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Peters

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[54] **WIRELINE OPERATED SUBSURFACE SAFETY VALVE**

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[52] **U.S. Cl.** .... **166/72,** 166/224 S, 251/73

[51] **Int. Cl.** **E21b 33/03,** E21b 43/12

[58] **Field of Search** .... 166/72, 224 S; 251/73

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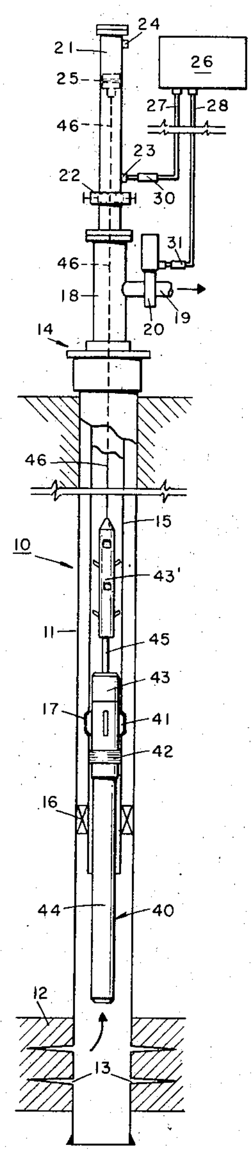
[57] **ABSTRACT**

A subsurface safety valve system for controlling the flow of production oil and/or gas fluids through a well pipe. The valve assembly is installed in the well pipe a predetermined depth below the surface. A wireline connects the valve assembly to surface facilities which include apparatus for maintaining sufficient tension on the wireline to hold the valve assembly to permit the valve assembly to close. A valve element closes off flow of fluids through the valve assembly by upward movement of a valve element actuator, the same direction as the upward flow of the production well fluids.

24 Claims, 5 Drawing Figures



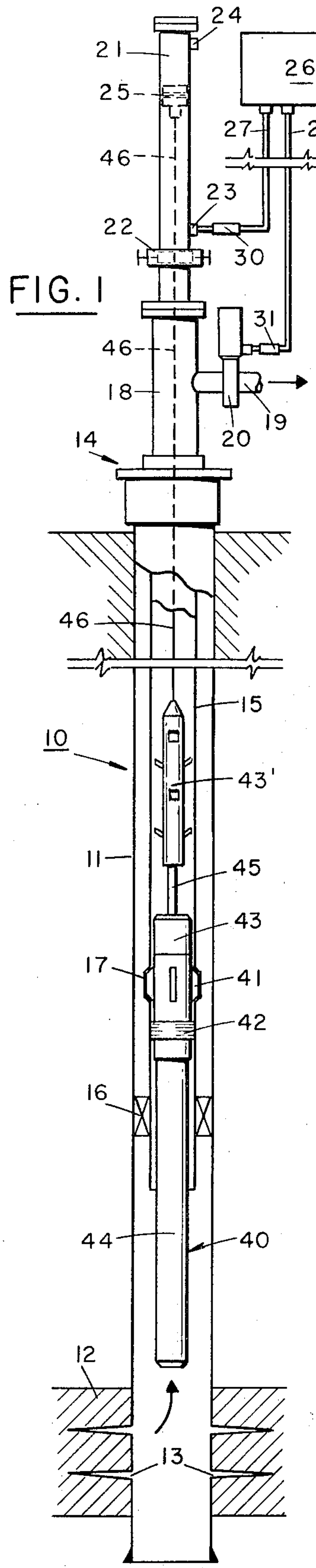


FIG. 1

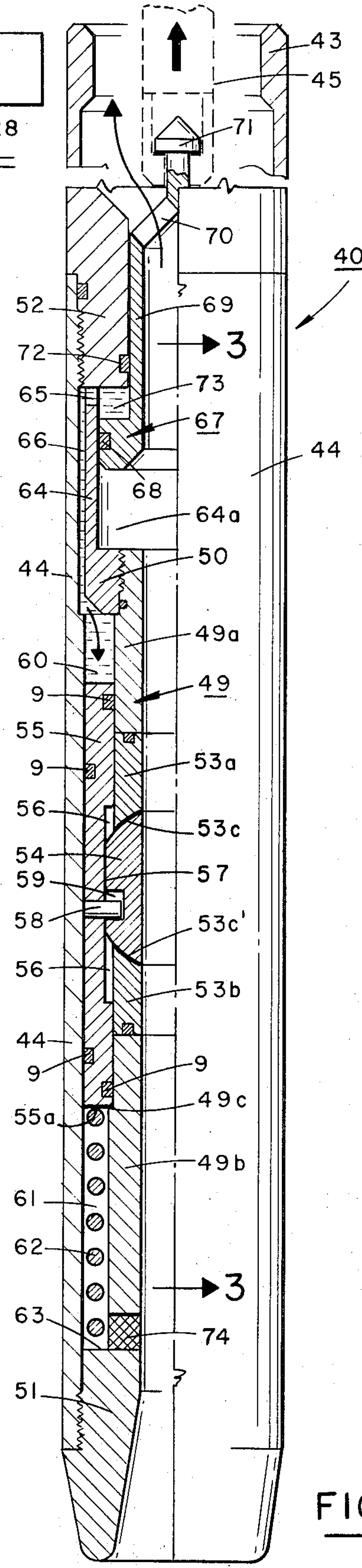


FIG. 2.

