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Mott

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[54] **SURFACE CONTROLLED FLOAT VALVE AND INSIDE BLOWOUT PREVENTER DRILLING TOOL**

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[73] Assignee: **Hydril Company,** Houston, Tex.

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[21] Appl. No.: **359,685**

[52] **U.S. Cl.** **166/73,** 166/224

[51] **Int. Cl.** **E21b 43/12**

[58] **Field of Search** 166/73, 226, 224

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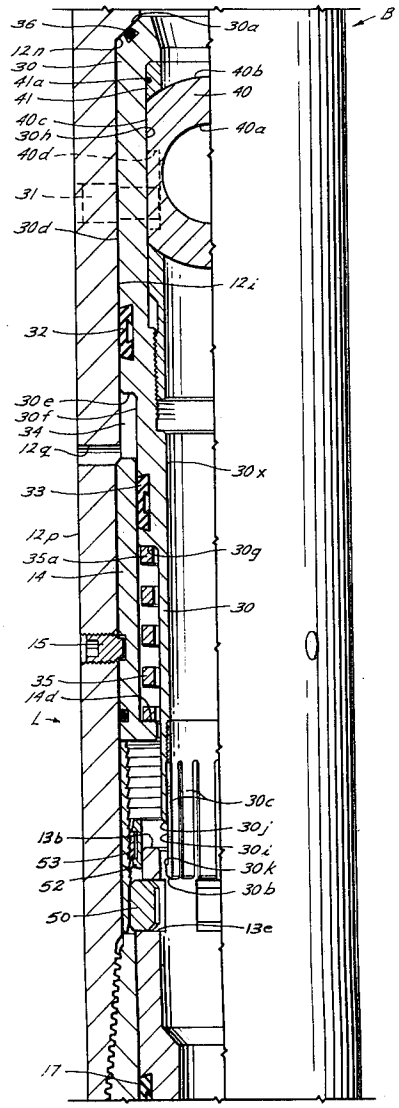
Primary Examiner—James A. Leppink

Attorney, Agent, or Firm—Pravel, Wilson & Matthews

[57] **ABSTRACT**

A full bore opening rotatable ball valve inside blowout preventer well tool adapted for connection in a well conduit to automatically control undesired flow in the bore therethrough and including a releasable locking means for holding the ball valve in open position when running the tool into the well bore and which is released by a predetermined manipulation of the drilling string to enable the well pressure responsive operation of the ball valve.

18 Claims, 10 Drawing Figures



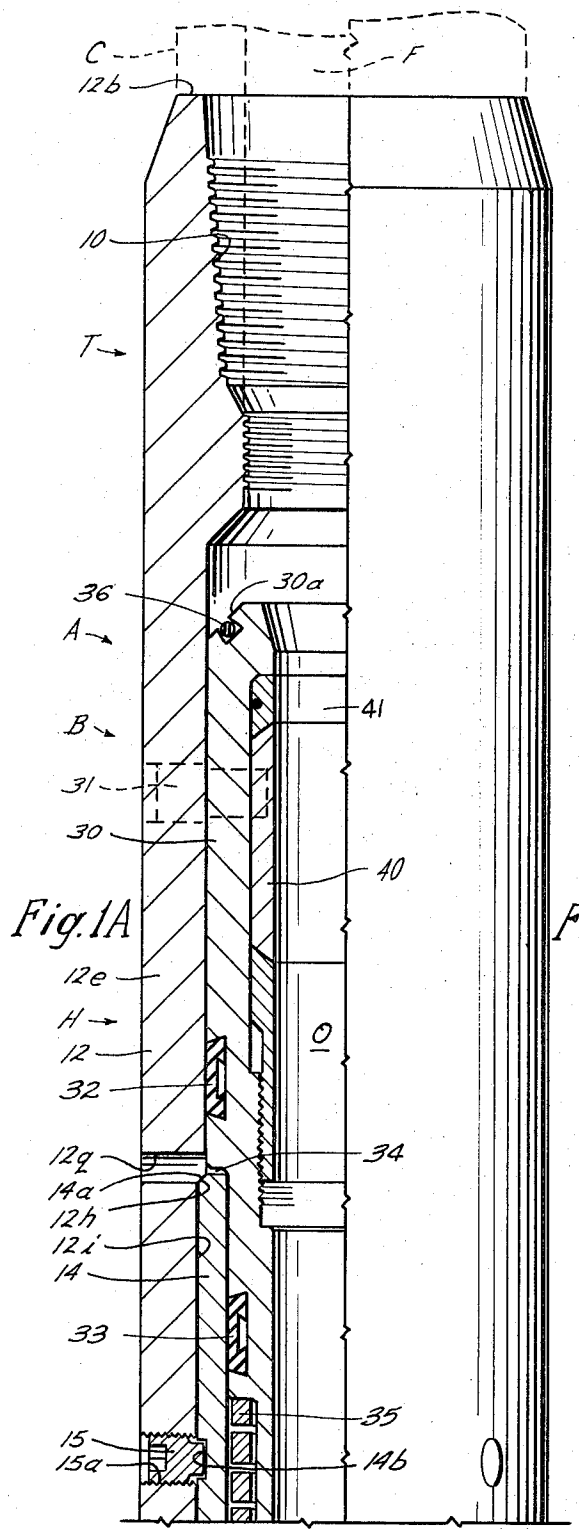

C
F
12b
10
T
36
30a
A
41
B
31
30
40
12e
H
12
32
12g
34
14a
12h
12i
14
33
35
15
15a
14b

