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APPARATUS FOR HOLDING TUBING IN WELLS

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Fig. 1.

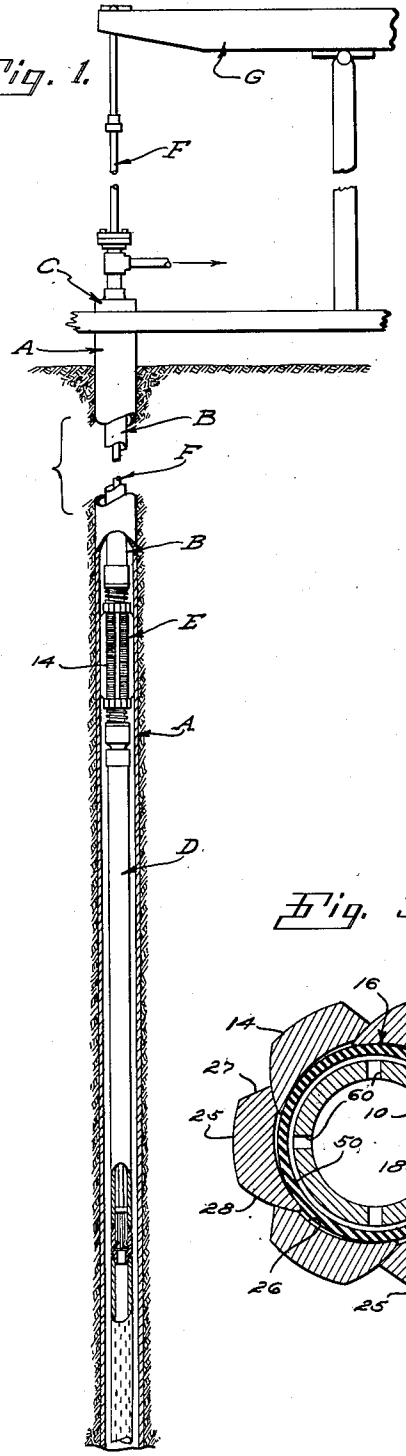


Fig. 2.

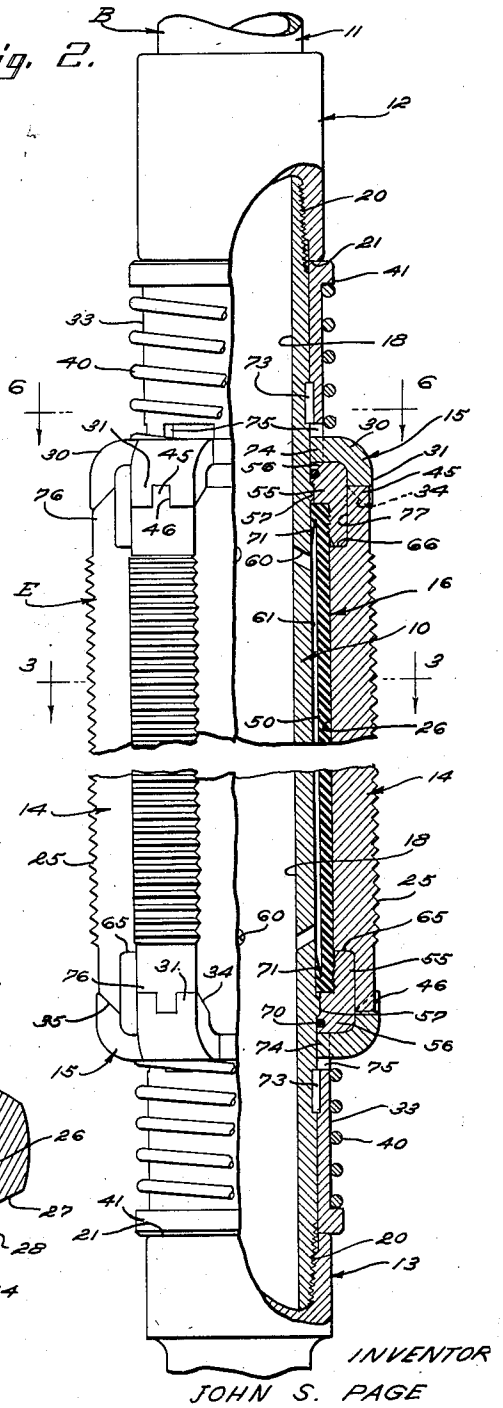


Fig. 3.

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Fig. 4.