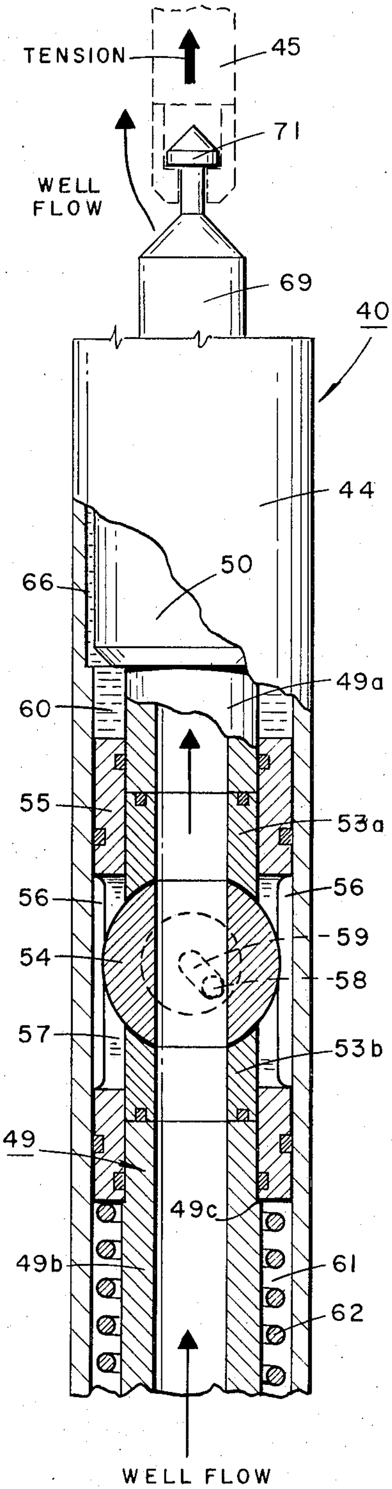


FIG. 3.