Fig. 1A

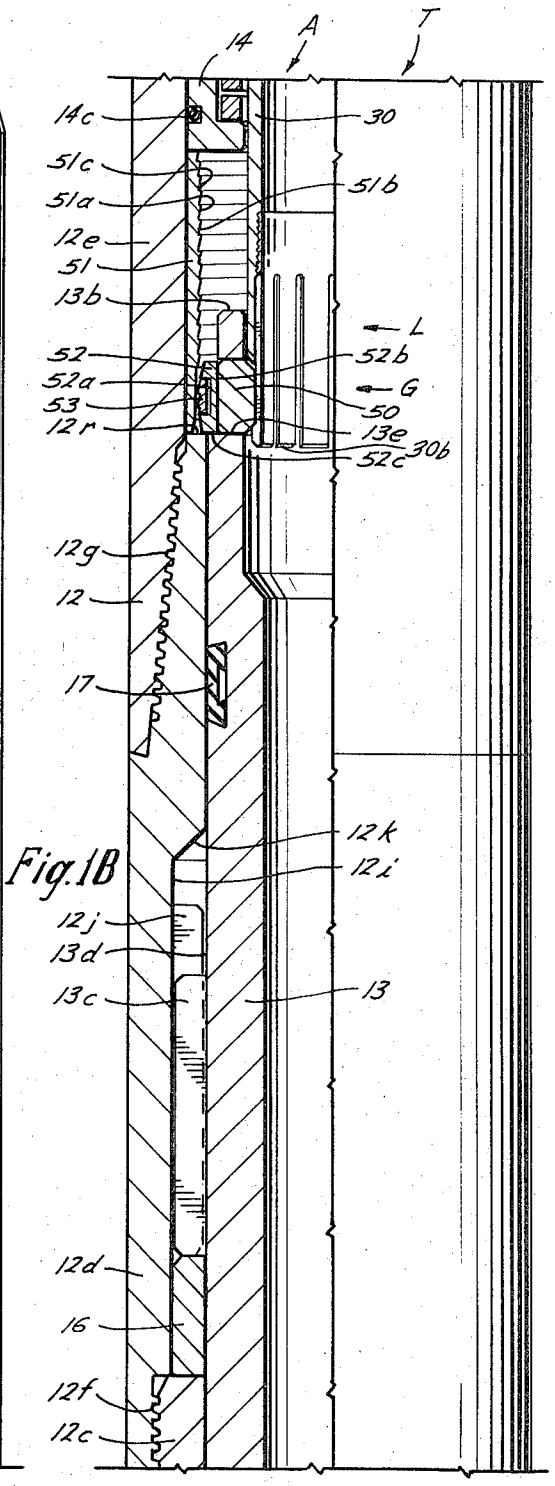

14
A
T
14c
30
51c
51b
51a
12e
51
13b
L
52
52b
52a
G
53
50
12r
13e
52c
30b
12g
12
17
12k
12i
12j
13d
13c
13
12d
16
12f
12c

