May 1, 1956 — J. J. LANE — 2,743,781

HYDRAULIC ANCHOR TOOL

Filed Aug. 25, 1952 — 3 Sheets-Sheet 1

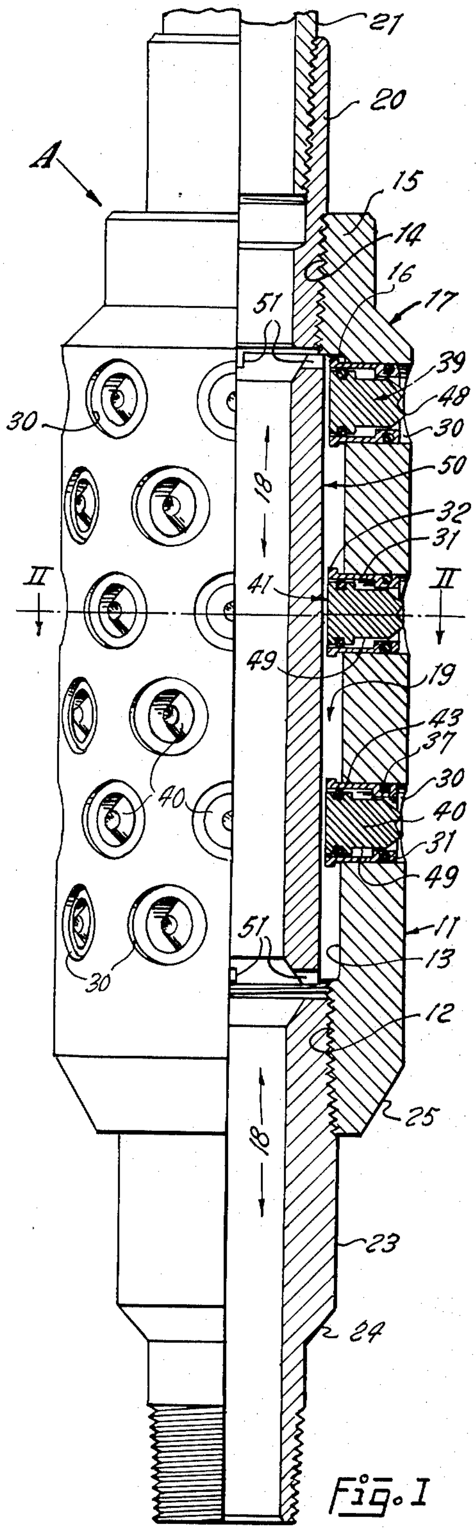

Fig. I

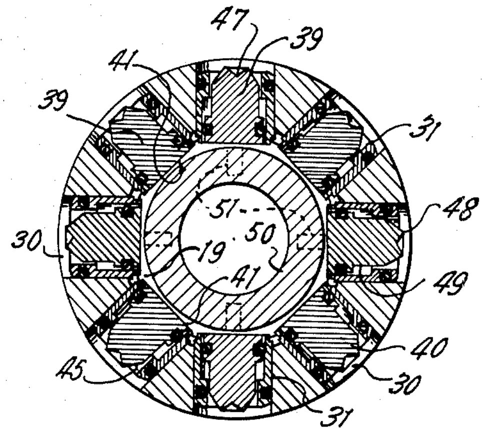

Fig. II

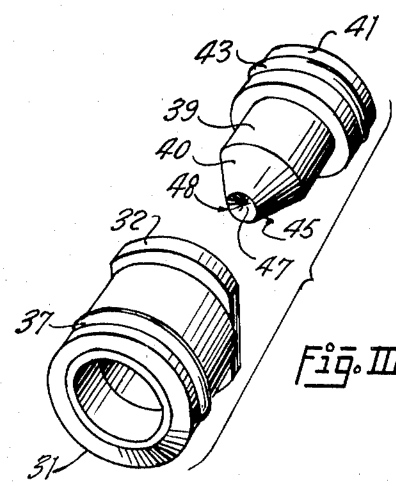

Fig. III

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