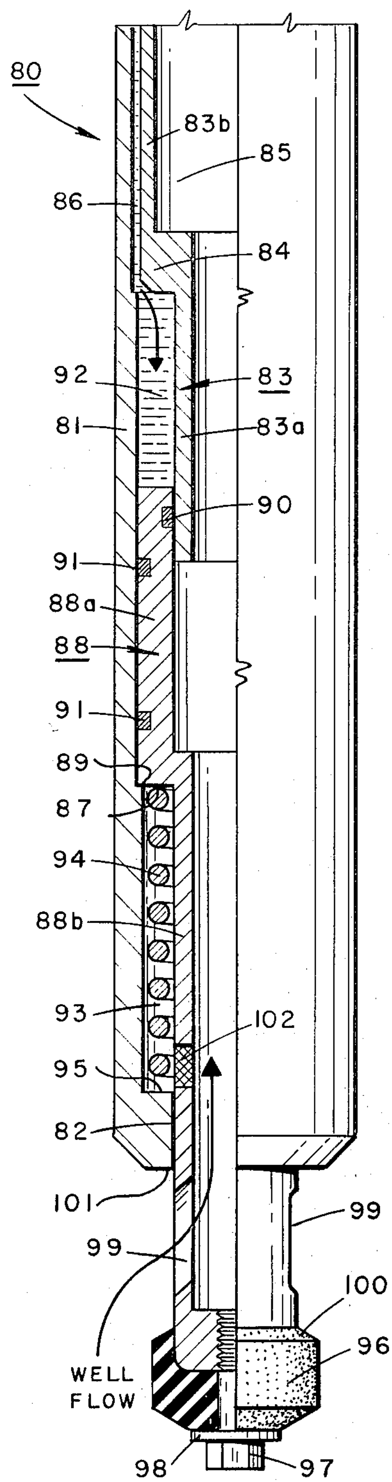

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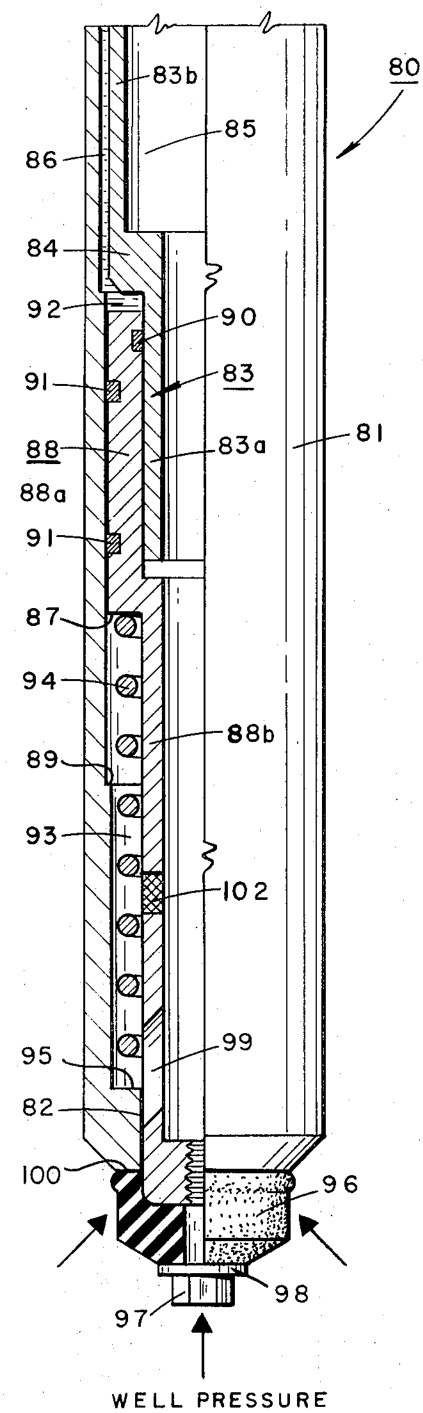
FIG. 4.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WELL PRESSURE

FIG. 5.

WIRELINE OPERATED SUBSURFACE SAFETY VALVE

BACKGROUND OF THE INVENTION

The present invention concerns subsurface safety valves for use in well production pipe strings and, in particular, subsurface safety valves controlled from the surface. The well production pipe string provides a flow path to the surface for well fluids produced from subsurface formations.

Many of the present methods for controlling subsurface safety valves from the surface require recompletion procedures which are often very expensive in existing wells. Subsurface valves which are controlled by hydraulic communication from the surface through a control pipe or line are seriously limited as to depth because of the hydrostatic pressure created by the control liquid in the control pipe (unless precharged gas loading is used to overcome the hydrostatic pressure). In addition, undetected leaks in the control pipe may cause premature valve closure. In the present invention, a subsurface valve is operated by a wireline which connects the valve to the surface. It is controlled at the surface but does not require the complicated downhole equipment required in the hydraulic power systems used to control subsurface valves from the surface. It has the advantageous features of being operable independent of the pressure in the well and independent of the depth at which it is located and it avoids expensive downhole operations. The valve also has the desirable feature of closing in the same direction as the fluid movement, namely, upward through the well bore. Such upward closure movement is desired because when the valve closes, pressure below the valve closure will be higher than that above the closure. This additional force upward assists the valve actuator which closes the valve element. Since the force which keeps the valve element open is downward, provision has been made so that the upward tension applied by the control wireline causes a downward force on the actuator for the valve element.

SUMMARY OF THE INVENTION

A subsurface safety valve assembly positionable in a well pipe used to produce oil and/or gas fluids and controllable by a wireline which extends to the surface, includes a valve element having an open position and a closed position to permit and prevent flow of fluids, respectively, through the well pipe and means attachable to a wireline and connected to the valve element for maintaining the valve element in its open position when a predetermined force is applied to the wireline and for permitting the valve element to move to its closed position upon removal of the force on the wireline.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 schematically illustrates the safety valve system of the present invention;

FIG. 2 is a vertical view, partly in section, of the valve assembly shown in FIG. 1;

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 2; and

FIGS. 4 and 5 are vertical views, partly in section, of another embodiment of the safety valve assembly in its open and closed positions, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, a well casing pipe **11** is shown arranged in a well **10**. Casing pipe **11** penetrates a subsurface formation **12** which is, along with casing pipe **11**, perforated as at **13**. The casing pipe supports a surface well head assembly **14** and a tubing string **15**. A packer **16** seals the annulus between casing pipe **11** and tubing string **15**. A landing nipple **17** is provided in the wall of tubing string **15** above packer **16**. A christmas tree assembly **18** is mounted on well head assembly **14** and is provided with a flow-line **19** containing a wing valve **20**.

A lubricator tube **21** is connected to the upper end of tree assembly **18**. Lubricator **21** is provided with a wireline sealing means **22**, a fluid inlet connection **23** above sealing means **22** and a vent opening **24** at the upper end of lubricator tube **21**. A piston **25** is slidably arranged in lubricator tube **21** above sealing means **22**.

A source of control fluid under pressure, indicated at **26**, is connected by a conduit **27** to inlet connection **23** to supply hydraulic pressure to the underside of piston **25**. A conduit **28** is connected to a control for hydraulically openable, spring-closable wing valve **20**. Hydraulic pressure from control source **26** maintains valve **20** in the open position. Heat sensitive connectors **30** and **31** are provided in conduits **27** and **28**, respectively, to open those conduits to the atmosphere (or otherwise release pressure from the cylinder formed by lubricator **21** and from the actuators of valve **20**) at a predetermined temperature.

