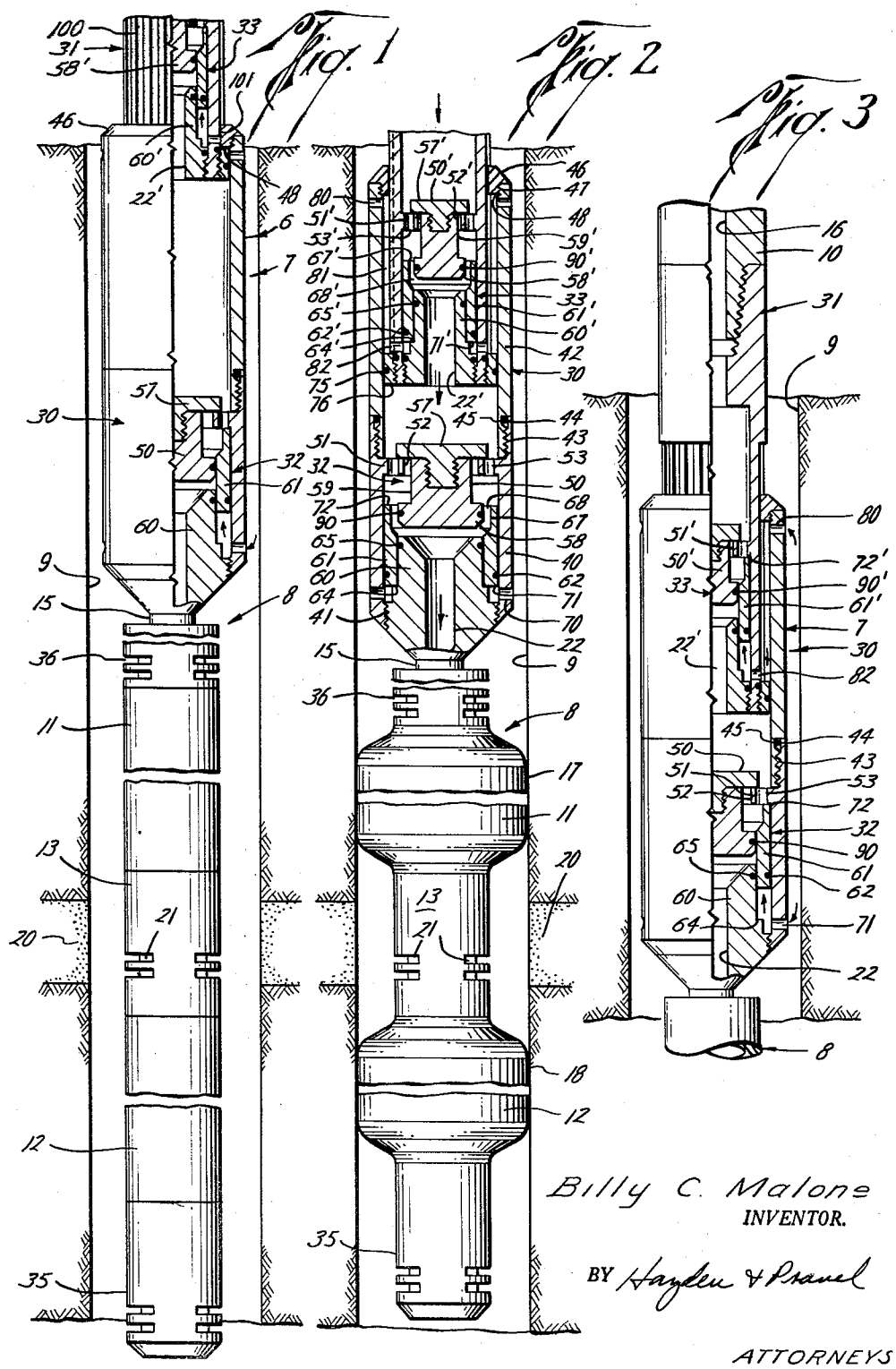
Nov. 24, 1964 B. C. MALONE 3,158,200

PUMPING APPARATUS FOR ANCHORING IN A WELL BORE

Filed Aug. 9, 1961 3 Sheets-Sheet 1



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PUMPING APPARATUS FOR ANCHORING IN A WELL BORE

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Fig. 4

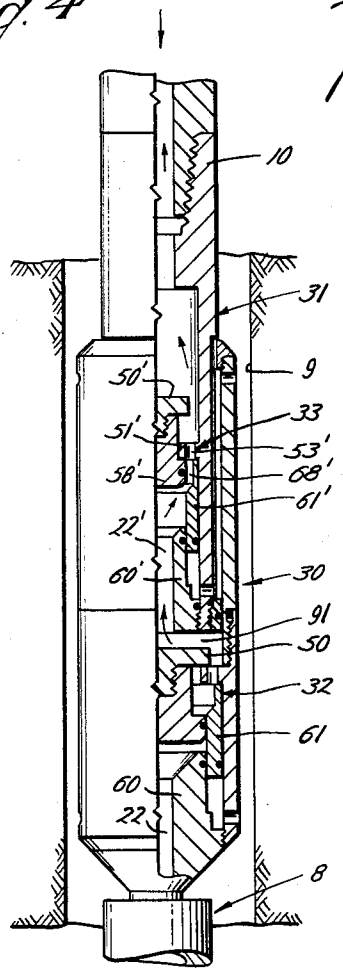
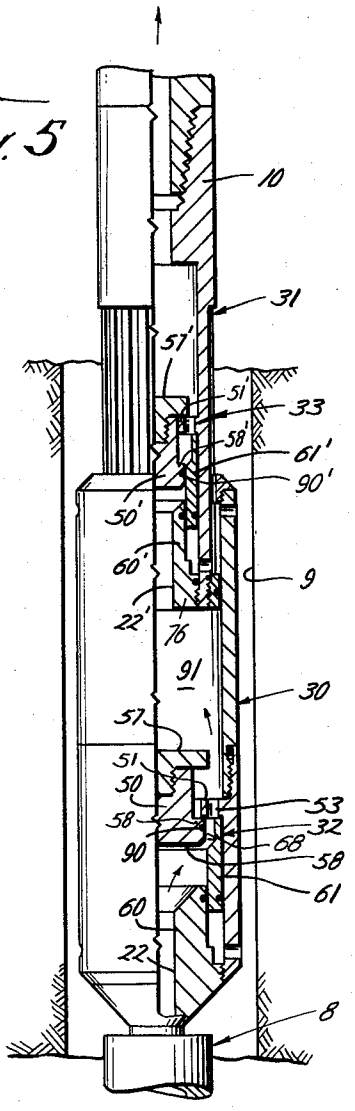


Fig. 5



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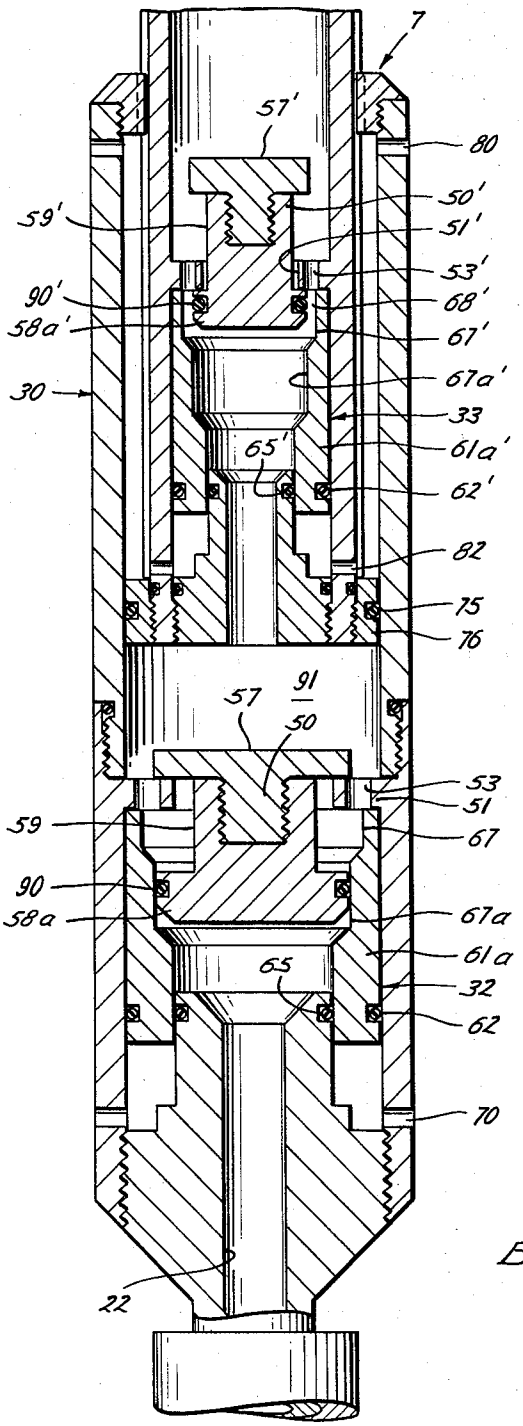


Fig. 6

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PUMPING APPARATUS FOR ANCHORING IN A WELL BORE

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Filed Aug. 9, 1961, Ser. No. 130,306
14 Claims. (Cl. 166—106)

The present invention relates to a well tool for connection with a well string to be lowered into a well bore, and more particularly to a pump arrangement for anchoring in a well bore on a well string whereby fluid may be circulated through the well string and through the pump arrangement in either direction and for pumping fluid through the well string in one direction.

In the drilling of oil and gas wells in unproven territory or area, it is desirable to test various formations before the expense of the well completion is incurred in order to determine whether or not the well is commercially worthwhile.

At the present time, this testing operation is carried out by first stopping drilling operations, then removing the drill string from the well bore and then lowering the packer tool into the well bore on a tubing string. The packers are set in the well bore so as to straddle or span the indicated producing formation and an opening is provided in the tubing between the packers so as to obtain a sample of the formation fluid in the tubular string. The flow from the producing formation into the tubing string is accomplished by running a swab tool through the tubing string. This serves to urge or encourage flow from the zone being tested into the tubing string whereupon the tubing string and the trapped sample therein may be removed from the well bore.