Fig. 1B

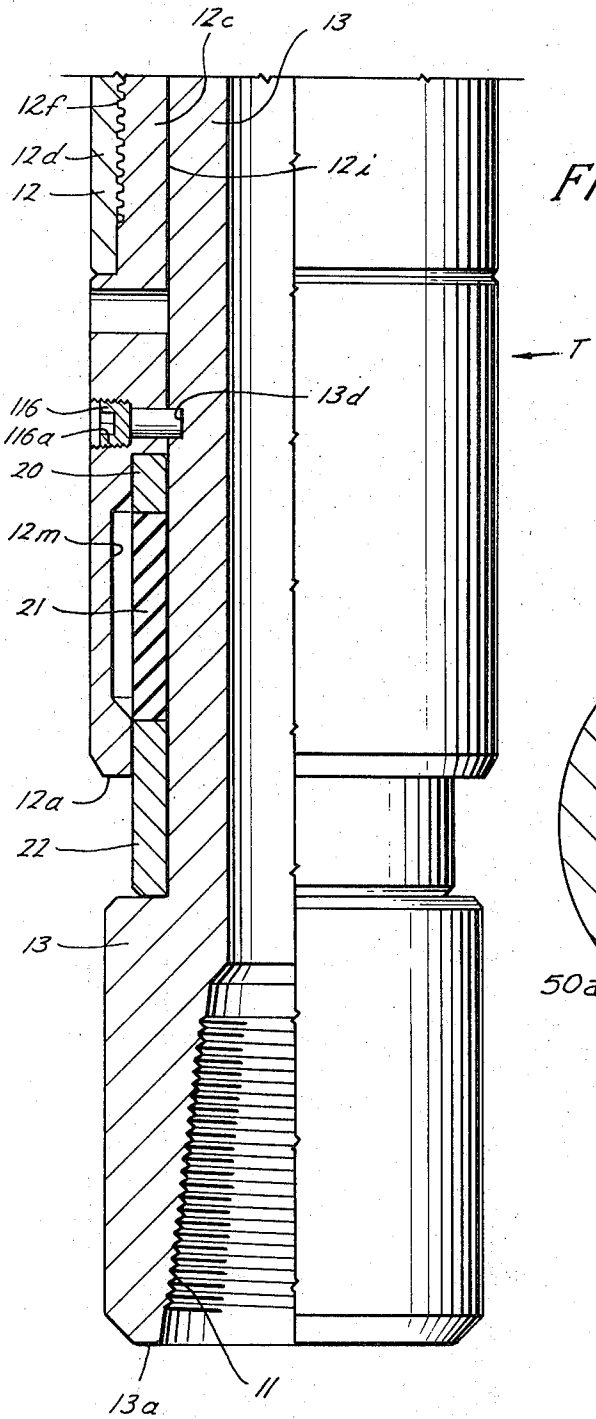

12c
13
12f
12d
12
12i
T
13d
116
116a
20
12m
21
12a
22
13
13a
11

Fig. 1C

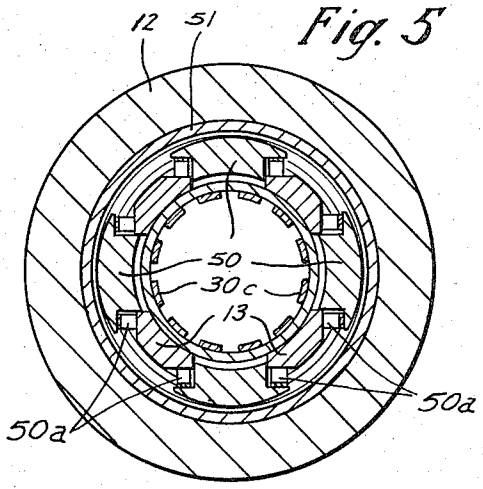

12
51
50
30c
13
50a
50a

Fig. 5

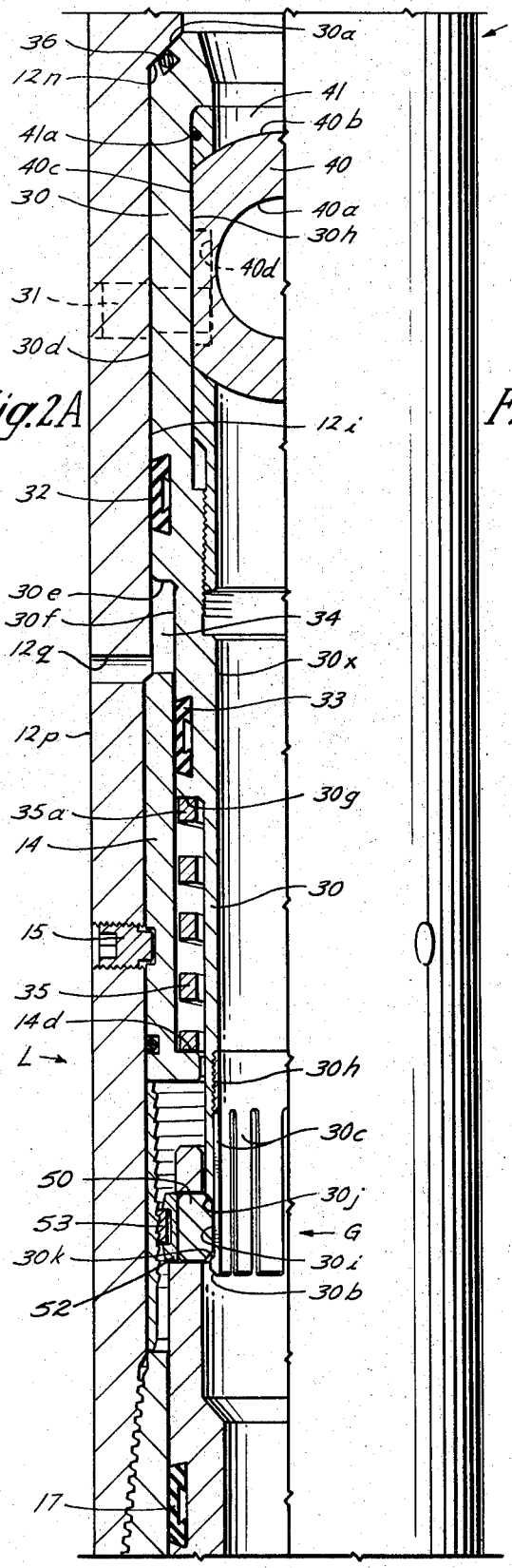

36
12n
41a
40c
30
31
30d
32
30e
30f
12q
12p
35a
14
15
35
14d
L
50
53
30k
52
17
30a
41
40b
40
40a
30h
40d
12i
34
30x
33
30g
30
30h
30c
30j
G
30i
30b
B

Fig. 2A

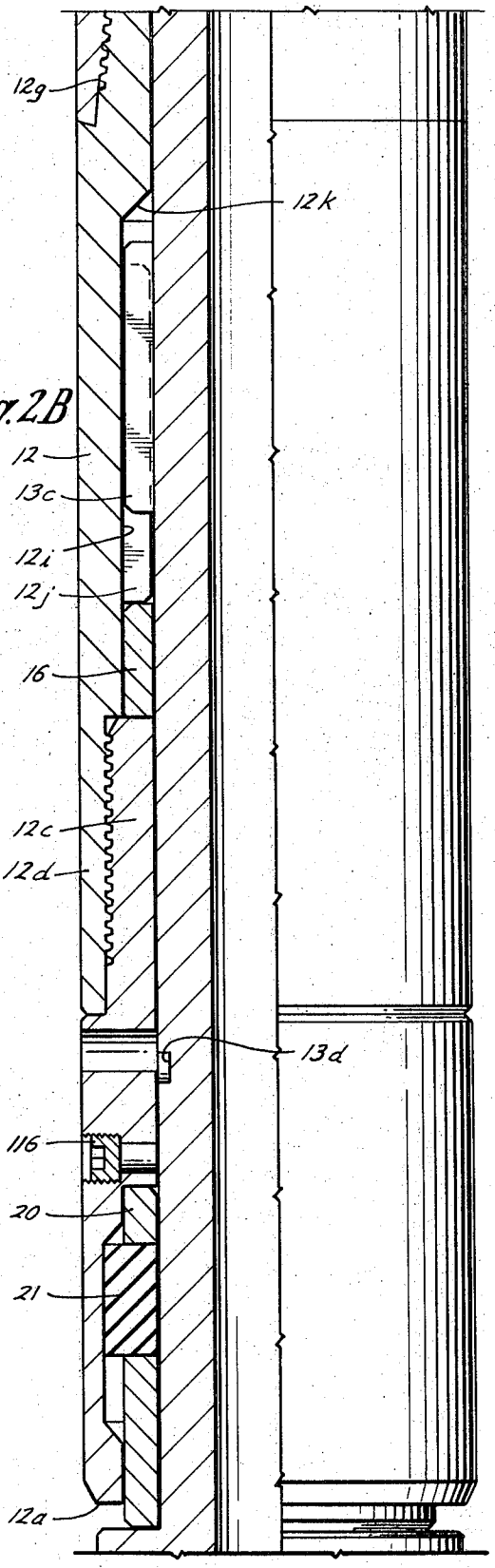

12g
12k
12
13c
12i
12j
16
12c
12d
13d
116
20
21
12a

Fig. 2B

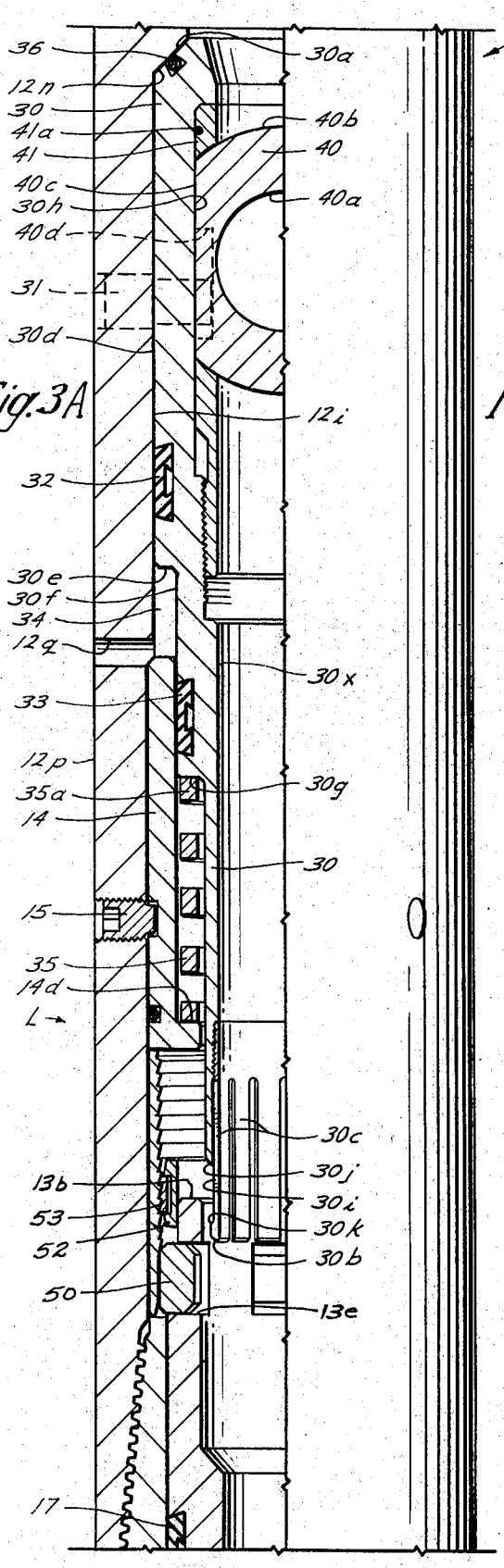

36
12n
30
41a
41
40c
30h
40d
31
30d
32
30e
30f
34
12q
33
12p
35a
14
15
35
14d
L
13b
53
52
50
17
30a
40b
40
40a
12i
30x
30g
30
30c
30j
30i
30k
30b
13e
B