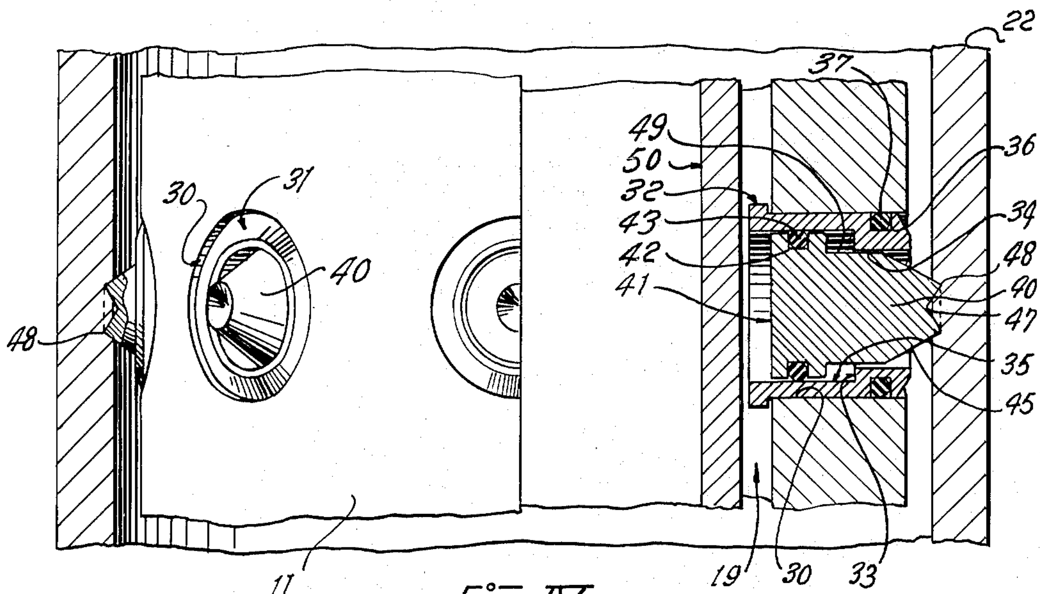

Fig. IV

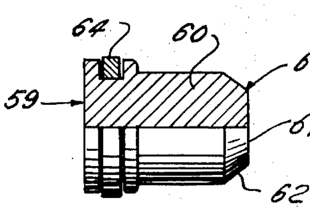

Fig. V

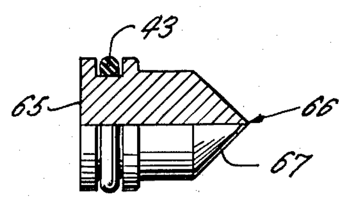

Fig. VI

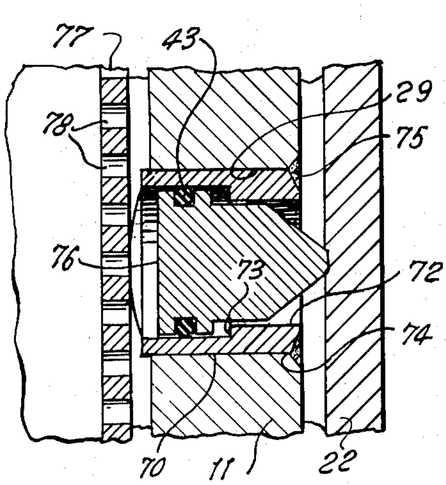

Fig. VII

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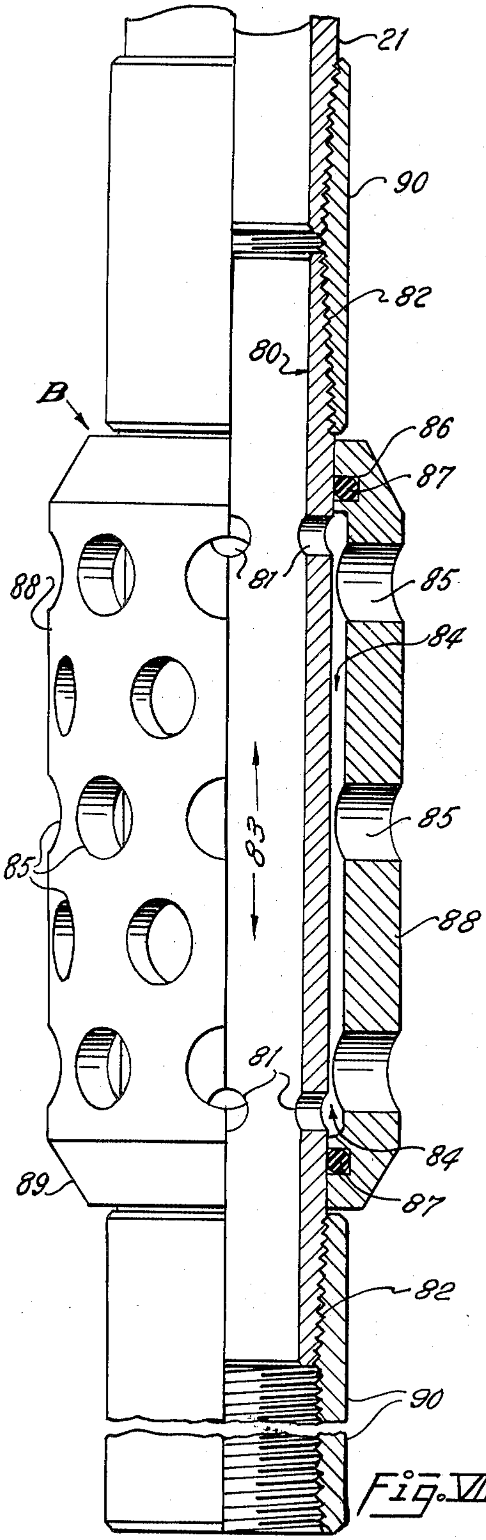