In another form of testing, a chamber is provided in the drill string adjacent the bit for trapping formation fluids therein. However, this procedure is extremely undesirable because the sample may be contaminated with drilling fluids. If the formation pressure is tested, drilling fluid may contaminate the formation and block it off partially to cause inaccurate measurements of formation pressure and flow rate.

It can be appreciated that a great deal of time, trouble, and expense is involved in testing operations as they presently exist, and the present invention for one of its objects has the provision of a tool which may be lowered into a well bore on a drill string and which enables the testing of a particular zone with far more precision and accurate results than heretofore possible.

More particularly, the present invention is directed to a well tool which is adapted to be lowered into a well bore on a well string, such as the drill string, and which eliminates the necessity of lowering a swab through the well string in order to draw a sample of fluid into the well string from the well bore.

Yet a further object of the present invention is to provide a pumping arrangement for a well tool which may be connected to the lower end of a well string and to the upper end of a packer section, such pumping arrangement including valve means to enable well fluid to be circulated down through the well string for setting the packer section or for conducting treating operations or other well operations and which valve means is constructed and arranged so that when the well string is thereafter reciprocated relative to the anchor packer section, well fluid is pumped from the well bore into the well string.

Still a further object of the present invention is to provide a well tool which eliminates the necessity of lowering a tubing string into the well bore and then running a swab through the tubing string in order to obtain a sample of well fluid.

Still another object of the present invention is to provide a well tool which may be lowered into a well bore on the same string which has been used to drill the well, the well tool including a packer section and a pumping section, the pumping section being constructed and arranged whereby well fluid may be conducted down the well string so as to anchor the packer section in the well bore, and the pump section being also constructed and arranged so that when the well string is thereafter reciprocated, well fluid is pumped from the well bore into the tubing string.

A further object of the invention is to provide a pumping arrangement to be lowered into a well bore on a well string including an outer housing to be anchored in the well bore, a piston reciprocably mounted in said housing and connected to the lower end of the well string whereby reciprocation of the well string pumps fluid therein.

Yet a further object is to provide a test tool in which may be incorporated devices for measuring various formation conditions.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following description and drawings wherein:

FIG. 1 is a vertical view partly in section illustrating the present invention positioned in a well bore on a well string, the pump section being illustrated at the upper part of the drawing, and the packer or anchor section being illustrated in the lower part of FIG. 1;

FIG. 2 is a vertical view similar to FIG. 1, but illustrating the pump section of the present invention in one half sectional view and the packer section anchored in the well bore with the component parts of the pump shown in position for accommodating fluid circulation downwardly through the pump section;

FIG. 3 is a sectional view of the pump section of the present invention illustrating the position of its component parts when it is to be used to pump fluids from the well bore into the well string;

FIG. 4 is a sectional view similar to FIG. 3 but showing the well string in its lowered position relative to the anchored packer section to pump fluids into the well string;

FIG. 5 is a sectional view similar to FIG. 4 and showing the well string lifted relative to the anchored packer section to complete one cycle, or pump stroke, in the pumping operation; and

FIG. 6 illustrates an alternate embodiment of the invention.

Attention is first directed to FIG. 1 of the drawings wherein the present invention is designated generally by the numeral 6. The invention 6 includes the pump section designated generally by the numeral 7 and the packer or anchor section designated generally by the numeral 8. The pump section 7 is secured in the well string above the anchor or packer section 8, it being contemplated that the tool 6 will be lowered into the well bore 9 on a well string 10 as illustrated in FIG. 3 of the drawings.

The packer section 8 includes at least one inflatable element thereon, and two inflatable packer elements 11 and 12 are shown in the drawings. The spaced inflatable packer elements 11 and 12 are connected together by the portion 13, and the packer section 8 is supported on the mandrel or pipe 15. The structural arrangement of the spaced inflatable elements 11 and 12 and their arrangement on the pipe 15 may be in the form as disclosed in Patent No. 2,831,541, issued to G. E. Conover on April 22, 1958.

The pump section 7, which is formed above the packer section 8 as illustrated in the drawings, is constructed and arranged so that fluid may be circulated down the bore 16 of the well string 10 so as to inflate the elements 11 and 12 to anchor the packer section 8 in the well bore 9 as

illustrated at 17 and 18 of FIG. 2. This seals off the formation 20 which is to be tested and also anchors the packer section 8 in the well bore 9 so that the well string 10 may then be reciprocated so as to draw well fluids from the formation 20 through the passages 21 in the connection portion 13 between the elements 11 and 12 and into the passage 22 of the mandrel 15.

Continued reciprocation of the well string 10, as will be described in greater detail hereinafter, relative to the anchored packer section 8 will cause the well fluids to pass upwardly into the well string 10 above the pump section 7.

The present invention will be described in its use in connection with the packer section 8 which includes the inflatable elements 11 and 12. However, it should be understood that under some circumstances it may be desirable to use other forms of packer means or some other suitable arrangement for anchoring the pump section 7 in the well bore so that the well string 10 may be reciprocated so as to pump well fluids in the well string. Also, it can be appreciated that it may be desirable to circulate fluids in well string 10 for treating operations or for conducting operations other than inflating elements 11 and 12.