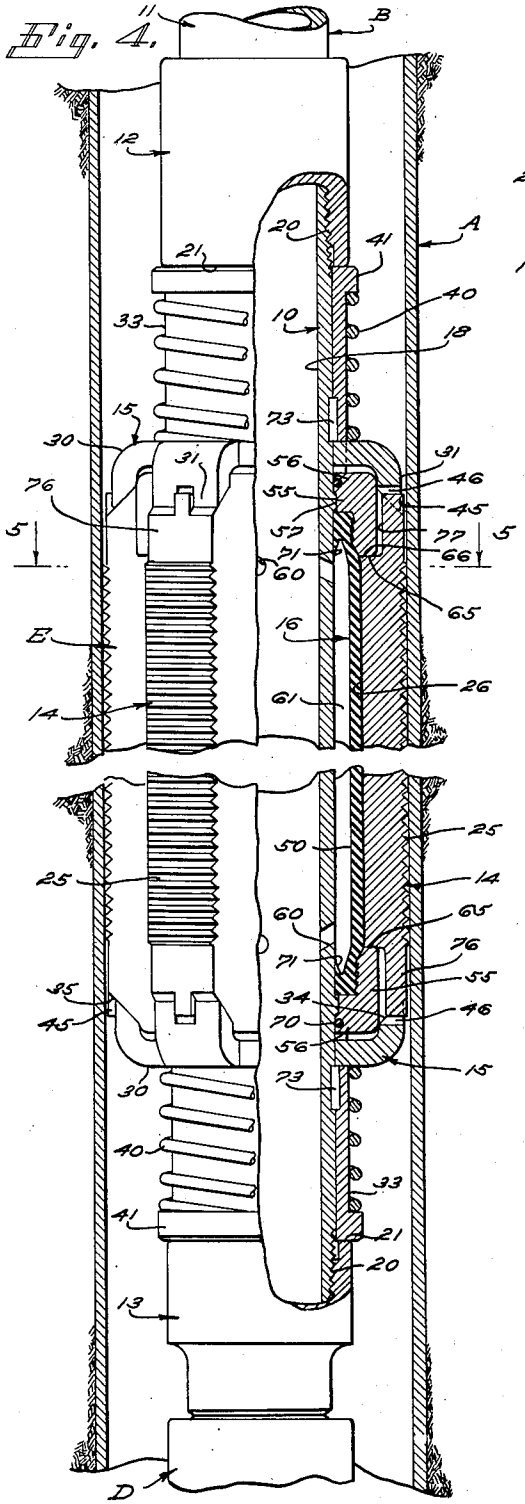


Fig. 5.

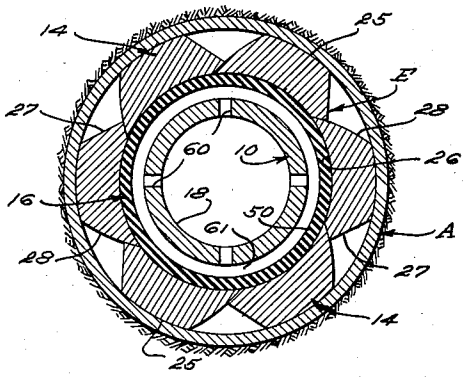
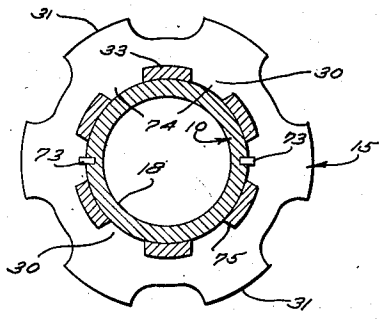


Fig. 6.



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Fig. 7.