A safety valve assembly, generally designated **40**, is positioned in the lower end of tubing string **15** and is locked in landing nipple **17** by locking dogs **41**. Seal means **42** closes off the annulus between the valve assembly and the tubing string. An internal running and retrieving collar **43** (see FIG. 2) is positioned at the upper end of valve assembly **40**. A suitable collar of this type is illustrated on page 3882 of the 1970–1971 edition of the *Composite Catalog of Oil Field Equipment and Services*, published by World Oil. The lower portion **44** of valve assembly **40** houses the valve components as shown in FIGS. 2 and 3. An overshot latch **45**, internally connected into valve assembly **40**, is attached by a wireline or cable **46** to piston **25** in lubricator tube **21** (see FIG. 1). A paraffin scraper **43'** may be attached to the lower end of wireline **46**.

As seen in FIGS. 2 and 3, valve assembly **40** includes an outer tubular member **44** and inner upper and lower tubular members **49*a*** and **49*b*** concentric to and spaced from tubular member **44**. Numeral **49** generally designates tubular members **49*a*** and **49*b*** as well as sleeve seats **53*a*** and **53*b*** which sealingly engage the outer surface of a ball valve member **54** as at **53*c*** and **53*c'***. Seats **53*a*** and **53*b*** are machined to provide an internally spherical surface for all areas of closure on the ball valve. A stop shoulder **49*c*** is formed on the exterior wall of section **49*b***. A cylindrical member **50** is threadedly attached to the upper end of tubular member **49*a*** and with its wall **64** forms a space **64*a***.

A sleeve piston **55** provided with suitable seals **9** is concentrically and slidably arranged between tubular member **44** and tubular members **49*a*** and **49*b*** and seats **53*a*** and **53*b*** and ball valve **54**. A pressure chamber **60** is formed above sleeve piston **55** and a spring chamber **61** containing a compression spring **62** is formed below sleeve piston **55.** Shoulder **49***c* limits the downward movement of sleeve piston **55.** Compression spring **62** abuts the lower end **55***a* of sleeve piston **55** and a shoulder **63** formed by the nose portion **51** of lower section **49***b* and biases or urges sleeve piston **55** upwardly.

Oppositely disposed windows **56** are formed in the walls of sleeve piston **55** to accommodate the outer periphery of ball valve **54.** The inner wall section of sleeve piston **55,** perpendicular to windows **56** and adjacent thereto are milled to form oppositely disposed flat surfaces **57** which engage the flat surfaces of ball valve **54.** Actuating pins **58** are fixed in the flat walls of the sleeve piston and extend into eccentrically located slots **59** formed in the flat surfaces of ball valve **54,** such that upward movement of sleeve piston **55** causes ball valve to rotate on its axis and close off the flow passageway through tubular members **49***a* and **49***b*. Downward movement of sleeve piston **55** from the closed position of ball valve **54** causes the ball valve to rotate to its open position shown in FIGS. 2 and 3.

The lower end of a sleeve piston **67** contains an annular shoulder which is slidable along the wall **64** of cylindrical member **50** in the space indicated at **64***a*. The annular shoulder contains a sealing ring **68** which engages the interior of wall **64.** The upper reduced diameter sleeve portion **69** of piston **67** is slidable in the bore of an upper section **52** of the valve assembly which is threaded to tubular member **44.** Sleeve portion **69** engages a seal **72** located in the bore wall of section **52.** A pressure chamber **73** is formed thereby which fluidly communicates with chamber **60** through opening **65** and passageway **66.** Fluid outlet ports **70** are provided in the upper end of piston **67** and an upwardly extending latching spear **71** is arranged on the uppermost end of piston **67.**

The wall of lower tubular member **49***b* contains a screened port **74** for passage of well fluids into and from spring chamber **61.** Spear **71** of piston **67** is connected to wireline **46** by the overshot latching means **45,** the operation of which is well known to the art. Chamber **73,** passageway **66,** and chamber **60,** together with hydraulic fluid contained therein form a closed hydraulic system.

The operation of the embodiment of the subsurface safety valve illustrated in FIGS. **1, 2,** and **3** is as follows. Valve assembly **40** is run in tubing string **15** and latched therein in accordance with conventional procedures. When installing the valve assembly sleeve piston **55** is in its uppermost position under the bias of compression spring **62** and piston **67** is in its lowermost position and ball valve **54** is closed. The closed hydraulic system has been filled with hydraulic fluid. Wireline seal **22** in lubricator tube **21** is open and overshot latch **45** is run on wireline **46** and latched to spear **71** of piston **67.** Piston **25** in lubricator tube **21** is attached to wireline **46.** Seal **22** is closed on wireline **46** and hydraulic pressure from source **25** is supplied through conduit **27** and inlet **23** to the underside of piston **25** moving piston **25** upwardly in lubricator tube **21** and applying thereby a tensional force to wireline **46.** The upward force on wireline **46** causes piston **67** to move upwardly forcing hydraulic fluid in chamber **73** to move into chamber **60,** thereby forcing sleeve piston **55** downwardly to its lowermost position against stop shoulder **49***c* and causing ball valve **54** to rotate to its full open position shown in FIGS. **2** and **3.** A predetermined tensional force is maintained on wireline **46** by fluid pressure supplied from source **26** to maintain ball valve **54** in its open position. Hydraulic fluid is also supplied through conduit **28** to wing valve **20** to maintain valve **20** open. Well fluids flow from formation **12** through open safety valve assembly **40,** tubing string **15,** and flow line **19.** Loss of hydraulic pressure from lubricator tube **21** releases the tensional force on wireline **46** which permits compression spring **62** to move sleeve piston **55** upwardly thereby rotating ball valve **54** to its closed position. Well fluids below ball valve **54** also pass through screened port **74** to add additional force against the underside of sleeve piston **55** to aid in closing the ball valve.