Fig. VIII

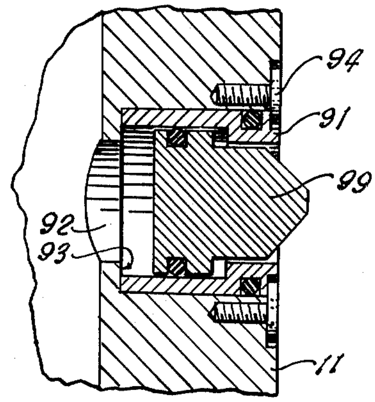

Fig. IX

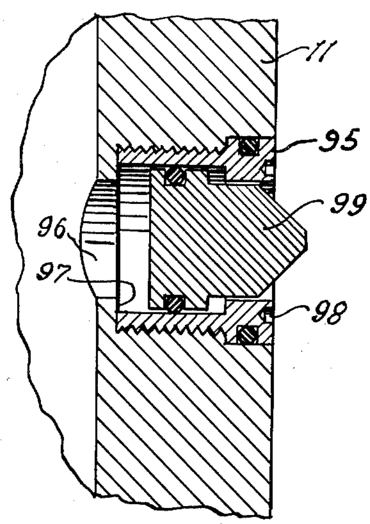

Fig. X

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HYDRAULIC ANCHOR TOOL

John J. Lane, Dallas, Tex., assignor to The Guiberson Corporation, Dallas, Tex., a corporation of Delaware

Application August 25, 1952, Serial No. 306,227

11 Claims. (Cl. 166—212)

This invention has to do with improvements in a hydraulically operated anchor tool. It is introduced into a surrounding cylinder, until in proper position, whereupon it is then firmly anchored thereto by specially constructed teeth, which are radially mounted and slideably carried in its walls and arranged to be forced outwardly thereof and into penetrating engagement with the inner face of the cylinder. The anchoring operation is reversible, and this tool may be completely and easily released from such engagement, and then withdrawn from the cylinder when desired.

This invention employs a barrel having a hollow interior; and a number of separate and independently operated pistons are slideably carried by the wall of the barrel, so as to be movable therethrough in response to fluid pressure introduced into the barrel behind the head of each piston. When such pressure is relieved, the pistons retract into the barrel in response to fluid pressure or mechanical force arising outside of the barrel.

This improved and novel anchor tool is entirely free of the heretofore customarily used wedges, hooks, springs and linkage found in older devices.

This invention employes a multiple number of symmetrically spaced and laterally operable independent pistons, propulsively moved outwardly by hydraulic pressure introduced into the barrel, until the free end of each piston is separately and individually set in biting engagement with the inner wall of the surrounding vessel, to which the tool is thus securely but releasably anchored.

The free end of each separate piston, extendable outside of the barrel of the tool, is provided with only a single tooth; and the outermost end of each such single tooth is provided with a biting or gripping edge for engagement in making anchor; and such edge is continuously kept sharp and capable of slight penetration into the walls of the surrounding vessel to which the tool is anchored. Each individual tooth is kept self-sharpened by the regular introduction, use and removal of the tool, in normal operation, within the surrounding vessel, pipe or casing to which the tool is set and fastened in a releasable holding relation.

Each anchoring tooth of this device has behind it a single piston, which is individually moved and operated, inwardly and outwardly, by fluid pressure. Such pressure is applied to the inner side of the piston to force its single tooth into positive anchor engagement; and release from engagement may be effected by the application of fluid pressure to the outer side of the piston.

Among the more important objects of this invention are the following: An extremely compact, highly dependable, self-centering, hydraulic anchor tool, wherein anchorage is provided by a multiple number of separately spaced teeth so constructed and arranged that each tooth is singly operated by remote control; and in which each tooth engages and does full duty and carries equal load; and in which each individual gripping tooth equally prevents tool movement in every direction; and in which the effectiveness of hydraulic power is greatly increased, so that there is exerted extremely effective unit power at the gripping point of each tooth.

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Other objects will become apparent in a reading of this specification.

The uses of the hydraulic anchor tool which is the subject of this invention are many, and they extend into the several fields of industrial activity. This tool is primarily made for use in wells, such as wells for oil, gas and water. However, it must be recognized that the tool is essentially an anchor. That is to say, the main purpose of this tool is to provide a holding device. It works to hold together two bodies, one of which is the anchor tool itself, and the other of which is a surrounding vessel having an inner wall spaced outwardly from and about the barrel of this anchor tool.

The tool may be used in securing and holding together two such bodies, in an extremely strong, stable and rigid connection. Such connection may be maintained for such period of time as may be desired, and it may be instantly and easily released at wil.