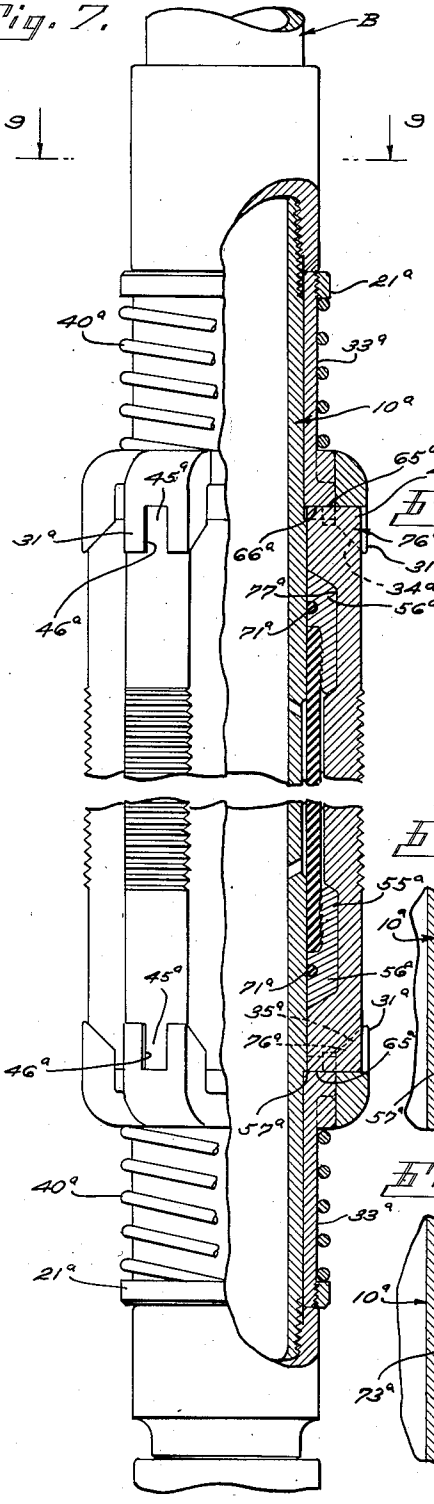


Fig. 8.

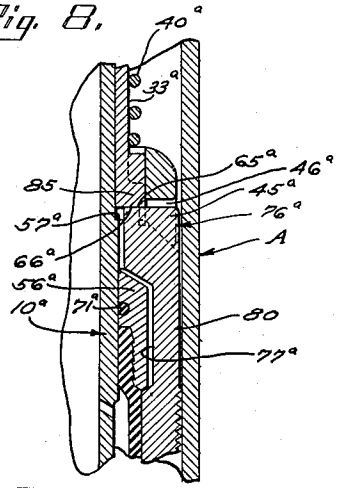


Fig. 9.

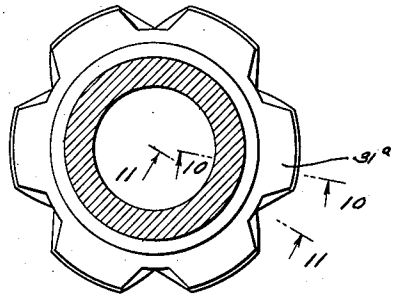


Fig. 10.

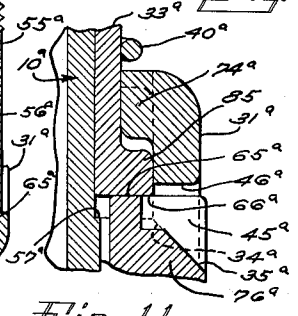


Fig. 12.

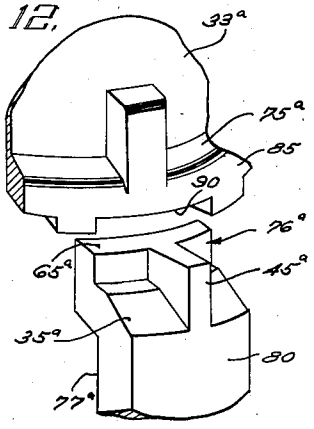
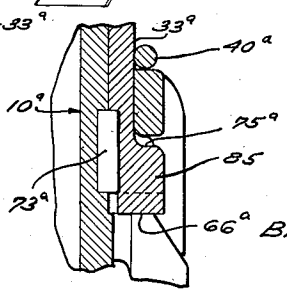


Fig. 11.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR HOLDING TUBING IN WELLS

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Application March 12, 1948, Serial No. 14,606

17 Claims. (Cl. 103—219)

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This invention is concerned with a method and apparatus for holding tubing in a well, and more particularly with holding a pump tubing in a cased oil well, it being a general object of the invention to provide for the effective holding or anchoring of a string of tubing to enable a pump, carried thereon or therein, to be operated without working or shifting of the tubing, while at the same time allowing the tubing to adjust or accommodate itself to conditions such as may set up undesirable strains or pressures in the event that the tubing is anchored solidly.