Fig. 3A

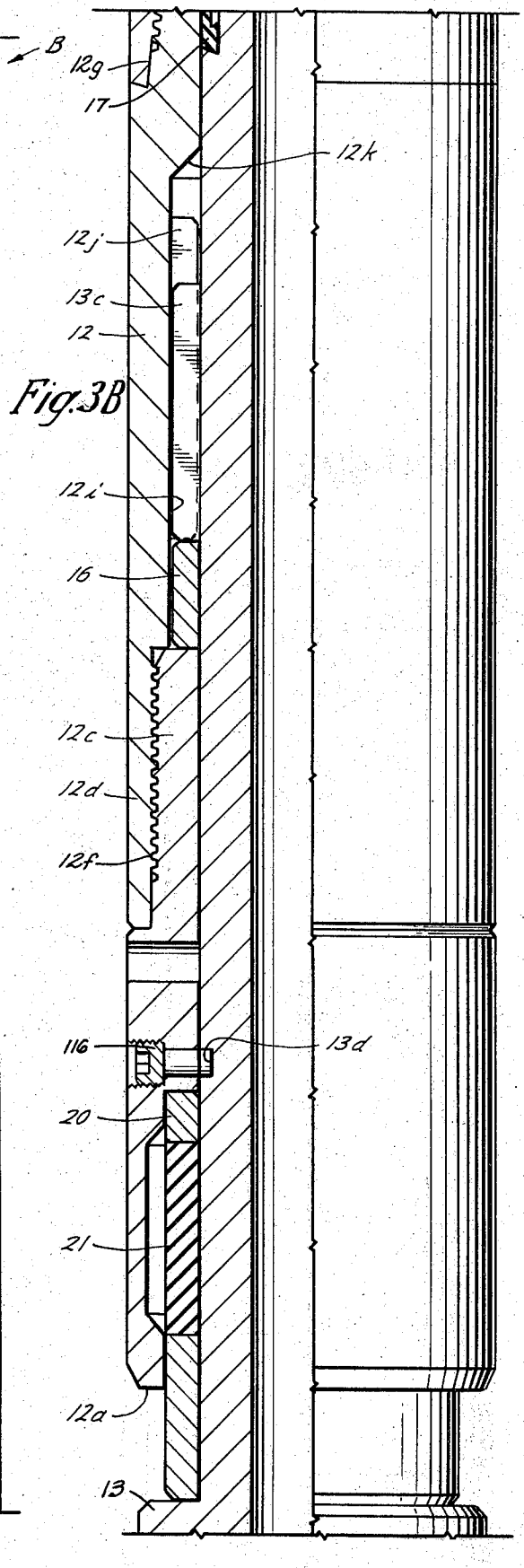

12g
17
12k
12j
13c
12
12i
16
12c
12d
12f
116
13d
20
21
12a
13

Fig. 3B

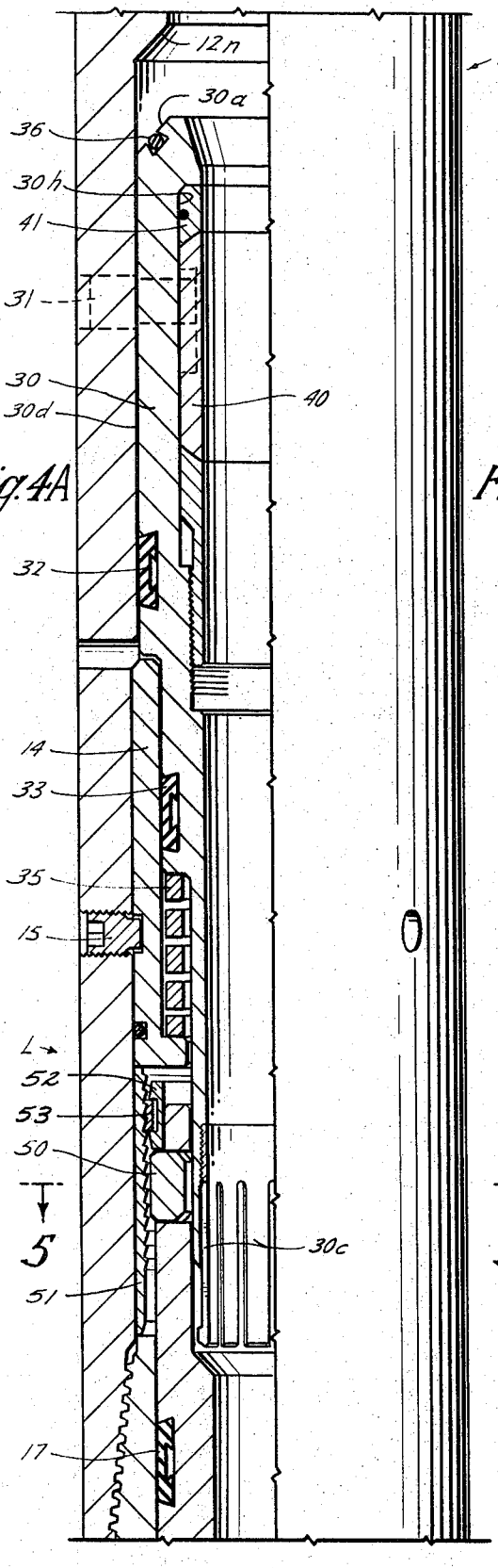

12m
B
30a
36
30h
41
31
30
30d
40
32
14
33
35
15
L
52
53
50
5
30c
51
17

Fig. 4A

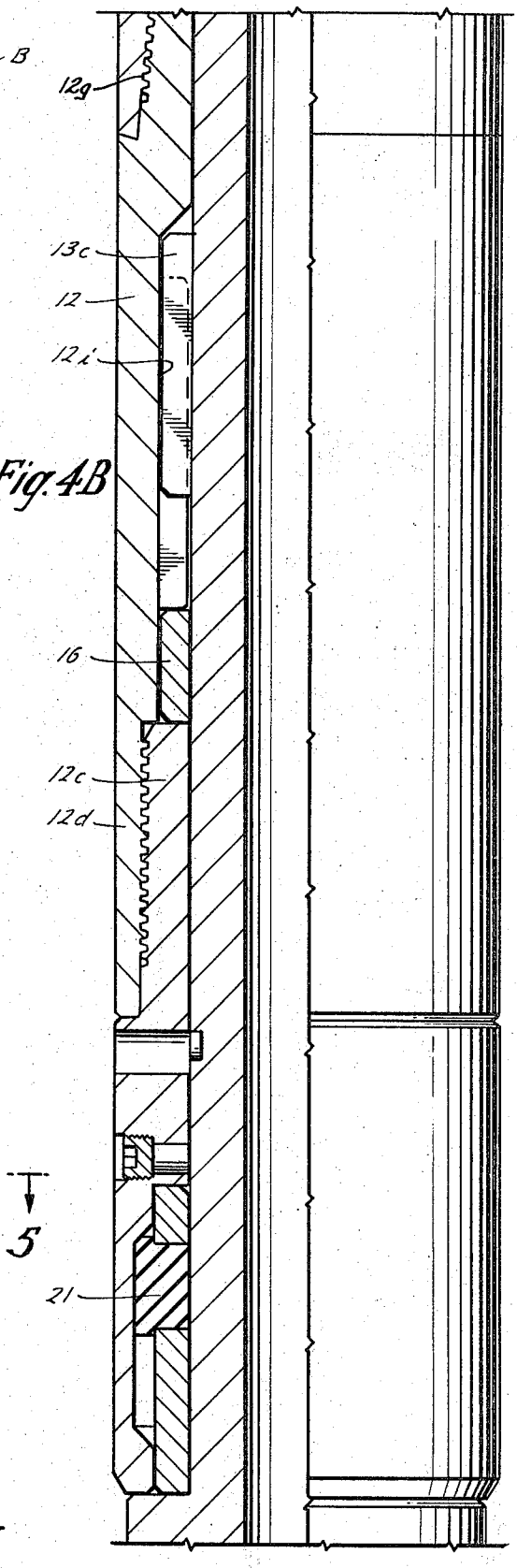

12g
13c
12
12i
16
12c
12d
5
21

Fig. 4B

SURFACE CONTROLLED FLOAT VALVE AND INSIDE BLOWOUT PREVENTER DRILLING TOOL

CROSS-REFERENCES TO RELATED APPLICATIONS

The present application is related to my co-pending applications, Ser. No. 201,878, entitled "Drilling Tool," now U.S. Pat. No. 3,783,942 and Ser. No. 212,260, also entitled "Drilling Tool."