The capacity of the tool to be so completely, although releasably, fixed within a surrounding vessel, as to prevent relative movement therebetween, is but one of the advantages of its use. It may also be used to provide the unyielding holding, in any required position of precisely maintained relationship, of some other tool or device connected to the anchor itself. Such other tools or devices may be placed at or near, or spaced apart from, one or the other end (or both ends) of the anchor tool itself, and attached thereto. Therefore, when the anchor tool is set in place, it maintains the fixed placement of any device fastened to it beyond either of its ends.

In various manufacturing and machine shop operations, this anchor tool may be employed to rigidly and accurately hold any material or machine or structure or casting which may be engaged or carried by this tool, so that operations (such as lifting, pressuring, cutting, forming, shaping, heating, cooling, and the like) may be carried out with and upon the structure, material or thing so engaged or carried by this tool.

In the accompanying drawings typical and suitable forms of this invention and its operative mechanism are made clear. The drawings disclose the use of such typical apparatus to provide an anchor tool in an oil well.

In these drawings different parts of the structures are indicated by different numerals; and where the same numeral identifies several parts, it is meant that these parts are the same.

The drawings set out preferred forms of two types of this invention. The type of hydraulic anchor tool which is identified, by the letter A, in the drawings, discloses structure wherein relative rotative motion is not permitted between the anchor barrel and the pipe string or rod or line which carries or supports it. On the other hand, the structure shown as at B, in the drawings, presents arrangement whereby a central mandrel, which may be connected to a pipe string so as to become a part thereof, is capable of being rotated in the anchor barrel when the latter is firmly anchored to any surrounding pipe.

Various modifications of the mandrel may be made, especially with respect to provisions for fluid pressure ports and channels therethrough and/or thereabout.

Modifications are also shown in design and arrangement of the sleeve which may be employed in the non-rotatable type of anchor tool. Sleeves, of proper structure, are usually provided as a backstop for the separate and individually operated piston teeth, where no other structure has been arranged to limit the inward movement of each piston. The individual pistons themselves permit of a considerable range of modification, as is made evident by the drawings.

Preferred and modified forms of the hydraulic anchor tool are set forth in the drawings to illustrate both fundamental and variable parts and structures which may be employed in this device. In the accompanying drawings:

Fig. I shows a partially sectionalized elevational view of a typical hydraulic anchor tool, with pistons recessed.

Fig. II shows a section taken along line II—II of Fig. I.

Fig. III shows an exploded perspective view of a typical piston and piston jacket.

Fig. IV shows a partially sectionalized elevational fragmentary view of an anchor tool, with pistons extending and engaging the inner wall of surrounding pipe.

Fig. V shows a partially sectionalized elevational view of a modified form of piston.

Fig. VI shows a partially sectionalized elevational view of another modified form of piston.

Fig. VII shows a sectionalized elevational fragmentary view of part of an anchor tool carrying a modified form of piston jacket and a modified form of sleeve or backstop.

Fig. VIII shows a partially sectionalized elevational view of a modified form of hydraulic anchor barrel having a rotatable mandrel extending therethrough; and in this view the anchor piston teeth (not shown) must be mounted in the passageways in the wall of the barrel, such view being primarily intended to show an arrangement for allowing relative rotation between a modified barrel and a modified mandrel.

Fig. IX is a fragmentary cross sectional elevational view showing modified means for mounting a piston and jacket in the barrel.

Fig. X is a fragmentary cross sectional elevational view showing other modified means for mounting a piston and jacket in the barrel.

The application and use of this anchor tool in various fields of industrial activity will become apparent when its use is made more clear in one particular field, such as in the operation and/or conditioning of wells in the earth.

In oil well practice, it is customary to set conventional packers close to the bottom of the well and produce oil through the tubing, or smaller pipe, which is carried within the well casing.

An important use of this anchor tool is found in normal production of oil and gas from wells. It may be used in conjunction with an oil well pump, which is attached to the lower part of the tubing string **21** and placed within the casing **22** at a point below normal oil level therein. This tool is used to anchor the tubing to the casing, by being placed above the pump in the tubing string. By making and maintaining such anchor, the objectionable "tube breathing" or stretching is materially reduced. This results in greater efficiency in each pump stroke of the pump operations.

The setting and operation of this hydraulic anchor tool is simple and easy. It has few parts; and every part is quite durable and very effective in function.

Fluid pressure is introduced into tubing string **21** and flows into central conduit **18** of the anchor tool, and passes through pressure communicating ports **51** into the enlarged central bore **13** of anchor barrel **11**. Such pressure is exerted independently against each of the numerous piston heads **41**. This causes the outward movement of each piston body **39**, until each individually moved piston tooth **40** is extended outwardly of barrel **11**. Such extension will cause biting edge **48** of each tooth to strike and slightly penetrate the wall of casing **22**. Thereupon the tool is firmly anchored to the casing by the engagement of the many piston teeth which are slideably mounted in the wall of the barrel of the tool.