The pump section 7 generally includes two portions, one of which is the outer cylindrical housing 30 which forms an extension on the mandrel 15 of the packer section 8. The other portion 31 assumes the general configuration of a piston which telescopically fits within the housing 30 as illustrated in FIG. 1 of the drawings, the portion 31 being adapted for connection to the well string 10 as best illustrated in FIG. 3 of the drawings. The housing 30 includes valve means designated generally by the numeral 32, and the piston 31 also includes valve means designated generally by the numeral 33. The valve means 32 in the housing and the valve means 33 in the piston 31 are constructed and arranged so that well fluids may be circulated through the bore 16 of the well pipe 10 and through the piston 31 and housing 30 in both directions to perform various operations, such as to inflate the elements 11 and 12. As previously noted, the structural arrangement of packer section 8 including pipe 15 and packers 11 and 12 is disclosed in Patent 2,831,541, and mandrel 15 may be initially in inflated position as the tool is lowered into the well bore. When the tool is positioned at the desired elevation in the well bore, fluid may be pumped down bore 16 of the well string 10 to inflate packers 11 and 12 and expand them as shown in FIG. 2 of the drawings.

It can be appreciated that pipe 15 is connected to housing 30 which in turn is connected to well string 10 by the keys 100 and keyways 101 whereby the pipe 15 may be manipulated as described in the patent above referred to whereby the pipe 15 and bore 16 of the well pipe may be communicated by ports 36 above the packer section 8 to the well bore, or the pipe 15 and bore 16 may be selectively communicated below the packer section 8, or between the packers. As previously stated, Patent 2,831,541 gives a complete structural detail of the packer section 8, including the manner of manipulating mandrel 15 relative to the anchored packers.

Since the housing 30 is connected to pipe 15 and since the pipe 15 is locked to packers 11 and 12 as disclosed in the patent, inflation of the packers anchors the housing 30 in the well bore 9. The well string 10 then may be reciprocated relative to housing 30 whereupon the valve means 32 and 33 cooperate to pass fluid therethrough and up into the well string 10.

As shown in FIG. 2, the housing 30 may be formed of any suitable number of sections to facilitate manufacture. As illustrated, the housing 30 includes a cylindrical portion 40 which is connected at its lower end by suitable means such as threads 41 thereon to the pipe or mandrel 15. A similar cylindrical portion 42 is connected to the upper end of 40 by cooperating threads 43. Suitable seal means as represented by the seal ring 44 in the groove 45 are provided for sealing off fluid leakage between 40 and 42. The upper end of 42 is provided with a cap 46 which may be suitably connected to 42 by any suitable means such as threads 47, the cap 46 including an annular shoulder 48 so as to limit the travel of piston 31 in the housing 30 as will be described in greater detail hereinafter. Such arrangement also forms a support for connecting the piston portion 31 and housing 30 as well as the packer section 8 as they are lowered into the well bore 9 on the well string 10.

The valve means designated generally at 32 in the housing 30 includes a valve element 50, which valve element is supported on the support 51 formed in the housing 30. It will be noted that the support 51 is provided with a central passage means 52 as well as additional passage means 53 which extend therethrough and provide access for fluid flow through valve means 32 as will be described hereinafter. The support 51 may be in the form of an annular ledge within the housing 30 as shown in the drawings. The valve element 50 includes an enlarged annular end portion 57 and an enlarged annular end portion 58 and the central portion 59 which extends longitudinally between the end portions 57 and 58, the central portion being reduced in diameter relative to the enlarged end portions as shown in the drawings. Thus, the valve element 50 may move longitudinally within the housing 30, such movement being limited by engagement of the enlarged end portions 57 or 58 with the support 51. It is to be further noted that the enlarged end portions 57 and 58 are of a suitable size so that regardless of the position of the valve element 50 within the housing 30, the passage means 53 in the support 51 is not blocked off.

The mandrel 15, which is connected by the threads 41 to the outer housing 30, extends upwardly into the housing 30 to form a guide 60. It will be noted that the guide 60, which is concentrically arranged within the housing 30, is of a smaller diameter than the inner diameter of the housing 30 to provide a space for receiving the sleeve 61 thereabout. The sleeve 61 fits within the space between the guide 60 and the inner wall of the housing, and is provided with seal means 62 to form a fluid seal between the inner wall of the housing 30 and sleeve 61. Also, an annular ledge 64 is provided adjacent the lower end of guide 60 for seating the end 71 of sleeve 61 when it is in its lowermost position as shown in FIG. 2 of the drawings. Suitable seal means 65 are provided for sealing off between the guide 60 and the sleeve 61 as the sleeve 61 moves longitudinally relative to the guide 60 during operation of the valve means 32 as will be described in greater detail hereinafter.

It will be noted that the sleeve 61 is counterbored as shown at 67 at its upper end so that when the valve element 50 is in its lowermost position as shown in FIG. 2 of the drawings and when the sleeve 61 is in its lowermost position as shown in FIG. 2 of the drawings, the sleeve 61 and enlarged end 58 of the valve element 50 are radially spaced to provide a passage means 68 for conducting fluid through the valve means 32.