BACKGROUND OF THE INVENTION

This invention relates generally to the field of well tools and more particularly to a surface controlled float valve and inside blowout preventer drilling tool.

My co-pending applications, Ser. Nos. 201,878 and 212,260, disclosed pressure responsive full bore opening rotatable ball valve inside blowout preventer drilling tools for blocking undesired upwardly flow in the bore of the drilling string in which the ball element was normally rotated closed to float the drilling string in the bore hole, but which was releasably lockable in the open position for enabling filling of the bore of the drill string through the drill bit to preclude collapsing of the string by fluid pressure when running back in the well.

While those tools have served a most useful purpose, they did require running and retrieval trips of wire-line tools to either lock open or release the ball element. Such trips were time-consuming, and therefore, undesirable due to the expense of the drilling time lost during such trips.

SUMMARY OF THE INVENTION

A full bore opening rotatable ball valve inside blowout preventer drilling tool adapted for connection in a drilling string and having a releasable locking means for holding the ball valve in the open position when running in the well bore and which is released by a predetermined manipulation of the drilling string to enable well pressure responsive operation of the ball valve.

An object of the present invention is to provide a new and improved inside blowout preventer drilling tool.

Another object of the present invention is to provide a new and improved surface controlled float valve drilling tool.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A, 1B and 1C are side views, partially in section, arranged in sequence from top to bottom of the drilling tool of the present invention in the locked open configuration;

FIGS. 2A and 2B are side views, partially in section similar to FIGS. 1A and 1B, respectively, illustrating the drilling tool in the closed condition during unlocking;

FIGS. 3A and 3B are views similar to FIGS. 2A and 2B, respectively, illustrating the drilling tool in the closed position after unlocking;

FIGS. 4A and 4B are views similar to FIGS. 3A and 3B, respectively, illustrating the drilling tool in the open position after unlocking; and

FIG. 5 is a view taken along line 5—5 of FIG. 4A.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The well tool of the present invention, generally designated T in the Figs. includes a housing H adapted for connection in a well conduit C to position the tool T for controlling undesired upwardly flow of fluid in a bore F of the well conduit C. The tool T includes a bore closure means B disposed in a bore or opening O extending through the tubular housing H and a means for releasably holding the bore closure means B in the open position and which is actuated to release the bore closure means B by predetermined manipulation of the well conduit C to enable movement of the bore closure means B to control flow of fluid through the bore O of the housing H.

The housing H is connectable in the well conduit or tubing C to form a portion and having the longitudinally extending bore O formed therethrough communicating the bore or flow passage F of the well conduit C above and below the housing H. The bore O of the housing H is of substantially the same diameter or cross-sectional flow area as the flow passage F of the conduit C and aligned therewith to provide a full opening well tool enabling the running of other well tools through the bore O of the housing H when desired. The conduit C is preferably a drilling string well conduit, but the tool T of the present invention may be employed in any flow conducting conduit and should not be considered limited to use in either a well or a drilling string.

As illustrated in FIGS. 1A, 1B and 1C, the housing H extends downwardly from an upper box or threaded connection **10** (FIG. 1A) to a lower threaded connection **11** (FIG. 1C) which is preferably, but not necessarily, a box connection also, to enable the connection of the well tool T in a drill string C immediately above a drilling bit (not illustrated) as is well known. The housing H includes an upper tubular section or first housing portion **12** and a lower tubular section or second housing portion **13** which is connected with the upper tubular section and longitudinally movable relative thereto in a telescoping manner to and from a tool extended or elongated position and a tool contracted or shortened position. The lower tubular section **13** extends upwardly from a downwardly facing annular shoulder **13*a*** adjacent the box threads **11** (FIG. 1C) to an upwardly facing annular shoulder **13b** (FIG. 1B) while the upper tubular section **12** extends upwardly from a downwardly facing annular shoulder **12*a*** (FIG. 1C) to an upwardly facing annular shoulder **12*b*** adjacent the threads **10.** For ease of assembly of the tool T, the upper tubular section **12** is formed of tubular members **12*c***, **12*d*** and **12*e*** secured together by fluid leakage blocking threaded engagement at **12*f*** and **12*g*** and with the upper tubular section **12** further including a sleeve **14** concentrically disposed adjacent a bore defining inner surface **12*i*** of the upper tubular section **12** adjacent the sleeve **12*e***. The sleeve **14** (FIGS. 1A & 1B) is secured with the tubular section **12** by engagement of an upwardly facing annular shoulder **14*a*** thereof with a downwardly facing tapered annular shoulder **12*h*** formed by the surface **12*i*** and which is blocked from downwardly movement by a keeper pin **15** (FIG. 1A) received in a recess **14*b*** of the sleeve **14** and which is secured to the sleeve **12*e*** by threaded engagement at **15*a***. As illustrated in FIG. 1B, the sleeve **14** mounts an O-ring **14*c*** to block leakage of fluid between the sleeve **14** and the sleeve **12*e***.

As also illustrated in FIG. 1B the upper tubular section **12** is mounted with the lower tubular section **13** to

enable relative longitudinal movement therebetween while blocking relative circumferential rotational movement between the concentrically arranged tubular sections **12** and **13** for transmitting rotary motion therebetween to enable the use of the well tool T of the present invention in a rotary drill string C. The lower tubular section **13** includes a plurality of radially outwardly projecting lugs **13***c* formed on an outer surface **13***d* of the tubular section **13** adjacent the sleeve **12***d* which mounts a plurality of radially inwardly projecting lugs or ears **12***j* which extend between the ears **13***c* for providing a spline or keyed arrangement to enable relative longitudinal movement therebetween while preventing relative rotational movement. As illustrated in FIG. **2B**, the inner surface **12***i* of the sleeve **12** forms a downwardly facing annular shoulder **12***k* which limits relative contracting telescopic movement between the upper tubular section **12** and the lower tubular section **13** (FIG. **2B**) while a ring member **16** mounted above the sleeve **12***c* and adjacent threads **12***f* provides a stop to limit the telescoping longitudinal movement at the extended position (FIG. **1B**).