Each tooth may be provided with a jacket **31**, mounted in passageway **30**, the latter being made by drilling a hole through the barrel wall. Jacket **31** is provided with a flange **32**, at its inner end, which prevents the ejection of the jacket. The outer end of the jacket is provided with

an in-turned lip which affords retaining shoulder **33** to prevent ejection of the piston by limiting its outward travel. The jacket is provided with a resilient seal ring **37** carried in annular recess **36** made in the outer wall near its forward end. The enlarged piston head **41** is provided with flexible piston ring **43** carried in an annular recess **42**, which is provided in the outer wall of the piston head. The jacket **31** provides enlarged guide surface **35** for guiding the piston head, and smaller guide surface **34** for guiding the piston body **39**. The outermost surface of body **39** affords load bearing surface **49** of the piston.

The tooth is provided with bevel **45**, the forward end of which terminates in biting edge **48**. This biting edge may be kept narrow by the provision of concavity **47** arranged in the extreme forward end of the tooth. A cylindrical sleeve **50**, carried within the barrel **11** in slightly spaced relation thereto (thus providing annular main pressure conduit **19**), constitutes a backstop for all pistons and affords means whereby their inward movement is limited.

This hydraulic anchor tool invention presents radical improvements in design, construction and operation, in multi-purpose utility, in general effectiveness, in simplicity and ease of control in setting and releasing, and in rugged strength, over prior art attaching and anchoring devices which have been heretofore operated either by mechanical or hydraulic means.

This hydraulic anchor (A or B) provides a barrel (**11** or **88**) within which is found a pressure chamber (**19** or **84**). Radially extending through the wall of the barrel there is arranged a number of singly acting and symmetrically spaced pistons (**41** and modifications **59**, **65**, **76** and **99**). Each such piston has an enlarged piston head at its inner end (typical of which is shown as at **41**), whereby hydraulic pressure from the pressure chamber may be applied thereagainst with great holding effect.

The free ends of these pistons are relatively small compared to the greater piston head area; and pressure within the barrel will force the free ends of the pistons to pop out of the barrel. They are made to extend radially in a symmetrical pattern revealing spaced individual teeth. One form of tooth is shown as at **40**. There is a single piston behind each tooth.

The free or contacting end of each tooth is conical or frusto-conical in shape. Only the beveled or cone-like end of a tooth projects beyond the outer wall of the barrel of this tool, so that when pressure is released within the barrel the free and smaller and somewhat pointed ends of each piston tooth will immediately retreat entirely into the barrel wall, if it strikes any obstruction, going in or out of the hole. The result thereof is that after pressure is relieved behind the piston heads, no tooth which may remain extended beyond the body wall can hang up in the casing. Instead of hanging up, the teeth are driven back into the barrel upon striking anything in the annulus of the well which would or could cause the old style slips to bind or hang up or become wedged. Therefore, this hydraulic anchor tool will not stick in the hole. The very thing that would cause a conventional slip to get stuck repels this improved piston tooth, immediately obviating the possibility of a hang up.

However, in normal operation, no once extended tooth of this anchor tool remains extended after pressure is relieved in the barrel. Instead, each tooth retracts at once into the barrel in much the same manner as a turtle's head disappears within its shell in the presence of outside force.

This is always so when the column of standing liquid in the well annulus exerts a greater pressure than is found within the tubing, and hence within the barrel of this tool. This is especially so when the pressure pump on the surface of the ground is stopped and the tubing is opened and its internal pressure relieved, and a greater pressure is allowed in the annulus.

Therefore, when this anchor tool is thus released from engagement with the wall of a surrounding casing, the pistons retract inwardly of the barrel in response to greater pressure outside of the barrel.

Normal wear tends to sharpen the teeth of this tool. They are rotatable and self-sharpening. They may be sharpened by engaging and disengaging the wall of the casing, which action occurs in a tilting movement. Each individual tooth is allowed to tilt slightly in its piston jacket. (Numeral **31** shows a typical jacket.) This is permitted by a slight looseness around the piston tooth, together with a resilient seal ring **43** about the piston. This tilt is caused by the transferring of the pressure thrust, exerted against the tool, to the wall of the casing in which the several teeth find their respective engagements. By this is meant that one gripping or digging edge of a rotatable piston tooth slightly penetrates the wall of the casing to a greater extent than the remaining edges of the free or toothed end of the piston.

Construction which permits rotation in the teeth therefore allows a tilted tooth to be sharpened on one edge only at one time and on another edge at another time. Friction and abrasion during engagement and during the momentary release of the tooth and during the trip of the tool into and out of the well, all combine to sharpen a cutting edge on the tooth, first on one side and then on another. Such cutting edges are shown as at **48**, **63** and **66**.

The pistons of this tool are quickly and inexpensively produced by automatic screw machines. This allows them to be made round, and thus permit their rotation within a round jacket **31**, which is provided for them to slide in. The jacket itself, also being round, is capable of being made at low cost on automatic screw machines. Such possibility for economy in manufacture reduces labor and saves time. This in itself is a valuable advance in the art of producing slip engaging means usable in toothed anchoring devices.