Paraffin scraper **43′**, attached to wireline **46,** may be pulled upwardly through well pipe **15** whenever it is deemed necessary to remove paraffin from the wall of the well pipe. Wireline **46** is unlatched from and latched to the valve assembly in a manner well known in the art.

Another embodiment of the subsurface valve assembly, generally designated **80** is shown in FIGS. **4** and **5.** Only the lower changed portion of the valve assembly is illustrated. The upper portion of the valve assembly is the same as the upper portion of the valve assembly illustrated in FIGS. **2** and **3.** A tubular member **81,** having an opening **82** in the lower end, has positioned in its upper end a concentric tubular member **83** which comprises a lower section **83***a*, an enlarged diameter upper section **83***b* (equivalent to cylindrical member **50** of FIGS. **2** and **3**) and an annular shoulder **84** formed therebetween. Upper section **83***b* forms a space **85** (equivalent to space **64***a* of FIGS. **2** and **3**) in which a piston, not shown, such as **67** shown in FIGS. **2** and **3** reciprocates. A fluid passageway **86** is formed between tubular member **81** and section **83***b*.

A concentric sleeve member **88,** which includes an upper enlarged diameter section **88***a* and a lower reduced diameter section **88***b*, is slidably arranged in the lower end of tubular member **81.** The connection between the upper and lower sections **88***a* and **88***b* forms a downwardly facing shoulder **87.** Upper section **88***a* forms a sleeve piston in the annulus between tubular member **81** and section **83***a* which is slidable between upper shoulder **84** and a lower shoulder **89** formed on the inner wall of tubular member **81.** Seals **90** and **91** engage the walls of section **83***a* and tubular member **81,** respectively. Reduced diameter section **88***b* extends downwardly through opening **82** and below the lower end of tubular member **81.** The annulus above sleeve piston **88***a* between tubular member **81** and lower section **83***a* forms a chamber **92** and the annulus below the sleeve piston **88***a* between tubular member **81** and section **88***b* forms a spring chamber **93.** A compression spring **94** is confined in chamber **93** and abuts shoulder **87** and a lower shoulder **95** formed at the lower end of tubular member **81.** In FIG. **4** sleeve member **88** is illustrated in its lowermost position. Fluid entry ports **99** are formed in section **88***b* just above the lower end thereof. An upwardly facing cup-shaped seal member **96** is attached to the lower end of section **88***b* by bolt **97** and washer **98.** When section **88***b* is in its lowermost position ports **99** are below the lower end of tubular member **81** and open to well fluid flow. The upper annular edge **100** of seal member **96** abuts and seals against the lower end. **101** of tubular member **81** when section **88b** is raised to its uppermost position as shown in FIG. **5.** In this upper position, ports **99** are positioned within the lower end of tubular member **81** and fluid flow through the valve assembly is closed off. A screened port **102** is provided in section **88b** for entry of well fluid to chamber **93** below section **88a.** After the valve has closed as shown in FIG. **5** well pressure below the valve assists in maintaining the valve closed.

In operation of the embodiments shown in FIGS. **4** and **5** when hydraulic fluid pressure in chamber **92** is released by releasing tension on wireline **46**, as previously described herein with respect to the embodiment shown in FIGS. **1, 2,** and **3,** spring **94** moves sleeve member **88** upwardly moving ports **99** within tubular member **81** and forcing seal member **96** to seal against the lower end of tubular member **81.**

While connectors **30** and **31** in conduits **27** and **28** are described as heat sensitive, in that they would dissolve or disintegrate under a high temperature to cause release of fluid pressure in conduits **27** and **28** and the resulting closure of the subsurface valve assembly and the wing valve, other devices sensitive to, for example, increased pressure or impact might be used instead.

The nose portion **51** of lower tubular member **49b** and the upper section **52** both threaded to tubular member **44** and cylindrical member **50** threaded to tubular member **49a** are shown as separate components in order to facilitate construction of the valve assembly. Any one or all of these components may be formed integral with the tubular member to which it is screw threadedly connected.

Further, instead of the piston-cylinder-fluid pressure arrangement for maintaining a correct tension on the wireline, shown and described herein for purposes of illustration, other arrangements may be used. Thus, the wireline could be directly connected to a surface winch or drum on which the torque and thereby the correct tension on the wireline may be maintained by, for example, a hydraulic gear pump or other suitable means. Other means, such as pressure or impact responsive means, for automatically releasing tension on the wireline may be substituted for or used together with the heat sensitive means illustrated. Of course, tensional force on the wireline may be released manually.

Other changes and modifications may be made in the illustrative embodiments of the invention shown and/or described herein without departing from the scope of the invention as defined in the appended claims.