It is common to extend a string of tubing into a well at least to the point or region where fluid is available to be pumped and to establish a pump usually in or on the tubing at the body of fluid to be moved. The usual or ordinary well pump is of the reciprocating type involving a reciprocating element operated by a sucker rod located within the tubing. For proper operation of the usual well pump it is highly desirable that the stationary element of the pump be fixed so that it does not move or work in the course of operation of the pump. To gain this end and to eliminate general undesirable working of the tubing in the well, anchors have been provided and used and the ordinary anchor is generally located on the tubing at or near the pump and engages the casing in which the tubing is located in a manner to fix that point or part of the tubing positively against movement, either movement incidental to the operation of the pump or due to any other forces that may exist or which may be set up.

In practice undesirable forces or strains are frequently set up in tubing anchored by means of the ordinary tubing anchor, due primarily to the fact that the ordinary anchor is positive and holds the tubing at a given point so that no movement whatever of the tubing takes place at that point, while at the same time shrinkage or expansion or possibly stretching or compression of the tubing may occur setting up forces tending to shift the point that is fixed. For example, the usual string of tubing is run into the well cold and is set by being engaged with a head at the top of the well and by being anchored by the setting of the usual anchor. The pump is then installed or is operated, circulating hot fluid from the bottom of the well upwardly through the tubing with the result that the temperature of the tubing is materially increased throughout a substantial portion of, if not throughout its entire length. This, of course, causes elongation of the tubing and the conditions established by

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the initial setting of the tubing are altered, and undesirable or uncompensated strains or pressures are set up. Further, as the string of tubing is initially set it is empty, whereas under working conditions after the pump is in operation the tubing becomes full of fluid, with the result that a very substantial load is carried by the tubing, tending to elongate it. This load, under normal conditions, is carried by or distributed between the head at the upper end of the well holding the upper end of the tubing and the anchor at the lower end portion of the tubing.

It is a general object of my present invention to provide a tubing located in a well casing with its lower end portion anchored against shifting during the normal course of operation of a pump related to the tubing and so that it is shiftable under forces or strains set up because of factors such as those above set forth, with the result that the tubing operates at all times in a most desirable manner.

Another object of the present invention is to provide an anchor for a tubing operable to normally grip a casing to hold the tubing against movement relative thereto yet shiftable in either direction in the casing under pressures or strains in excess of those incidental to normal pumping. The anchor provided by the present invention remains tight or fixed under pressures such as are exerted by reason of the normal action of an ordinary well pump, yet at the same time it is shiftable either up or down in the casing in response to forces or pressures that may occur due to changes in temperature, loading, etc.

Another object of the present invention is to provide an anchor of the general character referred to involving shoes arranged in an annular group or series normally collapsed to be free of the casing and expansible to engage and grip the casing, the shoes being of such form and design as to effectively resist movement of the anchor in the casing in either direction, that is, either up or down.

Another object of the invention is to provide an anchor of the general character referred to involving hydraulic means for actuating or operating the casing engaging shoes. In the preferred form of the invention the hydraulic means involves a single expansible member in the form of a tubular elastic member surrounding the body of the anchor and engaged behind the shoes to force them outwardly when pressure is applied.

Another object of the invention is to provide an anchor of the general character referred to involving few simple dependable parts making

the structure simple and inexpensive of manufacture.

It is a further object of the invention to provide a method of handling a tubing in a well casing to normally hold the pump carrying portion of the tubing in a fixed position in the casing, while the tubing is free to shift in response to forces or pressures such as might otherwise cause either undesired kinking or stretching of the tubing.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the apparatus and a typical manner of carrying out the method of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a view showing a typical application of the invention to an oil well, certain of the parts being shown in section. Fig. 2 is an enlarged side elevation of the anchor embodying the present invention, certain of the parts being broken away to show in section, the mechanism being shown in the collapsed or retracted position. Fig. 3 is a detailed transverse sectional view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is a view similar to Fig. 1 showing the mechanism in the open or actuated position and showing it located in a casing. Fig. 5 is a transverse sectional view taken as indicated by line 5—5 on Fig. 4. Fig. 6 is a transverse sectional view taken as indicated by line 6—6 on Fig. 2. Fig. 7 is a view similar to Fig. 2, showing another form of construction and showing the shoes in the in or retracted position. Fig. 8 is a view of a portion of the structure shown in Fig. 7, showing the shoes expanded or operated and engaged with a well casing. Fig. 9 is a plan section taken as indicated by line 9—9 on Fig. 7. Fig. 10 is an enlarged detailed sectional view of a portion of the structure taken as indicated by line 10—10 on Fig. 9. Fig. 11 is a view similar to Fig. 10 but taken on line 11—11 on Fig. 9. Fig. 12 is a fragmentary perspective view of a portion of the structure showing the end portion or head of one of the shoes and a portion of a sleeve with which such head portion cooperates.