These cheaply produced piston teeth may be inexpensively replaced when their engaging ends become worn off too short to make their continued use practicable. Since no other part of this tool experiences any wear or abrasion of consequence, it is of great value to be able to inexpensively replace worn teeth. Therefore, this tool has an uncommonly long life. The operation of replacing the piston teeth is very simple. A new toothed piston element may be quickly inserted in the barrel, as is made plain in the drawings. See Figs. I, II, III, IX and X. It may be inserted from within the barrel or from the outside of the barrel, depending on the type of jacket and piston employed. Forms of the jacket are shown as at **31**, **70**, **91** and **95**.

The stepped-down design of the entire piston element results in great improvement in the stability of the piston in its sliding movement, and prevents binding of the piston as it slips back into the wall of the barrel. This novel design for individual piston elements presents certain advantages, including these:

(*a*) Every point on the piston is symmetrical about the center line of the piston; and this makes the piston "non-directional," and

(*b*) The fluid drive area (piston head area, typically shown as at **41**) is always much greater than the gripping area (**48**, **63**, **66**) of the free, engaging tooth end of the piston, and

(*c*) The fluid drive diameter of the piston (shown as at **41**) is greater than the bearing diameter (shown as at **49**), which latter diameter is along the mid-part of the piston; and

(*d*) The load bearing diameter of the piston is greater than the diameter of the toothed end of the piston.

These four elements of design are preferably kept in the making of pistons for this anchor tool. However, the greatest advantage of such design is found in the provision of a fluid pressure area (piston head area) far in excess of the area of the free, gripping end of the piston which provides its engaging tooth. Such design insures the actual (although slight) penetration of an edge or point of a tooth into the casing wall, in response to the relatively great fluid pressure applied to the exceedingly larger area of the piston head. Such difference in the ratio of these two most important areas is of primary importance in the construction of the piston tooth for this anchor tool. It is recommended that this difference in ratio be at least three to one; and it is to be noted that an increase of difference in the ratio (which may be achieved by making the biting end of the tooth of less area by being pointed) will result in the anchor tool having greater penetration. By varying the size of penetrating of the tooth, the holding characteristics may be varied, in contemplation of load carried, nature of contacting metals and the measure of hydraulic power employed.

Such difference between the area to which fluid pressure is applied and the area of engagement with the casing wall is not encountered in conventional hydraulically operated apparatus used for anchoring purposes in oil field operations. In fact, such prior art devices are not found to use a single tooth individually and separately moved to engagement by hydraulic force.

It is to be noted that whatever the variations employed in the design, and making of this anchor tool, and however the individual pistons may be designed, and however they may be mounted and slideably carried in the wall of the barrel of the tool, it is apparent that throughout the various modifications (as shown in the drawings or as may be otherwise made) there is always provided a single piston under each tooth. A separate piston powers each tooth quite independently of every other tooth, and this results in very high engagement efficiency in each tooth of the tool.

With such design and construction as is presented by this invention for making and using individually moved and operated teeth, it is now possible to accurately calculate the force required to maintain complete engagement of a tooth against any known thrust; and such calculation can be made at any given hydraulic pressure. This is so because the basic factors affecting each individual tooth can now be known through the use of a piston tooth designed as here presented. Given a certain side thrust against the tooth in engagement, then the other factors are the pressure on a piston head of certain area and the further factor of the engaging area of the free end of the tooth. No longer is it necessary to take into consideration the weight of the tubing or any part of the tubing weight whatsoever, as in the conventional practice in older devices. With this tool it is possible to hold any portion of any pressure load designed.

In this connection it is to be noted that the barrel of the tool may be made as long or as short as the requirements of a given job and load to be carried may indicate.

The total number of toothed pistons carried by and operated from the barrel may be varied, as needed. For instance, only one horizontal band of pistons may be used, as by employing only the pistons shown in Fig. II. Fewer pistons may be used in a tool having only one band of pistons than is shown in Fig. II; and more pistons may be used than shown in such figure.

Tools having many bands of pistons may be employed. Tools may be made with no two pistons in the same horizontal band. Tools employing the invention here presented have been made carrying anywhere from three to ninety-six pistons.

In mounting the anchor tool in tubing string, adapter **20** is arranged between barrel cap **15** and end of tubing **21**, and these members are provided with suitable connecting means. Bore **14** in the barrel cap has been threaded for connection. However, any suitable connection means may be employed. At the inner end of bore

14 the enlarged main pressure conduit 19 begins. This allows the provision of sleeve retaining shoulder 16, to prevent upward movement of sleeve 50. Barrel cap 15 should be provided with beveled outer surface 17; and the lower end of barrel 11 should be beveled as at 25. Such provisions facilitate the introduction and withdrawal of the tool from a pipe.

Sub 23 may be employed as a connector between the anchor body and tubing or other pipe, or to connect the anchor body with a packer or other tool. This sub is threaded at each end, but any suitable connection means may be employed. It is to be noted that sub 23 retains one end of sleeve 50. This sub should be beveled on its outer wall as at 24.