As illustrated in FIG. **1C**, the tool T includes a mounting ring **20** concentrically located between the sleeve **12***c* and the sleeve **13**, a resiliently deformable tubular unit **21** and a lower guide ring **22** all of which cooperate to provide a means for dampening transmission of vibrations and shock incurred during the rotary drilling operations by the drill bit from the lower tubular section **13** to the upper tubular section **12**. The guide ring **22** engages the sleeve **12***c* adjacent the shoulder **12***a* to maintain the upper tubular section **12** and the lower tubular section **13** in concentric alignment despite relative longitudinal movement therebetween. The inner surface **12***i* tubular section **12** is recessed at **12***m* for receiving therein a portion of the deformed resilient or buffering unit **21** when the upper tubular section **12** and the lower tubular section **13** are in the relative contracted position (FIGS. **2B** and **4B**). The resilient unit **22** when deformed into the condition illustrated in FIG. **4B**, either absorbs or transmits to the upper tubular section **12** with a smaller amplitude, shocks and vibrations incurred by the drill bit during drilling operations. The resilient unit **21** is preferably formed of any suitable and readily avaliable high-temperature compatible rubber-like material to enable the use of the tool T when the temperature incurred in drilling operations is relatively high. The resilient unit is preferably secured to both the guide ring **22** and the mounting ring **20** by any suitable means to form a single unit for ease of assembly. A shear pin **16** to prevent inadvertent or undesired relative telescoping movement between the upper tubular section **12** and the lower tubular section **13** is received in a recess **13***d* of the sleeve **13** and is threadedly secured to the sleeve **12***c* by threaded engagement at **16***a* . The lower tubular section **13** mounts an annular sealing element **17** effecting a sliding seal with the surface **12***i* to block leakage of fluid between the upper and lower tubular sections **12** and **13**.

As illustrated in FIGS. **1A** and **1B**, the well tool T includes the bore closure means B and an operator or actuator means, generally designated A, for effecting movement of the bore closure means B to and from the open and closed positions. The actuator means A includes a sleeve **30** disposed in the bore O and mounted with the housing H adjacent the sleeve **12***e* and a pivot means or pins **31**. The operator sleeve **30** is longitudinally movable in the bore O to and from a lower or first position (FIG. **4A**) for effecting movement of the bore closure means B to the open position and to and from an upper or second position for effecting movement of the bore closure means B to the closed position for blocking flow of fluid through the bore O of the housing H (FIG. **3A**). The operator **30** extends downwardly from a tapered upwardly facing annular shoulder **30***a* which engages a downwardly facing annular shoulder **12***n* provided by the inner surface **12***i* to limit upwardly movement of the operator sleeve **30** to a plurality of tapered downwardly facing shoulders **30***b* arranged in an annular-like manner and formed by a corresponding plurality of circumferentially spaced downwardly extending resilient members or prongs **30***c*. The operator sleeve **30** includes an outer surface **30***d* which is stepped to provide a downwardly facing annular shoulder at **30***e* for engaging the shoulder **14***a* of the sleeve **14** to limit downward movement of the operator sleeve **30** and for providing a smaller diameter outer surface portion **30***f* adjacent the sleeve **14**. The operator **30** mounts annular sealing elements **32** and **33** on the surfaces **30***e* and **30***f*, respectively, to effect a sliding seal with the surfaces **12***i* of the sleeve **12***e* and an inner surface **14***c* of the sleeve **14** to block leakage of fluid therebetween. The seals effected by the elements **32** and **33** along with that of the O-ring **14***c* define an annular expansible chamber **34** which communicates with the area adjacent an exterior surface **12***p* of the upper section **12** through a port or passageway **12***q*. Thus, fluid pressure adjacent the exterior surface **12***p* of the tool T will be communicated into the chamber **34** through the port or passageway **12***q* for urging on the pressure responsive shoulder **30***e* to move the operator sleeve **30** upwardly in response to the pressure in the annular chamber **34**. The actuator means A further includes an urging or spring means **35** disposed in concentric relationship between the sleeve **14** and the operator sleeve **30** adjacent the keeper pin **15**. The fixed sleeve **14** provides an upwardly facing annular shoulder **14***d* for mounting the spring **35** with the housing H and with an upper end **35***a* of the spring **35** engaging a downwardly facing annular shoulder **30***g*, located below the sealing element **33**, the spring **35** serves to urge the operator sleeve **30** to the upper position.

The bore closure means B is located in the bore O of the housing H adjacent an inner surface **30***x* of the operator sleeve **30** which defines a full opening flow passage through the operator **30**. Preferably, the bore closure means B includes a rotatable ball valve element **40** having a flow port **40***a* formed therethrough of substantially the same inner diameter or flow area as the inner diameter of the flow passage F of the drill string C to provide a full bore opening well tool T. The ball member **40** is rotatable to and from an open position (FIG. **4A**) aligning the flow port **40***a* with the bore O of the housing H for enabling flow of fluid through the well tool T and the closed position to position the flow port **40***a* transversely to the bore O of the housing H for substantially blocking flow of fluid through the bore O with the ball member **40**. The ball member **40** includes an outer spherical surface **40***b* engaging an annular seal ring **41** mounted with the operator sleeve **30** above the ball **40** for effecting an annular seal therebetween to block passage of fluid between the ball and the seal ring **41**. The seal ring **41** is sealed to the operator sleeve **30**

by an O-ring 41*a* to block passage or leakage of fluid between the seal ring 41 and the operator sleeve 30. The ball 30 includes a pair of parallel flat surfaces 40*c* with each surface 40*c* having a radially extending slot or recess 40*d* formed therein for receiving a portion of one of the longitudinally aligned pivot pins 31 therein. Relative longitudinal movement between the ball 40 and the pivot pins 31 will effect a 90° rotation of the ball between the open and closed position. The assembly and operation of the rotatable ball 40 in the well tool T is set forth in greater detail in my co-pending application Ser. No. 256,194, entited "Pressure Operated Safety Valve With Lock Means" to which specific reference is made for incorporating that disclosure herein.

The well tool T further includes means, generally designated L in the Figs., for releasably holding or locking the ball 40 in the open position and which are actuated to release the ball 40 for rotational operating movement thereafter by a predetermined manipulation of the well conduit C. The means L for holding the ball 40 in the open position includes a latch or gripping means G mounted with the housing H and which is movable from a locking position (FIG. 1B) for operably engaging and holding the operator sleeve 30 in the lower position for maintaining the ball 40 open to a released position (FIG. 3A) for enabling operating movement of the operator sleeve 30 to rotate the ball 40 open and closed. The latch means G includes a plurality of locking or latch dogs 50 movably disposed in a corresponding plurality of circumferentially spaced window openings 13e located adjacent the annular shoulder 13b. The latch dogs 50 are movable radially outwardly from an engaged position (FIG. 1B) with the operator 30 to a free position (FIGS. 3A & 5) for enabling the operator 30 thereafter to move to and from the upper and lower positions. The downwardly projecting resilient fingers 30*c* of the operator sleeve 30 are threadedly connected to the sleeve 30 by threaded engagement at 30*h* for ease of assembly and fabrication, and cooperate with the outer surface 30*d* of the operator sleeve 30 to form an annular recess 30*i* having a tapered downwardly facing annular shoulder surface 30*j* and a plurality of circumferentially spaced upwardly facing tapered annular shoulder surfaces 30*k*. The recess 30*i* receives the latch dogs 50 therein to block relative longitudinal movement between the operator sleeve 30 and the latch dogs 50 when the latch dogs are in the locking position. As illustrated in FIGS. 1B and 1C, with the upper tubular section 12 and the lower tubular section 13 in the relative extended position the operator sleeve 30 is held in the lower position relative to pivot pins 31 by the latch dogs 50 for holding the ball 40 in the open position.