The present invention is intended to be carried out in connection with a typical oil well and in the drawings I have shown a typical installation wherein the well is lined or equipped with a casing A. A string of tubing B extends downwardly in the casing from a head C where it is secured and a pump D is carried by the lower end portion of the tubing. An anchor E is provided at the lower end portion of the tubing B at or close to the pump D. The anchor is preferably carried by the tubing and engages the casing and is such as to resist movement in either direction in the casing when it has been set as by the introduction of fluid pressure from the tubing.

The pump D may be of any suitable or desired construction, for example, it may, as shown in the drawings, be an oridnary reciprocating pump in which there is a part secured to the tubing to be fixed or held against movement while a complementary part is reciprocated as by means of a sucker rod F. It will be understood that the sucker rod may be reciprocated in any suitable manner, as for instance by a pump jack or walking beam G, as shown in the drawings.

The anchor E provided by the present invention is such as to be attached to or coupled in the string of tubing B and the anchor construction involves numerous features provided by the present invention.

The anchor E in the case illustrated in Figs. 1 to 6, inclusive, of the drawings, involves, generally, a central tubular body 10 connected by couplers 12 and 13 with portions 11 of the tubing B. The anchor further involves a plurality of grippers or shoes 14 which are such as to engage the casing, mounting means 15 for the shoes 14 and operating means 16 for the shoes.

The body 10 is a central elongate tubular element and may be susbtantially uniform in size throughout its length. The body is the element of the structure on which or to which the various other parts of the anchor are mounted and, as shown in the drawings, it has a central bore or passage 18 which is a continuous smooth opening corresponding in size and shape with that of the tubing parts 11 to which the anchor connects.

The couplers 12 and 13 are located at the ends of the body 10 and it is preferred that they be formed separate from the body to be releasably coupled thereto so that they are detachable. In the case illustrated the couplers 12 and 13 are both separable from the body and are joined to the body 10 by coupling threads 20. It will be apparent that the couplers 12 and 13 may be varied in form, type or character, depending upon the parts with which the anchor is to be joined. The coupler 12 is shown internally threaded at its outer end to receive a tubing part 11, while the coupler 13 is shown externally threaded at its outer end to receive a coupling which is a part of the tubing string. The couplers 12 and 13 being threaded onto the ends of the body 10 are spaced a substantial distance apart and have opposed inner ends or shoulders 21 between which the other elements of the anchor are confined.

The grippers or shoes 14 are disposed circumferentially of the body 10 at a point between the opposed shoulders 21. It is preferred that there be an annular series of shoes and that adjacent shoes be related so that they engage. In the case illustrated the adjacent shoes overlap as clearly illustrated in Figs. 3 and 5 of the drawings.

Each shoe 14 is an elongate part extending lengthwise of the structure and it is preferably formed with a circumferentially curved outer gripping face 25. The gripping face is toothed or otherwise formed to establish the desired engagement with the interior of the well casing A when the anchor is set. In the case illustrated the outer face 25 is toothed and is circumferentially curved to have the same curvature as the interior of the well casing A.

Each shoe has a circumferentially curved inner face 26 the curvature of which is preferably such as to be concentric with the body 10 when the anchor is set or the shoe expanded. The side walls 27 of the shoe extend lengthwise of the shoe and diverge as they extend inwardly from the outer face 25 to the inner face 26, with the result that the inner portion or face 26 of the shoe is wider circumferentially than the outer face 25.

In practice various constructions may be employed to gain the desired overlapping relationship of the shoes, it being preferred that the shoes be overlapped so that they form a continuous annular assembly in which the individual shoes are braced one from the next. In the case illustrated the inner corner formed between the

inner face and one side wall of each shoe is relieved or cut away to present an inclined face 28 opposing and bearing upon the side wall 27 of the adjacent shoe. It will be apparent from Figs. 3 and 5 of the drawings how the inclined face of each shoe bears on the next adjacent shoe establishing an overlapping engagement between the shoes allowing the shoes to move freely in and out between a collapsed position such as is shown in Fig. 3 and an expanded position such as is shown in Fig. 5.