A port means 70 is provided in the lower end of the housing 30 and communicates with the lower end 71 of sleeve 61. When the fluid pressure in the well bore 9 exceeds the fluid pressure existing within the well string and within the housing 30, the sleeve 61 will be moved longitudinally of the housing 30 until its upper end 72 abuts the support 51 as illustrated in FIG. 3 of the drawings. It will be noted that the guide 60 is of suitable axial extent so that when the sleeve 61 is in its uppermost position as shown in FIG. 3 of the drawings, the guide 60 and sleeve 61 are in contact for a substantial portion of the axial extent of the sleeve 61 so as to properly center the sleeve 61 during its movement and operation in the housing 30. Also, the seal means 65 between the guide 60 and sleeve 61 is always in contact with the inner wall of the sleeve 60 so as to form a fluid seal therebetween.

The piston 31 includes an elongated portion which is reduced in diameter relative to the piston end 76. Seal

means 75 are provided about the enlarged piston end 76 so that the piston end 76 is sealably engaged with the outer housing 30 during longitudinal movement of the piston 31. The piston, or piston element 31, includes valve means 33, which valve means has components that correspond to the components of the valve means 32. For example, a guide 60' is concentrically formed within the element 31 and extends longitudinally upwardly from the enlarged piston end 76. A passage 22' extends through the guide 60' and end 76 for the passage of fluid therethrough. The guide 60' includes an annular shoulder 64' for receiving the lower end 71' of the sleeve 61'. The guide 60' is spaced relative to the inner wall of the piston element 31 so as to provide a recess for receiving the sleeve 61', and seal means 62' are provided between the sleeve 61' and the inner wall of the piston element 31. Also, suitable seals 65' are provided between the guide 60' and the sleeve 61'.

The sleeve 60' is provided with a counterbore 67' which provides a passage 68' between the enlarged end 58' and sleeve 61' as shown in FIG. 2 of the drawings.

The piston element 31 also includes an annular support 51' which is provided with passage means 52' and 53' therethrough. The support 51' carries a valve element 50' having enlarged ends 57' and 58' connected together by the central portion 59' which central portion is of a smaller diameter than the annular enlarged end portions 57' and 58' whereby the valve element 50' may move up and down relative to its support 51'.

The outer housing 30 is provided with port means 80 which communicate well fluid to the annular space 81 surrounding the reduced portion of piston element 31 on one side of the enlarged piston end 76 and also communicate with the end 71' of the sleeve 61' through the port or passage means 82 in the piston element 31 immediately above the enlarged end 76 as shown in FIG. 2 of the drawings. Thus, as long as fluid pressure in the well string 10 is greater than the fluid pressure in the well bore, the sleeve 61' and the sleeve 61 will assume the position shown in FIG. 2 of the drawings to enable fluids to be communicated through the well string 10, the valve means 33, and the valve means 32.

Normally, the present invention will be used in well bores which have a fluid medum therein. In the operation of the present invention, it can be connected to the lower end of a well string, such as the drill string, and lowered into a well bore until the packer section 8 is disposed so that the packer elements 11 and 12 span the formation 20 which is to be tested. The fluid pressure within the well string 10 may be increased so that the sleeve elements 61' and 61 assume the position in their respective valve means 33 and 32 as illustrated in FIG. 2 of the drawings. When this occurs, fluid pressure may be communicated through the well string 10 to the inflatable elements 11 and 12 so as to inflate the elements and anchor them in the well bore. When this has occurred, the outer housing 30 of the pump section 7 is anchored in the well bore whereupon the portion 31, or the piston element 31, may be reciprocated within the housing 30 so as to effect a pumping action to draw fluids in the passages 21 from the formation 20 and into the well string 10 above the pump section 7.

In FIG. 3, the pump section designated generally at 7 is shown when the pump pressure within the well string 10 has been relieved. When the pump at the earth's surface is shut off or reduced in speed, the fluid pressure existing in the well bore 9 will act through the port means 70 in the housing 30 and through the port means 80 and 82 in the piston element 31 so as to move the sleeves 61 and 61' upwardly until their upper end 72 and 72' engage the supports 51 and 51', respectively. When this occurs, it will be noted that the valve elements 50 and 50' in the valve means 32 and 33 engage their respective sleeves 61 and 61' so as to close off the valve means 32 and 33. The valve element 50 and the valve element 50' are provided with suitable seal means 90 and 90' on their enlarged ends 58 and 58', respectively, whereby the valve elements 50 and 50' may sealably engage with their respective sleeves 61 and 61'.

FIG. 4 illustrates the relative position of the components of the valves 32 and 33 at the end of one-half cycle of the pump stroke. It will be noted that the piston element 31 and well string 10 have been moved downwardly relative to the housing 30 which is anchored in the well bore 9. The telescoping movement of the piston element 31 within the housing 30 causes the valve element 50 to remain in the position described with regard to FIG. 3. However, the presence of fluid within the housing 30 in the space 91 between the valves 32 and 33 and the telescoping of the valve element 31 downwardly within the housing 30 will cause the valve element 50' to move upwardly relative to its support 51' as illustrated in FIG. 4 of the drawings. When this occurs, the valve element 50' will move to a position relative to its respective sleeve 61' so that the passage 53' in the support 51' may communicate through 68' with the passage 22' in the guide 60' and piston head 76 and with the chamber 91 between the valve means 32 and 33. Thus, any fluid in the chamber 91 will be moved through the passage means 22', 68', and 53' above valve means 33 and into the passage 16 and well string 10.