Having fully described the apparatus, objects, advantages, and operation of my invention, I claim:

1. A subsurface safety valve assembly controllable by a wireline which extends to the surface and positionable in a well pipe which provides a flow path to the surface for well fluids produced from subsurface formations comprising:

a movable valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path;

valve element actuating means attachable to said wireline and connected to said valve element for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline and for permitting said valve element to move to its closed position upon removal of said tensional force on said wireline;

said actuating means comprising:

fluid pressure means responsive to said tensional force applied to said wireline for actuating said valve element to its open position; and

biasing means for moving said valve element to its closed position upon removal of said tensional force on said wireline.

2. A subsurface safety valve assembly controllable by a wireline which extends to the surface and positionable in a well pipe which provides a flow path to the surface for well fluids produced from subsurface formations comprising:

a movable valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path;

valve element actuating means attachable to said wireline and connected to said valve element for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline and for permitting said valve element to move to its closed position upon removal of said tensional force on said wireline;

said actuating means comprising:

a first outer tubular member;

a second upper inner tubular member concentric to and spaced from said first tubular member;

a third inner lower tubular member concentric to and spaced from said first tubular member;

said valve element being positioned between said second and third tubular members;

a sleeve piston arranged in the space between said first tubular member and said second tubular member and said third tubular member and said valve element;

means connecting said sleeve piston to said valve element for moving said valve element (1) from an open to a closed position upon movement of said sleeve piston from its lower to its upper position and (2) from a closed to an open position upon movement of said sleeve piston from its upper to its lower position;

a closed fluid pressure system responsive to said tensional force applied to said wireline for applying a downwardly directed fluid pressure force to said sleeve piston to move said valve element to its open position; and

biasing means arranged in the space between said first and third tubular members for urging said sleeve piston upwardly to move said valve element to its closed position.

3. A valve assembly as recited in claim **2** in which said third tubular member contains a shoulder on its outer surface for limiting downward movement of said sleeve piston.

4. A valve assembly as recited in claim **3** including a screened port formed in said third tubular member fluidly communicating the interior of said valve assembly and the space in which said biasing means is arranged.

5. A subsurface safety valve assembly controllable by a wireline which extends to the surface and positionable in a well pipe which provides a flow path to the surface for well fluids produced from subsurface formations comprising:

a movable valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path;

valve element actuating means attachable to said wireline and connected to said valve element for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline and for permitting said valve element to move to its closed position upon removal of said tensional force on said wireline;

said valve element comprising a ball valve and said actuating means comprising:

a first outer tubular member having an inwardly extending enlarged upper portion;

a second upper inner tubular member concentric to and spaced from said first tubular member having an outwardly extending enlarged upper portion;

a third inner lower tubular member concentric to and spaced from said first tubular member;

said ball valve being positioned between said second and third tubular members;

a first sleeve piston arranged between said first tubular member and said second and third tubular members and said ball valve;

biasing means arranged between said first tubular member and said third tubular member and abutting the lower end of said sleeve piston to urge said sleeve piston upwardly;

means connecting said first sleeve piston and said ball valve capable of rotating said ball valve (1) from an open to a closed position upon movement of said first sleeve piston upwardly and (2) from a closed to an open position upon movement of said first sleeve piston downwardly;

a first fluid chamber formed between the lower end of said enlarged portion of said second tubular member and the upper end of said first sleeve piston and between said first and second tubular members;

a second sleeve piston slidable on the inner wall of said second tubular member and having an inner extending enlarged lower portion slidable on the inner wall of said enlarged upper portion of said first tubular member;

a second fluid chamber formed between the lower end of the enlarged portion of said first tubular member and the upper end of the enlarged portion of said second sleeve piston and between the inner wall of said second tubular member and outer wall of said second sleeve piston;

a fluid passageway formed between the inner wall of said first tubular member and the outer wall of the enlarged upper portion of said second tubular member fluidly communicating with said first and second fluid chambers; and

the upper end of said second sleeve piston being attachable to said wireline whereby when a tensional force is applied to said wireline, fluid is forced from said second fluid chamber through said passageway into said first fluid chamber to force said first sleeve piston downwardly against the bias of said biasing means to rotate said ball valve to its open position.

6. A valve assembly as recited in claim **5** in which the wall of said sleeve piston contains oppositely disposed openings for accommodating said outer periphery of said ball valve.

7. A subsurface safety valve assembly controllable by a wireline which extends to the surface and positionable in a well pipe which provides a flow path to the surface for well fluids produced from subsurface formations comprising:

a movable valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path;

valve element actuating means attachable to said wireline and connected to said valve element for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline and for permitting said valve element to move to its closed position upon removal of said tensional force on said wireline;

said actuating means comprising:

a first tubular member;

a second tubular member within, concentric to and spaced apart from said first tubular member;

a sleeve piston extending upwardly into the space between said first and second tubular members and downwardly through the lower end of said first tubular member and having upper and lower positions, the lower portion of said sleeve piston being spaced from said first tubular member;

said valve element being positioned on the lower end of said sleeve piston and capable of sealingly engaging the lower end of said first tubular member;

the lower end of said sleeve piston containing openings above said valve element to permit fluids to flow through said valve assembly when said sleeve piston is in its lower position;

a closed fluid pressure system responsive to tensional force applied to said wireline for applying a downwardly directed fluid pressure force to said sleeve piston; and

biasing means arranged in the space between said first tubular member and said sleeve piston adapted to bias said sleeve piston upwardly.