There are projecting end portions or heads 76 at the ends of the shoes and they are preferably alike at both ends of the shoes. The heads are relieved or cut away from their inner sides at 77 to accommodate clamp members that hold the expansible sleeve of means 16. This leaves the shoes with thickened middle or main portions the inner sides of which are engaged by the expansible sleeve while the outer sides carry the teeth provided for engaging the casing.

The mounting means 15 for the shoes 14 supports the shoes for free movement or operation between the collapsed and expanded positions. The mounting means 15 preferably includes holders that engage the ends or heads 76 on the end portions of the shoes.

The holders are located at the ends of the group or series of shoes and each holder involves an annular part or collar 30 surrounding the body 10 and circumferentially spaced axially projecting fingers 31 projecting from the collar and engaging the heads 76 of the shoes 14. In the particular form of the invention being described the collars 30 do not bear directly upon the body 10 but rather bear on sleeves 33 which in turn are carried on the body 10. The collars are slidable on the sleeves 33 to be shiftable lengthwise of the structure, their movements away from the ends of the sleeves being limited by stop means hereinafter described.

The sleeves 33 are confined lengthwise of the body by the couplers on the body and they are preferably engaged on the body so as to be held against rotation relative to the body. In the structure illustrated a key 73 is provided between the body and each sleeve positively holding the sleeve against rotation relative to the body.

The fingers 31 correspond in number and circumferential spacing with the shoes 14 and the tip or end portion of each finger engages the end or head 76 of a shoe. In the construction that I have provided inwardly pitched or undercut ends 34 of the fingers engage or bear upon inclined or beveled faces 35 on the heads 76 of the shoes. With this construction, as the shoes 14 move from the in or contracted position to the out or expanded position the collars 30 carrying the fingers 31 are wedged somewhat apart or shifted axially of the structure. The spreading of the holders is limited so the shoes are stopped by the holders against becoming detached from the other parts of the structure.

The present invention provides means normally yieldingly urging the holders inwardly or toward each other so that when the force expanding the shoes has been relieved the shoe holders cooperate to return or retract the shoes from the out position to the collapsed position. In the case illustrated helical compression springs 40 are carried on or surround the sleeves 33 and are confined between the collars 30 and flanges 41 on the outer end portions of the sleeves. It will be apparent that by suitably pitching the faces 34 and 35 and by providing springs 40 of suitable strength the shoes 14 are retracted in the desired manner.

In accordance with my invention I preferably provide means for maintaining the ends of the shoes engaged or aligned with the fingers 31 so that the shoes are not free to shift circumferentially out of cooperative position with reference to the fingers 31. In the case illustrated keyed engagement is provided between the holders and shoes through lugs 45 projecting from the ends of the fingers and engaged in sockets or recesses 46 in the fingers. The cooperation of the lugs 45 in the sockets 46 is free or loose enough so that their engagement in no way interferes with free movement of the shoes radially or in and out, but positively checks circumferential movement of the shoes relative to the holders on which the fingers occur.

Each shoe holder is preferably secured against rotation relative to the body 10 so that it acts to hold the shoes against shifting circumferentially of the body. In the particular form of the invention under consideration a keyed engagement is provided between each shoe holder and the sleeve with which it is engaged. In the drawings lugs 74 are shown projecting inwardly from the collar portions 30 of the shoe holders to extend into notches 75 in the inner end portions of the sleeves 33. The notches 75 extend lengthwise of the sleeves so the shoe holders are free to move longitudinally of the sleeves in the manner necessary to allow proper radial movement of the shoes but are positively checked against circumferential movement. The shoe holders, being keyed to the sleeves against circumferential movement and the sleeves in turn being keyed to the body, the shoe holders are related to the body so that they will not rotate thereon and they in turn hold the shoes so that the shoes do not move circumferentially of the body. The lugs 74 cooperate with the notches 75 forming positive stop means limiting spreading of the holders. These parts are so related that the holders are not spread far enough to release the shoes.

The operating means 16 is preferably a hydraulic means or a hydraulically operated structure and it involves, generally, an element or structure behind or within the series of shoes. In the case illustrated the means 16 involves an expansible member or sleeve 50 arranged between the exterior of the body 10 and the interior of the annular series of shoes 14.

The member 50 is preferably a tubular body or sleeve of rubber, or like material, and it preferably extends substantially throughout the length of the series of shoes. The rubber sleeve 50 is preferably such as to normally fit snugly on or around the body 10 and it has its ends sealed to the body 10 while its intermediate portion is not joined to the body but is free to be expanded away from the body as shown in the drawings.