FIG. 5 illustrates the next one-half cycle of movement of the valve element 31 relative to the anchored housing 30, and in this cycle of the pump stroke, it will be noted that the relative position of the valve elemnets 50' and 50 in the valve means 33 and 32, respectively, has been reversed. When the well string 10 is moved upwardly so as to move piston element 31 upwardly within the housing 30, any fluid above piston element 50' will act on the enlarged end 57' so as to seat the enlarged end 57' on the support 51'. When this occurs, the enlarged end 58' and its seal 90' engages sleeve 61' so as to trap the fluid above the valve element 57'.

However, such upward movement permits the valve element 50 to move upwardly in response to pressure acting on its enlarged end 58, or in response to reduced pressure in 91, whereupon the enlarged end 58 moves upwardly to engage the support 51. When this occurs, the enlarged end 58 and its seal 90 are moved out of engagement with the sleeve 61 whereupon well fluids in the passage 22 which communicate with the passage 21 between the spaced inflatable elements 11 and 12 are passed through the passage 68, and then passage 53 of the support 51 into the chamber 91.

The cycle of pump operation described in FIG. 4 is then repeated. In other words, well string 10 is lowered whereupon the fluids in the chamber or passage 91 are moved upwardly above the valve element 50' while fluid communication between the valve element 32 and the well bore through the passage 21 is shut off.

The next cycle of operation as described with regard to FIG. 5 is then repeated so as to draw well fluid in through the passage means 21, passage 22, passage means 68, and 53, and into the chamber 91.

The passages 22, 68, 53, 91, 22', 68', and 53' form a fluid passage means through the outer housing 30 to conduct fluids therethrough in either direction, as described hereinabove.

The foregoing permits the well string to be reciprocated so as to pump the formation 20 to obtain a sample of its fluids for further study and analysis.

After the sample of the well fluid has been obtained, the well tool 6 may then be removed from the well bore. Patent 2,831,541 illustrates one form of the packer section 8, and the mandrel 15 may be manipulated so as to deflate packers 11 and 12 whereupon the tool 6 may then be removed from the well bore.

In order to accomplish functioning the release mechanism, the piston element 31 is non-rotatably connected to the housing 30 by suitable means such as the longi-

tudinally extending keys **100** on the outer surface of the element **31** which fit within the keyways **101** in the cap **46** as shown in the drawings.

A limiting stop is provided on **31** to limit its downward movement as the well string **10** is reciprocated.

The valve means **32** is a stationary or standing valve and the valve means **33** travels with piston element **31**.

In some situations, the density of the fluid in the well bore will not be as great, or greater than, the density of the fluid in well string **16**. When the pump section **7** is functioning, sleeves **61** and **61'** should remain in their uppermost position as shown in FIGS. 4 and 5. Additionally, other factors may indicate the desirability of providing a construction wherein the area of the sleeves **61** and **61'** exposed to the pressure in bore **16** is different from the area of the sleeves **61** and **61'** exposed to the pressure in the well bore **9**.

FIG. 6 illustrates one form of accomplishing this function. In FIG. 6, the pump section is illustrated generally by the numeral **7** and includes two portions, one of which is the outer cylindrical housing **30** which forms an extension on the mandrel **15** of the packer section **8** as described with regard to FIGS. 1–5 hereinabove. The other portion **31** assumes the general configuration of a piston which telescopically fits within the housing **30** as previously described with regard to the form of the invention shown in FIGS. 1–5. The portion **31** is, of course, connected to the well string **10** as described and shown in greater detail in connection with FIG. 3 of the drawings.

The housing **30** includes valve means designated generally by the numeral **32**, and the piston **31** also includes valve means designated generally by the numeral **33**. The valve means **32** in the housing and the valve means **33** in the piston are constructed and arranged so that well fluids may be circulated through the bore **16** of the well pipe **10** and through the piston **31** and housing **30** in both directions to perform various operations in a manner as described with regard to FIGS. 1–5; however, certain modifications have been made in the valve means **32** and **33** in that the sleeves designated at **61*a*** and **61*a'*** have been modified from that as described with regard to the FIGS. 1–5 modification. It is to be noted that the other equivalent elements of the valves **32** and **33** are numbered as they are numbered in FIGS. 1–5, inclusive.

However, sleeves **61*a***, **61*a'***, and enlargements **58*a*** and **58*a'*** on valve elements **50** and **50'** are of slightly different construction so that the present invention may function even when the pressure of the fluid in the well bore **9** or the density of the fluid in the well bore is such that it is the same as or possibly less than the pressure or density of the fluid in the bore **16** of the well string **10**.

As illustrated in the drawings, the sleeve **61*a*** is counterbored as shown at **67** which is similar to the counterbore of the sleeves **61** and **61'** of the FIGS. 1–5, inclusive, modification. Additionally, a second counterbore **67*a*** is provided in sleeve **61*a*** which is somewhat larger than the internal diameter of the bore that extends through the sleeve **61*a*** but which is somewhat smaller than the counterbore **67**. Similarly, the sleeve **61*a'*** is provided with a counterbore **67'** and an additional counterbore **67*a'*** which is slightly smaller than the counterbore **67'**, but which is slightly larger than the internal diameter of the bore that extends through the sleeve **61*a'***.