8. A subsurface safety valve assembly controllable by a wireline which extends to the surface and positionable in a well pipe which provides a flow path to the surface for well fluids produced from subsurface formations comprising:

a movable valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path;

valve element actuating means attachable to said wireline and connected to said valve element for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline and for permitting said valve element to move to its closed position upon removal of said tensional force on said wireline;

said valve element comprising a cup-shaped seal and said actuating means comprising:

a first tubular member having an inwardly extending enlarged upper portion;

a second tubular member within, concentric to and spaced apart from said first tubular member and having upper and lower portions;

a first sleeve piston extending upwardly into the space between said first and second tubular members and downwardly through the lower end of said first tubular member and having upper and lower positions;

said cup-shaped seal being arranged on the lower end of said first sleeve piston and capable of sealingly engaging the lower end of said first tubular member;

the lower end of said first sleeve piston containing openings to permit fluids to flow through said valve assembly when said first sleeve piston is in its lowermost position;

biasing means arranged between said first tubular member and said first sleeve piston adapted to bias said sleeve piston upwardly;

a first fluid chamber formed by the space between said first tubular member and the lower portion of said second tubular member above said first sleeve piston;

a second sleeve piston slidable on the inner wall of said second tubular member and having an inner extending enlarged lower portion slidable on the inner wall of said enlarged upper portion of said first tubular member;

a second fluid chamber formed between the lower end of the enlarged portion of said first tubular member and the upper end of the enlarged portion of said second sleeve piston and between the inner wall of the upper portion of said second tubular member and the outer wall of said second sleeve piston;

a fluid passageway formed between the inner wall of said first tubular member and the outer wall of the upper portion of said second tubular member fluidly communicating with said first and second fluid chambers; and

the upper end of said second sleeve piston being attachable to said wireline whereby when a tensional force is applied to said wireline fluid is forced from said second fluid chamber through said passageway into said first fluid chamber to force said first sleeve piston downwardly against the bias of said biasing means until said openings in said first sleeve piston are below the lower end of said first tubular member.

9. A subsurface safety valve system for controlling flow of fluids through a well pipe which provides a flow path to the surface for upwardly flowing well fluids produced from subsurface formations comprising:

a valve assembly arranged in said well pipe including a valve element having an open position to permit flow of fluids through said flow path and a closed position to prevent flow of fluids through said flow path and valve element actuating means connected to said valve element and including means movable downwardly for actuating said valve element to its open position and biasing means movable upwardly to urge said valve element to its closed position; and

a wireline attached to said actuating means for maintaining said valve element in its open position when a predetermined tensional force is applied to said wireline, said biasing means of said actuating means moving said valve element to its closed position upon removal of said tensional force on said wireline.

10. A subsurface safety valve system as recited in claim **9** including means connected to said wireline for releasably maintaining said tensional force on said wireline.

11. A valve system as recited in claim **9** in which said actuating means comprises:

fluid pressure means responsive to said tensional force applied to said wireline for actuating said valve element to its open position; and

biasing means for moving said valve element to its closed position upon removal of said tensional force on said wireline.

12. A valve system as recited in claim **9** in which said actuating means comprises:

a first outer tubular member;

a second upper inner tubular member concentric to and spaced from said first tubular member;

a third inner lower tubular member concentric to and spaced from said first tubular member;

said valve element being positioned between said second and third tubular members;

a sleeve piston arranged in the space between said first tubular member and said second tubular member and said third tubular member and said valve element;

means connecting said sleeve piston to said valve element for moving said valve element (1) from an open to a closed position upon movement of said sleeve piston from its lower to its upper position and (2) from a closed to an open position upon movement of said sleeve piston from its upper to its lower position;

a closed fluid pressure system responsive to said tensional force applied to said wireline for applying a downwardly directed fluid pressure force to said sleeve piston to move said sleeve piston upwardly and move said valve element to its open position; and

biasing means arranged in the space between said first and third tubular members for urging said sleeve piston upwardly and move said valve element to its closed position.

13. A valve system as recited in claim **12** in which said third tubular member is provided with a shoulder on its outer wall for limiting downward movement of said sleeve piston.

14. A valve system as recited in claim **13** including a screened port formed in said third tubular member fluidly communicating the interior of said valve assembly and the space in which said biasing means is arranged.

15. A valve system as recited in claim **14** including means connected to said wireline for releasably maintaining said tensional force on said wireline.