Clamp collars 55 surround the end portions of the rubber sleeve 50 holding or clamping said portions of the sleeve securely to the exterior of the body 10. The clamp collars have hub portions 56 that engage or bear on the body 10. In the case illustrated the hubs 56 engage shoulders on flanges 57 projecting from the exterior of the body, which shoulders form stops for the hubs.

The sleeves 33, hereinabove described, occur between the shoulders 21 of the couplers and the hubs 56 and serve to hold the hubs tight against the shoulders of the flanges 57. It will be apparent that when the couplers are made tight on the threads 20 the sleeves 33 effectively

clamp the hubs of the clamp collars tight against the flanges 57 and thus fix the clamp collars in position on the body where they hold the ends of the sleeve 50 in the desired position.

Ports 60 are provided laterally through the wall of the body 10 so that the interior of the sleeve 50 is in communication with the interior of the body 10. In the preferred form of the invention one or more ports 60 occur near each end of the sleeve or near each end of the chamber 61 that occurs between the sleeve and the body. By providing ports at each end portion of the sleeve 50 I eliminate danger of trapping air or gas in the sleeve.

The hubs 56 of the clamp collars are preferably sealed with the body 10 as by a packing or sealing rings 70. The ring 70 is shown carried in the hub portion and engaging the exterior of the body. It is further desirable that the portion of each clamp collar which surrounds the end of the rubber sleeve be engaged with the sleeve through a coarse thread and that the engagement be tapered so that when the structure is assembled, as shown in the drawings, the end portion of the rubber sleeve is clamped tightly against the exterior of the body 10. Further, in the form of the invention under consideration the rubber sleeve is provided at each end portion with an inwardly faced sealing lip 71 which is such as to have sealing engagement with the exterior of the body 10 so as to hold pressure in the chamber 61 when the structure is set.

With the construction just described it will be apparent that the sleeve 50 is related or confined to the body 10 to provide a simple yet highly effective means for forcing the shoes 14 outwardly and into pressure engagement with the inner wall of casing A. It will be apparent that fluid pressure established in the body 10 acts through the ports 60 to operate inside the sleeve 50 in order to force it out.

In the form of my invention being described the clamp collars 55 have parts serving as means guiding the shoes 14 for the desired movement radially of the body and holding the shoes against shifting axially of the body. It will be observed from the drawings that the clamp collars 55 have radially disposed end faces 65 slidably engaged by shoulders 66 at the ends of the heads 76. The faces 65 of the collars 55 are definitely spaced by reason of the construction above described and the shoes are fitted between the faces 65 to slide radially between the in and out positions shown in the drawings.

It is to be observed that through the construction that I have provided the fingers 31 of the shoe holders and the outer or toothed portions of the shoes are circumferentially spaced in a manner to establish longitudinal channels or fluid passages so that the anchor cannot possibly operate to cut off flow of fluid past it.

In accordance with the present invention, and in particular in accordance with the method of the present invention, the anchor E constructed substantially as hereinabove described is applied to the tubing B at the pump D or close enough to the pump to satisfactorily anchor it. The tubing with the anchor E applied thereto and with the pump or parts of the pump applied thereto is initially lowered into the casing A to the desired point, usually to a point where the pump is submerged in the fluid in the well. The anchor E is then actuated either by introducing fluid into the tubing or by operating the pump so that fluid from the well enters the tubing to find its way through the ports 60 of the anchor into the chamber 61 behind the sleeve 50. A suitable head of fluid in the tubing will create pressure behind the sleeve expanding the sleeve and forcing the shoes 14 into pressure engagement with the casing A.

The various parts are related and proportioned so that the shoes 14 grip the casing A with sufficient force or pressure to prevent shifting of the pump under the forces or strains incidental to the normal pumping action. Such gripping pressure may be finally or fully established in the anchor only after the tubing is full of fluid as is the case during normal pumping operation.

In accordance with the present invention the anchor E does not wedge or so set itself in the casing A as to make it impossible for the anchor to move in either or both directions, but rather it is at all times subject to movement or shifting in either direction in the casing A. The engagement of the anchor with the casing is such that when strains or forces are set up due to factors or combinations of factors such as expansion, contraction or loading of the equipment, etc., the anchor may respond or shift slightly or at least enough to relieve any excess pressures or strains, either tension or compression strains.