The enlargement **58*a*** on the valve element **50** and the enlargement **58*a'*** on the valve element **50'** are dimensioned so that the seals **90** and **90'** thereon will engage within the second counterbore **67*a*** and **67*a'***, respectively, of each of the sleeves **61*a*** and **61*a'*** when the sleeves are in their uppermost position.

Thus, when the valve element **50** is seated as illustrated in FIG. 6 of the drawings so that seal **90** engages the wall of the counterbore **67*a*** in the sleeve **61*a***, the effective area of the sleeve **61*a*** which is exposed to the fluid pressure within the chamber **91** of housing **30** is smaller than the effective area of the sleeve **61*a*** that is exposed to the fluid pressure in the well bore and acting on its lower end beneath seal **62**.

It can be appreciated that in a similar manner when the valve element **50'** is in its lowermost position, the seal **90'** engages the second counterbore **67*a'*** of the sleeve **61*a'*** in a manner as described with regard to valve element **50** hereinabove. This provides a smaller effective area of the sleeve **61*a'*** that is exposed to the fluid pressure in the well string **10** than that which is exposed to the well bore and acting on the lower end of the sleeve **61*a'*** across seal **62'**.

It can be further appreciated that the area differential exposed to the fluid in the well string and exposed to the fluid in the well bore may be varied as desired by changing the structural components in any suitable manner as above noted. Thus, the pressure required to pump the sleeves **61*a'*** and **61*a*** down or to cause them to move up against the barriers **51** and **51'** would be proportional to the areas exposed to the fluid pressure in the well string and in the well bore. For example, if the area of each of the sleeves **61*a*** and **61*a'*** exposed to well bore pressure and the area on each sleeve exposed to the fluid pressure in the well string is in the ratio of 1.1 to 1, then the ratio of the pressure in the well string to the pressure in the well bore to effect downward movement of the sleeves **61*a'*** and **61*a*** will likewise be 1.1 to 1. Of course, this ratio may be varied, and this example is given for purposes of illustration only.

Under various well conditions and operation conditions, it may be desirable to provide a construction wherein a differential area is provided on the sleeves as hereinabove described.

Broadly, the present invention relates to a well tool which is adapted to be anchored in a well bore whereupon the well string may be reciprocated so as to pump well fluids into the well string.

What is claimed is:

1. A well tool for connection with a tubular well string to be lowered into a well bore comprising, a packer section, said section including at least one inflatable packer element adapted to be inflated by fluid flow from the well string, a pump section connected in the well string above said packer section, said pump section including telescoping portions, one of said portions being secured to the upper end of said packer section and the other of said portions being secured to the lower end of the well string, valve means in each of said portions responsive to fluid pressure in said well bore and responsive to fluid pressure in the well string, said valve means so constructed and arranged when the fluid pressure in the well string is greater than the fluid pressure in the well bore to conduct fluid pressure through said valve means in said packer section to inflate said packer element, said valve means so constructed and arranged when the fluid pressure in the well bore is greater than the fluid pressure in the well string after said packer element has been inflated and upon reciprocation of the well string to conduct fluid pressure through said packer section to the well string.

2. A well tool for connection with a well string to be lowered into a well bore and anchored whereby the well string may be reciprocated to pump well fluids therein including, anchor means for connection to a well string whereby the well tool may be positioned in a well bore, a pump section connected in the well string above said anchor, said pump section including valve means therein, said valve means so constructed and arranged to conduct well fluid therethrough to actuate said anchor means, said valve means operable after said anchor means is actuated and upon reciprocation of the well string to pump fluid in the well string.

3. The invention recited in claim 1 wherein said valve means in said portion secured to said packer section is

a standing valve and wherein said valve means in said portion secured to the well string is a traveling valve.

4. The invention recited in claim 3 including a sleeve mounted in each of said portions, seal means between said sleeve and said portions, port means in each of said portions for communicating well fluids to act on said sleeves, said sleeves each being slidable in their respective portion and relative to said valve means, said valve means each including a movable valve element, means supporting each of said elements in their respective portion, seal means on said element, said sleeves movable in response to the fluid pressure in the well bore to a position for engagement with said valve elements so that said valve elements may alternately open and close upon reciprocation of the well string to pump fluids in the well string.

5. A pump arrangement for anchoring in a well bore on a well string whereby fluid may be circulated down the well string through the pump arrangement and for pumping fluid up the well string including, an outer housing, means for anchoring said housing in a well bore, said housing having a fluid passage therethrough, a valve element in said housing, a support for said valve element, said support having flow passages therethrough, said valve element having enlarged end portions whereby the movement of said valve element relative to said support is limited, a sleeve in said housing, port means in said housing for communicating fluid from the well bore to act on said sleeve and move it to a position adjacent said valve element, seal means on said valve element whereby said valve element and sleeve may be sealably engaged to stop fluid flow through said housing in one direction, a piston sealably engaged with said housing above said support and adapted for connection with the well string for reciprocation thereby, said piston having a fluid passage therethrough for communicating with the fluid passage through said housing, a valve element in said piston, a support for said piston valve element, said support having flow passages therethrough, said piston valve element having enlarged end portions whereby the movement of said piston valve element within said piston is limited, a sleeve in said piston, port means in said housing and in said piston for communicating fluid from the well bore to act on said piston sleeve and move it to a position adjacent said piston valve element, seal means on said piston valve element whereby said piston valve element and piston sleeve may be sealably engaged to stop fluid flow through said piston in one direction, said housing valve element movable to close off flow through said housing when said piston moves toward said housing valve element and said piston valve element movable to open said piston to receive fluid from said housing when said piston moves toward said housing valve element, and said housing valve element movable to open flow into said housing when said piston moves away from said housing valve element and said piston valve element movable to close flow from said housing when said piston moves away from said housing valve element.