The latch means G further includes a retainer sleeve 51 concentrically mounted with the upper tubular section 12, a movable locking or latch member 52 for engaging and maintaining the latch dogs 50 in the locking position and a latch or lock member keeper 53 carried by the lock member 52. The retainer sleeve 51 includes an inner surface 51*a* shaped or formed with alternating tapered downwardly facing and flat upwardly facing annular shoulders 51*b* and 51*c*, respectively, to enable upward movement of the latch member 52 towards the fixed sleeve 14 securing the sleeve 51 from upward movement in the bore O, and which thereafter blocks downward movement of the lock member 52 by engaging the outwardly biased gapped keeper ring 53 mounted in an annular recess 52*a* of the latch member 52 with the shoulder 51*c*. As illustrated in FIG. 1B, an inner surface 52*b* of the latch ring 52 engages the plurality of latch dogs 50 to maintain the latch dogs 50 in the engaged position when the ring 52 is adjacent the windows 13e. The latch ring 52 includes a downwardly facing lower annular shoulder 52*c* which engages both an upwardly facing annular shoulder formed by the window opening 13*e* of the lower tubular member 13 and an upwardly facing annular shoulder 12*r* formed by the sleeve 12*d* adjacent the threads 12*g*. With this arrangement, relative contracting telescopic movement of the lower tubular section 13 into the upper tubular section 12 will move the latch member 52 upwardly along the retaining sleeve 51 to the position illustrated in FIG. 2A. Thereafter, when the tubular section 12 and 13 move to the relative extended telescopic positions (FIG. 3A), the lock member 52 is retained by the shoulder 51*c* of the sleeve 51 engaging the keeper 53 in the upper position, while the latch dogs 50 along with the lower tubular section 13 move downwardly, for spacing the latch member 52 from the windows 13*e* and enabling the latch dogs 30 to move outwardly in response to the camming or wedging action of the lower tapered shoulder surface 30*k* of the recess 30*i* to release the operator sleeve 30 and rotate the ball 40 closed. In other words, by sequentially applying the weight of the well conduit C above the housing H to telescopically move the tubular sections 12 and 13 to the contracted position and thereafter enabling the sections 12 and 13 to return to the extended position by lifting the conduit to remove the weight of the upper well conduit C from the housing H, the tool T is actuated to release the ball 40 from the open position for normal operations. Normally, to effect movement of the tubular sections 12 and 13 to the contracted position, it is necessary to lower the drilling string C until the drill bit engages the bottom of the well hole and then continue to lower the well conduit with the rotary drilling equipment (not illustrated) to apply the weight of the drilling string C to the tool to shear the shear pin 16 and actuate the release. Thereafter, by lifting with the rotary drilling equipment the tubular sections 12 and 13 are moved to the extended positions and the ball 40 is released for operation. After release, the sleeve 51 serves to maintain the lock member 52 spaced from the latch dogs 50 to prevent inadvertent locking of the ball 40 in the open position.

In the use and operation of the present invention, the well tool T is assembled in the condition illustrated in FIGS. 1A, 1B and 1C. Reference is again made to my co-pending application Ser. No. 256,194 entitled "Pressure Operated Safety Valve With Lock Means," for a more detailed description of the method of assembling the tool T.

The well tool T is connected in the drill string C using the thread connections 10 and 11 as is well known in the art and lowered into the well bore hole until the drill bit engages the bottom thereof. By continuing to lower the drill string C the pin 16 will be sheared and the upper and lower tubular sections, 12 and 13, respectively, will move to the contracted position (FIG. 2A and 2B) for moving the latch dogs 50 and the lock member 52 upwardly along the retainer sleeve 51, until the ball 40 is rotated closed. Thereafter by lifting the drilling string above the tool T the upper and lower tu-

bular sections **12** and **13** will be moved back to the extended position (FIGS. **3A** and **3B**) which moves or spaces the latch member **52** from the latch dogs **50** as the latch member **52** is retained in the upper position by the keeper **53** engaging the retaining sleeve **51** and the latch dog **50** moves radially outwardly by the camming action of the shoulder **30***k* to enable the operator **30** to thereafter move upwardly in response to the urging of the spring **35.** Leaf springs **50**a (FIG. **5**) hold the latch dogs **50** in the released position. It will be immediately appreciated that the release means of the present invention in not requiring rotation of the drill string to actuate is more desirable than that of the prior art as it eliminates the risk of inadvertent and undesired downhole separation of the drilling string C.

When it is desirable to commence drilling operations and circulate drilling fluid down the bore of the drill string and out through the drill bit, the pressure in the bore O of the housing H above the ball **40** is increased by the mud pumps at the surface (not illustrated) and the increased pressure is communicated to the upwardly facing annular shoulder **30***a* of the operator **30** for urging the operator **30** to move downwardly and rotate the ball **40** to the open position. While this is occurring, the well pressure in the well chamber adjacent the exterior surface **12***p* of the tool T is communicated into the expansible chamber **34** through the port **12***q* to provide an offsetting upwardly urging on the shoulder **30**e of the operator **30.** When the pressure in the bore O exceeds the combined upwardly urging of the spring **35** and the well pressure in the chamber **34,** the operator **30** will move downwardly to the position illustrated in FIGS. **4A** and **4B** for enabling flow of fluid down the bore of the drill string and outwardly into the well through the nozzles of the drill bit as is well known in the art.

To insure that the ball **40** will be rotated positively between the open and closed position and will not partially open or flutter between the open and closed position which would regulate the flow and may possibly damage the ball **40** or seat ring **41,** the annular shoulder surface **30***a* is provided with an O-ring **36** for effecting an annular fluid tight seal with the annular shoulder **12**n of the sleeve **12** to block communication over the entire annular surface **30***a* when the operator **30** is in the upper position and the ball is rotated closed. As the operator **30** commences to move to the lower position the annular seal effected by the O-ring **36** is broken enabling the increased pressure in the bore O above the ball **40** to be communicated across the entire annular surface **30***a* and the exposure of the additional surface area of the shoulder surface **30***a* insures that the operator **30** will move to the lower position and will not stop or equalize in an intermediate position with the ball **40** partially open.