Fig. VII shows modified piston jacket 70, mounted in modified passage 29, the outer ends of both members being beveled to form a welding recess 74, which may be sealed with fused metal, as at 75, thus securing this particular type of jacket in the barrel wall so that it is not readily removable therefrom. Such construction makes unnecessary any flange on the jacket to restrain it from outward movement. This jacket is provided with retaining lug and piston guide 72 which affords retaining shoulder 73 to limit the outward movement of piston 76.

Any desired sleeve of suitable varied form may be employed as means to limit the inward movement of pistons. For instance, instead of standard sleeve 50, sleeve 77 may be used, and such sleeve is to be provided with fluid pressure ports 78 therethrough.

Instead of the usual flexible piston ring 43, modified piston packing ring 64 may be employed with any piston head. Instead of a piston tooth such as standard Fig. IV, modified piston tooth 60 may be employed to afford a tooth having a flat end 61 and a different bevel 62.

Another modified piston 65 is shown in Fig. VI, with a tooth coming to a point, as at 66, and having modified bevel 67.

Other forms of construction in piston teeth are shown, as the bevel 45, on piston 41, such bevel terminating in a free end having a concavity 47 to provide a circular biting edge, as shown at 48.

The most fundamental change or modification indicated herein, over the usual or preferred embodiment A of this tool (Figs. I, II and III) is disclosed by the tool B, shown in Fig. VIII, wherein barrel or body 88 is arranged and constructed for relative rotative motion with respect to mandrel 80. This mandrel is firmly secured to coupling 90, the latter being attached through the use of threads 82.

Central conduit 83 of mandrel 80 is free and unobstructed, and communicates freely with tubing 21.

Fluid pressure ports 81 are provided through the wall of mandrel 80 to communicate with main pressure conduit 84 of barrel 88. This latter conduit allows fluid pressure to be exerted upon pistons carried in passageways 85, which are arranged through the wall at spaced intervals.

An annular recess 86 is provided at each end of barrel 88 to receive a resilient sealing ring 87. Each end of the barrel in this tool should be beveled, as at 89.

Through the use of modified tool B, firm anchor may be made of barrel 88 with surrounding casing wall 22, yet the tubing string 21 may be rotated, and the mandrel 80, firmly attached thereto, will rotate in barrel 88. There are many occasions upon which it is necessary to rotate the tubing. It may be necessary to make rotary movements to lock and unlock the tubing from a packer or other tools; and at the same time it may be very necessary that the anchorage of this tool be understood. Such is easily practiced with the use of hydraulic anchor tool B.

Figures IX and X show modifications allowing both jacket and piston to be inserted in the wall of barrel (11 or 88) from the outside of the barrel.

In Fig. IX jacket 91 is set into modified passageway 92, which is provided with piston retaining shoulder 93. Jacket retaining screw 94 is set into the outer face of the wall, in such way as to hold in place modified jacket 91.

In Fig. X modified and exterior threaded piston jacket 95 is inserted in the wall from the outside, by being placed in modified passage 96, which is provided with threads complementary to those on the jacket. This passage is provided with piston retaining shoulder 97 to limit the inward movement of any piston carried by the jacket. This particular jacket 95 should be provided with wrench holes 98 to receive a wrench for inserting and withdrawing the threaded jacket from the wall.

The central conduit (18 or 83) of both anchor tools A & B will allow the passage therethrough of any tool or apparatus which may be passed through the tubing connected with the tool. If it is desired to clean the main pressure conduits 19 or 84, it is only necessary to pass a swab through the anchor tool. This will cause fluid to circulate back to the sleeve or mandrel and thus clean out all channels in the tool.

Although it is not shown in the drawings, a plug or cap may be used to close one end of the barrel of this tool. With a pipe connected to the other end of the tool, fluid pressure may be introduced to test the tool, both at the factory and in the field. Such a plug may be employed where it is desired to set this anchor within any cylindrical vessel.

I claim:

1. In a tool for anchoring pipe in a well, a hydraulic anchor tooth comprising: a cylindrical body; an annular shoulder on one end of the body; a beveled tooth portion on the other end of the body, said tooth portion being concave at its outer end.

2. In a hydraulic anchor, an elongate tubular barrel; a plurality of lateral passages provided through the wall of the barrel and arranged in spaced relation; a piston jacket slideably mounted in each such passage; a piston slideably carried in each such jacket, said pistons being so constructed as to prevent the flow of fluid therethrough; means to limit the outward movement of the jackets in the passages; sealing means carried about each jacket arranged to seal between the jackets and the passages for preventing fluid from passing through the barrel wall; and a tubular piston stop arranged within the barrel to limit the rearward movement of each piston.