6. A pump arrangement to be anchored in a well bore by an inflatable element on a well string whereby the well string may be riciprocated to pump well fluids into the well string including, an outer housing for connection with the inflatable element to be anchored in a well bore, a piston in said housing for connection to the well string whereby said piston may be reciprocated within said anchored housing, said housing and piston having fluid passages for communicating to initially inflate the element and for thereafter communicating to pump well fluids in the well string, valve means in said housing and said piston, said valve means each including a valve element, a sleeve for surrounding each of said valve elements, port means in said housing and piston for conducting well fluid to act on each of said sleeves, said sleeves responsive to fluid pressure in said well string to move away from their respective element whereby fluid may be conducted through the well string, said sleeves responsive when the fluid pressure from the well bore exceeds the fluid pressure in the well string to move in a position to be engaged by said valve elements, said valve elements alternately engaging and disengaging their respective sleeve to open and close said valve means upon reciprocation of said piston means in said housing to pump fluid up the well string through said valve means.

7. A pump to be used with a packer section on a well string whereby the packer may be anchored in the well bore and then the well string reciprocated to pump fluids from the well bore into the well string including an outer housing for connection with the anchored packer section, a piston for connection with the well string and reciprocable within said housing, a valve means in each said housing and piston for controlling fluid flow therethrough, said valve means being inoperative to pump fluid when the fluid pressure in the well string exceeds the fluid pressure in the well bore, means to communicate the fluid pressure in the well to said housing and piston, a sleeve slidably mounted in each said piston and housing and responsive when the well bore fluid pressure exceeds the fluid pressure in the well string to move to a predetermined position relative to said valve means in said piston and housing, seal means between said sleeves and said piston and housing, said valve means in said piston and housing each including a valve element, said valve elements movable to contact an adjacent sleeve to close flow through said valve means in said piston and housing, said valve elements moving in opposite directions relative to each other as said piston is reciprocated in said housing whereby said valve means alternately open and close to pump well fluids upwardly through the well string.

8. The invention recited in claim 5 wherein said piston sleeve and housing sleeve are concentrically mounted respectively in said piston and in said housing and wherein said housing includes an annular shoulder means to limit the travel of said piston.

9. The combination recited in claim 5 including a guide concentric with and radially spaced within each of said piston and said housing, and wherein said piston sleeve and housing sleeve are concentrically mounted within said piston and housing recepectively and surround their respective guides to be guided by said guides, and seal means between said guides and said sleeves to inhibit leakage of fluid therebetween.

10. A well pump for anchoring in a well bore on a well string including an outer cylindrical housing, means to anchor said housing in a well bore, a piston for securing to a well string and reciprocably mounted in said housing, valve means in said housing and said piston, sleeve means in said housing and piston, said housing having passage means therein for communicating well fluid to act on said sleeve means, said sleeve means responsive to the fluid pressure in the well string to position said sleeve means relative to said valve means whereby said valve means in said housing and piston permits fluid flow through said housing and piston in one direction, and said sleeve means responsive to fluid pressure in the well bore in excess of the fluid pressure in the well string to position said sleeve means relative to said housing and piston valve means whereby reciprocation of the well string moves fluid through said housing and piston in the other direction.

11. A well pump for anchoring in a well bore on a well string including an outer cylindrical housing, means to anchor said housing in a well bore, a piston for securing to a well string and reciprocably mounted in said housing, valve means in said housing and said piston, means to deactivate said housing and piston valve means to permit fluid flow therethrough in one direction, said last named means responsive to fluid pressure in the well bore to effect actuation of said housing and piston valve means upon reciprocation of the well string to move fluid through said valve means in the opposite direction.

12. The combination recited in claim 11 wherein said means to deactivate and effect actuation of said housing

and piston means includes a sleeve in said piston and in said housing responsive to fluid pressure in said well string and in the well bore to move to deactivate and effect actuation of said valve means.

13. The combination recited in claim 12 including guide means in said housing and piston to guide said sleeves as they move in said housing and piston.

14. A well pump for anchoring in a well bore on a well string including an outer cylindrical housing, means to anchor said housing in a well bore, a piston for securing to a well string and reciprocably mounted in said housing, valve means in said housing and said piston, and means in said housing and piston to deactivate said valve means whereby fluid may be conducted therethrough in one direction, said last named means responsive to an excess of fluid pressure in the well bore over the fluid pressure in the well string to move in said housing and said piston whereby fluid may be conducted therethrough only in a direction opposite to the first mentioned direction.

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