When the combined urging of the pressure communicated into the chamber **34** and the spring **35** exceed the downwardly urging on the operator **30** effected by the pressure in the bore O of the housing H, the operator **30** will be moved back to the upper position (FIGS. **3A** and **3B**) to rotate the ball **40** closed. Such closing may result from increased well pressure in the chamber **34,** such as would be present during blowout conditions, or the supply of drilling fluid to the flow passage F of the drill string C may be interrupted for any reason. In other words, the ball **40** is rotated closed in normal operation when incipient pressure conditions indicate that the flow through the bore O could reverse to undesirable upwardly flow.

As illustrated in FIG. **4B**, the resilient unit **22** is deformed to dampen transmission of longitudinal or vertical vibrations and shock from the lower tubular section **13** to the upper tubular section **12** while the spline connection effected by the ears **13***c* and **12***j* transmit the rotary drilling motion through the tool T to the drill bit for enabling drilling operations.

The foregoing disclosure and description of the invention are 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 without departing from the spirit of the invention.

What is claimed is:

1. A well tool adapted for mounting with a well conduit to control flow of fluid through the well conduit, including:

a housing adapted for connection in a well conduit and having a bore extending therethrough for communicating the flow passage of the well conduit above and below said housing;

bore closure means disposed in said bore for movement to and from an opened position enabling flow of fluid through said bore and a closed position for substantially blocking flow of fluid through said bore;

operator means mounted with said housing for moving said bore closure means to and from the open and closed position in response to the urging of fluid pressure for effecting desired flow through the well conduit; and

means mounted with said housing for releasably holding said bore closure means initially in the open position and actuated to release said bore closure means for fluid pressure operation by said operator means by a predetermined manipulation of said housing wherein bore closure means movement to control the flow is enabled.

2. The structure as set forth in claim **1,** wherein:

the housing is manipulated to release said bore closure means for movement in response to sequentially applying and then removing the weight of the well conduit above said housing to said housing.

3. The structure as set forth in claim **1,** wherein:

the housing is manipulated to release said bore closure means for movement in response to sequentially lowering and then lifting the well conduit in the well.

4. The structure as set forth in claim **1,** wherein:

said means for holding said bore closure means in the open position includes latch means operably connected with said bore closure means and movably mounted with said housing between a locking position for holding said bore closure means in the open position and release position for enabling movement of said bore closure means to the closed position.

5. The structure as set forth in claim **1,** including:

an operator member mounted with said housing and movable to and from a first position for effecting movement of said bore closure means to the open position and to and from a second position for effecting movement of said bore closure means to the closed position wherein movement of said operator

member controls flow of fluid through the well tool.

6. The structure as set forth in claim 5, wherein:

said means for holding said bore closure means in the open position includes a latch means mounted with said housing and movable from a locking position operably engaging said operator to hold said operator in the first position to a released position for enabling operating movement of said operator member wherein said bore closure means is released for movement.

7. A well tool, including:

a housing adapted for connection in a well conduit having a bore extending therethrough for communicating the flow passages of the well conduit above and below said housing;

bore closure means disposed in said bore for movement to and from an opened position enabling flow of fluid through said bore and a closed position for substantially blocking flow of fluid through said bore;

means for releasably holding said bore closure means in the open position actuated to release said bore closure means by a predetermined manipulation of the well conduit;

said means for holding said bore closure means in the open position includes a latch means mounted with said housing and movable from a locking position operably engaging said operator to hold said operator in the first position to a released position for enabling operating movement of said operator member;

said housing having a first housing portion; and

said housing having a second housing portion connected with said first housing portion and movable relative thereto to and from an extended position and a contracted position, said second housing portion mounting said latch means to effect movement of said latch means from the locking position to the released position for enabling movement of said bore closure means when said second housing portion sequentially moves to the contracted position and the extended position wherein said bore closure means is released.

8. The structure as set forth in claim 7, wherein:

said first housing portion connected with said second housing position to enable relative longitudinal movement therebetween while blocking relative circumferential rotational movement therebetween wherein the well tool is operable in a rotary drill string.

9. The structure as set forth in claim 7, including:

means for dampening transmission of vibrations and shocks from said second housing portion to said first housing portion during drilling operations.

10. The structure as set forth in claim 7, wherein said latch means includes:

a. said second housing portion having a window opening formed therein;

b. a latch dog disposed in said opening and movable from an engaged position with said operator for holding said operator in the first position to a free position for enabling said operator to thereafter move to and from the first position and the second positions wherein movement of said bore closure means is enabled.

11. The structure as set forth in claim 10, including:

a. a lock member mounted with said housing and movable from a locked position for securing said latch dog in the engaged position to a released position enabling said latch dog to move to the free position wherein said bore closure means is released; and

b. said first housing portion engaging said lock member when said second housing portion is in the contracted position to thereafter move said lock member to the released position when said second housing portion moves to the extended position wherein said latch dog moves to the free position.

12. The structure as set forth in claim 10, wherein:

a. said second housing portion having a plurality of circumferentially spaced window openings formed therein; and

b. a corresponding plurality of latch dogs disposed in each of said openings and movable from the engaged position to the free position.

13. The structure as set forth in claim 5, wherein:

said bore closure means includes a ball member having a flow port formed therethrough for rotating to and from the open position to align said flow port with said bore for enabling the flow of fluid therethrough and the closed position for blocking the flow of fluid with said ball member.

14. The structure as set forth in claim 13, including:

pivot means engaging said ball member and co-acting with said operator member for rotating said ball member to and from the open and closed position.

15. The structure as set forth in claim 13, wherein:

said ball member moves longitudinally in rotating to and from the open and closed positions.

16. A well tool, including:

a housing adapted for connection in a well conduit having a bore extending therethrough for communicating the flow passages of the well conduit above and below said housing;

bore closure means disposed in said bore for movement to and from an opened position enabling flow of fluid through said bore and a closed position for substantially blocking flow of fluid through said bore; and

means for releasably holding said bore closure means in the open position actuated to release said bore closure means by a predetermined manipulation of the well conduit;

an operator member mounted with said housing and movable to and from a first position for effecting movement of said bore closure means to the open position and to and from a second position for effecting movement of said bore closure means to the closed position.

said operator member having a first pressure responsive surface communicating with said bore of said housing above said bore closure means to move said operator to the first position in response to the fluid pressure urging thereon; and

said operator member having a second pressure responsive surface communicating with an area adjacent an exterior surface of said housing to move said operator to the second position in response to the fluid pressure urging thereon wherein the well

tool operates in response to well pressures to control the flow.

17. The structure as set forth in claim **16,** including:

spring means mounted with said housing for urging movement of said operator member to the second position for maintaining the bore closure means in the closed position when the urging of the fluid pressure on said first pressure responsive surface is less than the combined urging of the spring means and the fluid pressure of said second pressure responsive surface.

18. The structure as set forth in claim **16,** including:

a fluid seal positioned on said first pressure responsive surface to block communication of the fluid pressure in said bore of said housing above said bore closure means to a portion of said first pressure responsive surface when said operator member is in the second position and which enables communication of the fluid pressure in said bore of said housing above said bore closure means with said portion of said first pressure responsive surface when said operator commences to move to the first position wherein said operator movement averts partial opening of said bore closure means.

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