therebetween, flexible gripping bands mounted on said body, with the ends of each band pivotally secured to the body, an expander sleeve disposed in said annular space for bowing said gripping bands outwardly into gripping contact with the well wall upon supplying fluid under pressure through said first fluid passage means to force the expander sleeve longitudinally relative to said gripping bands.

8. In a drilling assembly for drilling a well bore, a rotary drill bit, a fluid-driven turbine connected to and above said bit for rotating same, a torque arrestor connected to and above said turbine, a flexible conduit connected to and above said torque arrestor for conducting fluid to said torque arrestor, said torque arrestor having an anchoring assembly thereon including gripping members for gripping the wall of the well bore, a hollow mandrel extending through the anchoring assembly with a connection therebetween to permit relative longitudinal non-rotative movement therebetween, a first stop means on said mandrel and said anchoring assembly to limit the downward longitudinal movement of the anchoring assembly relative to the mandrel, fluid-actuated retracting means to retract said gripping members and to force said anchoring assembly downwardly relative to said mandrel

until said stop means prevents further downward movement of the anchoring assembly, actuating means for actuating said gripping members into gripping contact with the well wall when said anchoring assembly is at its limit of downward movement relative to the mandrel by the abutment of said stop means, a valve means operable by longitudinal movement of said flexible conduit to control the fluid flow from said flexible conduit to either said retracting means or said actuating means, a second stop means on said mandrel and said anchoring assembly to limit downward movement of said mandrel relative to said anchoring assembly, said mandrel being movable downwardly relative to said anchoring assembly when said gripping members are gripping the well wall until further downward movement is prevented by the abutment of said second stop means, the length of the mandrel from said first stop means to said second stop means being the maximum longitudinal distance which can be drilled with the anchoring assembly gripping the well wall at a particular point.

9. The structure set forth in claim 8, wherein said valve means is slidably connected to said mandrel to control the fluid actuation and release of said gripping members upon relative longitudinal movement of said valve means relative to said mandrel, said valve means having connection with said flexible conduit whereby said relative longitudinal movement of said valve means relative to said mandrel can be effected by longitudinal movement of said flexible conduit.

10. The structure set forth in claim 8, including a first longitudinal tube in said mandrel with openings therein to direct fluid from the bore of said mandrel to said anchoring assembly to actuate the means for retracting the gripping members and for moving the anchoring assembly downwardly, a second longitudinal tube in said mandrel with openings therein to direct fluid from the bore of said mandrel to said anchoring assembly to urge said gripping members into engagement with the well wall, and valve means on said mandrel to close off flow from the bore of the mandrel through said first longitudinal tube and to simultaneously open flow from the bore of the mandrel through said second longitudinal tube.

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