3. In a hydraulic anchor, an elongate tubular body; a plurality of lateral passages provided through the wall of said body and arranged in spaced relation; a piston jacket slideably mounted in each such lateral passage, each such jacket having an out-turned flange at its inner end engageable with the inner wall of the body to limit outward movement of the jacket in the passage, and each such jacket being open at each end; an in-turned shoulder in each such jacket intermediate the end thereof; a piston slideably carried in each jacket, the inner end of each such piston being provided with an enlarged piston head engageable with the in-turned shoulder to limit outward movement of the piston in the jacket; and a piston stop carried within the body behind the pistons engageable with the pistons to limit inward movement of the pistons with respect to the body.

4. In a hydraulic anchor, an elongate tubular body; a plurality of lateral passages provided through the wall of the body and arranged in spaced relation; a piston jacket slideably and rotatably mounted in each such passage, each such jacket having an in-turned shoulder intermediate its ends; means to limit the inward movement of the jackets relative to the tubular body; means to limit the outward movement of the jackets relative to the tubular body; a piston slideably and rotatably carried in each such jacket, each such piston being provided with an enlarged piston head; and such pistons being so constructed as to prevent the flow of fluid therethrough.

5. In a hydraulic anchor, an elongate tubular body; a plurality of lateral passages provided through the wall of said body and arranged in spaced relation; a piston

jacket mounted in each such passage, each such jacket having an in-turned shoulder intermediate its ends; a piston slideably carried in each such jacket, the inner end of the piston being provided with a laterally extending flange, engageable with the shoulder to limit outward movement of the piston, and the outer end of the piston being reduced to provide a tapered tooth, having a circular biting edge; each such piston being arranged to tilt in its respective jacket, and each such piston being so constructed as to prevent the flow of fluid therethrough.

6. In a hydraulic anchor, an elongate tubular barrel; a plurality of lateral passages provided through the wall of said barrel and arranged in spaced relation; a piston jacket mounted in each such passage, the jacket having an in-turned shoulder intermediate its ends; a piston tooth slideably carried in each such jacket, the inner end of the piston tooth having an enlarged piston head provided thereon engageable with the shoulder to limit outward movement of the piston tooth, and the piston tooth being concave at its outer end; each such piston head being smaller in diameter than the inner diameter of its jacket, whereby the teeth may tilt in the jackets; and a resilient seal positioned about the piston head arranged to seal between the piston head and the jacket.

7. In an anchor tool, a cylindrical tubular barrel having passages through the wall thereof; a tubular jacket mounted in each passage; an internal annular shoulder in each jacket; a cylindrical piston slideably carried in each jacket, the outer end of the piston being beveled to terminate in a tooth of less diameter; an enlarged head on the tooth engageable with the internal shoulder in the jacket to limit the outward movement of each piston; a sleeve carried in said barrel in spaced relationship to the barrel and forming a stop to limit the inward movement of the pistons; and fluid communication passages through the wall of the sleeve.

8. In an anchor tool, a cylindrical body; at least one opening in the wall of said body; a sleeve slideably carried in the opening, said sleeve being open at both ends; means to limit the inward movement of the sleeve relative to the cylindrical body; means to limit the outward movement of the sleeve relative to the cylindrical body; a piston tooth slideably carried in the sleeve; means to limit the outward movement of the piston in the sleeve relative to the cylindrical body; and means to limit the inward movement of the piston in the sleeve relative to the cylindrical body.

9. In an anchor tool, a cylindrical body; at least one opening in the wall of said body; a sleeve slideably carried in the opening, said sleeve being open at both ends; means to limit the inward movement of the sleeve relative to the cylindrical body; means to limit the outward movement of the sleeve relative to the cylindrical body; a piston tooth slideably carried in the sleeve; means to limit the outward movement of the piston in the sleeve relative to the cylindrical body; means to limit the inward movement of the piston in the sleeve relative to the cylindrical body; packing means between the sleeve and the opening; and packing means between the piston and the sleeve.

10. An anchor tooth assembly comprising: a sleeve having an outwardly turned flange providing a shoulder at one end thereof; an annular shoulder turned inwardly of the sleeve; a piston tooth slideably carried in the sleeve; said tooth having a beveled end, and an annular flange on the other end engageable with the inner shoulder of the sleeve; packing means disposed about the annular flange and arranged to seal between the piston and the sleeve as the piston slides therein; and packing means carried in the outer wall of the sleeve, said last named packing means being arranged to seal between the sleeve and a passage in the wall of a tubular body as the sleeve slides in the passage.

11. In an anchor tool, a cylindrical tubular mandrel; ports arranged through the mandrel wall intermediate its ends; a cylindrical barrel rotatably carried around the mandrel, said ports being located within the cylindrical barrel; passages provided through the wall of the barrel; packing means between the ends of the barrel and the outer face of the mandrel wall; a cylindrical jacket mounted in each passage, said jacket being open at each end, and having an internal annular shoulder therein; a cylindrical piston slideably carried in each jacket, the outer end of the piston being beveled to terminate in a tooth of less diameter; and an enlarged head on the tooth engageable with the internal shoulder in the jacket to limit the outward movement of each piston.

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