16. A valve system as recited in claim **9** in which said valve element comprises a ball valve; and said actuating means comprises:

a first outer tubular member having an upper portion of decreased inner diameter;

a second upper inner tubular member concentric to and spaced from said first tubular member having an upper portion of increased inner and outer diameters;

a third inner lower tubular member concentric to and spaced from said first tubular member;

said ball valve being positioned between said second and third tubular members;

a first sleeve piston arranged between said first tubular member and said second and third tubular members and said ball valve;

biasing means arranged between said first tubular member and said third tubular member and abutting the lower end of said first sleeve piston to urge said first sleeve piston upwardly;

means connecting said first sleeve piston and said ball valve capable of rotating said ball valve (1) from an open to a closed position upon movement of said first sleeve piston upwardly and (2) from a closed to an open position upon movement of said first sleeve piston downwardly;

a first fluid chamber confined between the lower end of said upper portion of said second tubular member and the upper end of said first sleeve piston and between the lower portions of said first and second tubular members;

a second sleeve piston having an upper portion slidable on the inner wall of the upper portion of said first tubular member and having a lower portion of increased diameter slidable on the inner wall of said upper portion of said second tubular member;

a second fluid chamber confined between the lower end of the upper portion of said first tubular member and the upper end of the lower portion of said second sleeve piston and between the inner wall of the upper portion of said second tubular member and the outer wall of the upper portion of said second sleeve piston;

a fluid passageway formed between the inner wall of said first tubular member and the outer wall of the upper portion of said second tubular member fluidly communicating with said first and second fluid chambers;

the upper end of said second sleeve piston being attachable to said wireline whereby when a tensional force is applied to said wireline fluid is forced from said second fluid chamber through said passageway into said first fluid chamber to force said first sleeve piston downwardly against the bias of said biasing means to actuate the ball valve to its open position and when said tensional force on said wireline is released said biasing means forces said first sleeve piston upwardly to actuate the ball valve to its closed position and said fluid is forced from said first fluid chamber through said passageway into said second fluid chamber.

17. A valve system as recited in claim **16** in which the wall of said sleeve piston contains oppositely disposed openings for accommodating the outer periphery of said ball valve.

18. A valve system as recited in claim **9** in which said actuating means comprises:

a first tubular member;

a second tubular member within, concentric to and spaced apart from said first tubular member;

a sleeve piston extending upwardly into the space between the first and second tubular members and downwardly through the lower end of said first tubular member and having upper and lower positions, the lower portion of said sleeve piston being spaced from said first tubular member;

said valve element being positioned on the lower end of said sleeve piston and capable of sealingly engaging the lower end of said first tubular member;

the lower end of said sleeve piston containing openings above said valve element to permit fluids to flow through said valve assembly when said sleeve piston is in its lower position;

a closed fluid pressure system responsive to tensional force applied to said wireline for applying a downwardly directed fluid pressure force to said sleeve piston; and

biasing means arranged in the space between said first tubular member and said sleeve piston adapted to bias said sleeve piston upwardly.

19. A valve system as recited in claim **18** including a screened port formed in said sleeve piston fluidly communicating the interior of said valve assembly and the space in which said biasing means is arranged.

20. A valve system as recited in claim **18** including means connected to said wireline for releasably maintaining said tensional force on the wireline.

21. A valve system as recited in claim **9** in which said valve element comprises a cup-shaped seal; and said actuating means comprises:

a first tubular member having an inwardly extending enlarged upper portion;

a second tubular member within, concentric to and spaced apart from said first tubular member and having upper and lower portions;

a first sleeve piston extending upwardly into the space between said first and second tubular members and downwardly through the lower end of said first tubular member and having upper and lower portions;

the cup-shaped seal being arranged on the lower end of said first sleeve piston and capable of sealingly engaging the lower end of said first tubular member;

the lower end of said first sleeve piston containing openings to permit fluids to flow through said valve assembly when said first sleeve piston is in its lowermost position;

biasing means arranged between said first tubular member and said first sleeve piston adapted to bias said sleeve piston upwardly;

a first fluid chamber formed between said first tubular member and the lower portion of said second tubular member above said first sleeve piston;

a second sleeve piston slidable on the inner wall of the upper portion of said second tubular member and having an inner extending enlarged lower portion slidable on the inner wall of said enlarged upper portion of said first tubular member;

a second fluid chamber formed between the lower end of the enlarged portion of said first tubular member and the upper end of the enlarged portion of said second sleeve piston and between the inner wall of the upper portion of said second tubular member and the outer wall of said second sleeve piston;

a fluid passageway formed between the inner wall of said first tubular member and the outer wall of the upper portion of said second tubular member fluidly communicating with said first and second fluid chambers; and

the upper end of said second sleeve piston being attached to said wireline whereby when a tensional force is applied to said wireline fluid is forced from said second fluid chamber through said passageway into said first fluid chamber to force said first sleeve piston downwardly against the bias of said biasing means to move said opening in said first sleeve piston below the lower end of said first tubular member.

22. A valve system as recited in claim **21** including means connected to said wireline adjacent the surface for releasably maintaining said tensional force on said wireline.

23. A valve system as recited in claim **22** wherein said means connected to said wireline at the surface includes releasable fluid pressure means.

24. A valve system as recited in claim **23** including a paraffin scraper attached to the lower end of said wireline; said wireline being releasable from connection to said valve actuating means for pulling said paraffin scraper upwardly through said well pipe.

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