For example, as the anchor is initially set by enough head of fluid in the tubing to force the shoes into gripping engagement with the casing, the tubing may not be full of fluid and the whole structure may not have been warmed up by means of the well fluid. As the pump operates and hot fluid from the well is circulated through the tubing the tubing finally reaches a normal heated and loaded condition. The various forces or strains that may be set up in the tubing while such changing conditions prevail are compensated for by shifting of the anchor. With my invention the anchor, being free of wedges or being without wedging action and having pressure engagement limited to that which can be established by reason of fluid pressure behind the shoes, is at all times free to shift either up or down in the casing A in response to the stresses or strains that develop or which may occur in excess of those incidental to normal pumping operations.

The form of the invention illustrated in Figs. 7 to 12, inclusive, is similar, generally, to that hereinabove described. However, there are certain variations in construction, as will be pointed out.

The body 10^a as shown in Figs. 7 to 12, inclusive, instead of being provided merely with flanges such as the flanges 57, is provided opposite or within the shoes with an enlarged portion similar, generally, to one of the flanges 57, except that it extends a substantial distance longitudinally of the body. The enlarged portion terminates in shoulders forming stops engaged by the inner ends of the sleeves 33^a. In this form of the invention the sleeves 33^a are stopped in the desired spaced relation between shoulders 57^a on the body and their inner ends 66^a are engaged by the ends of the shoes and guide the shoes radially.

The shoes in this form of the invention have end portions or heads 76^a projecting from their ends and the heads are undercut or relieved at 77^a to accommodate the clamp members that engage the ends of the rubber sleeve. Outward of or beyond the relieved portion 77^a each shoe head is inwardly enlarged or thickened and the outer end 65^a of such thickened portion slidably en-

engages the inner end 66a of a sleeve, as clearly shown in the drawings.

Each sleeve 33a is engaged with or set on the body 10a so that it cannot rotate thereon. In the drawings keys 73a are shown keying the sleeves 33a to the body.

The shoes are preferably keyed against shifting circumferentially relative to the body 10a and in this form of the invention the heads of the shoes are keyed to the sleeves and also to the shoe holders which, in turn, are keyed to the sleeves.

The heads 76a of the shoes are shown provided with lugs 45a received in notches or recesses 46a provided in the finger portions 31a of the shoe holders. A keyed engagement is provided between each shoe holder and the sleeve within it. In the particular case under consideration each sleeve has an enlarged inner end portion 85 relieved or cut away at 75a providing recesses into which projecting parts or lugs 74a on the shoe holders extend. This construction allows for free movement of the shoe holders axially of the structure, but positively keys the shoe holders against rotation on the sleeves.

The keyed engagement provided between the shoes and the sleeves provides a direct engagement between the heads 76a of the shoes and the inner end portions 85 of the sleeves, so that the shoes are held against rotation on the body independently of the shoe holders. In the case illustrated the enlarged end portions 85 of the sleeves are relieved or cut away at 90 providing recesses that receive the outer ends of the heads 76a. The manner in which the heads of the shoes engage in the recesses 90 will be apparent from an examination of Fig. 12 of the drawings.

The outward movement of the shoes is limited by the holders overlapping or overhanging the heads of the shoes, as shown in Fig. 10.

In the form of the invention under consideration the holders that engage and hold the end portions of the rubber sleeve that expands to operate the shoes are located within the recessed or relieved portions 77a of the shoes and they are otherwise free or independent of the various parts just described. The annular portions of the clamps are preferably threaded to the ends of the rubber sleeve and act to clamp the sleeve to the exterior of the body 10a. The hub portions 56a of the clamps are provided with packers or seals 71a providing sealing engagement between the clamps and the body.

The shoe holders have beveled or inclined faces 34a that engage and cooperate with correspondingly beveled or inclined faces 35a on the heads of the shoes and the shoe holders are normally urged inwardly or toward the shoes by springs 40a surrounding the sleeves 33a and confined by the flanges 21a on the sleeves and the holders where they surround the sleeves. The action of this construction is the same as that described with reference to the structure shown in Figs. 1 to 6, inclusive.

From the foregoing description it will be apparent that by my present invention I have provided a structure by which casing engaging shoes are effectively and dependably operated through hydraulic pressure and that the shoes when engaged may be forced to slide in either direction in the casing. It is also to be observed that the typical forms of construction that I have illustrated provide keyed engagement between the shoes and the body, to the end that the shoes are free to move radially of the body but are locked or held against circumferential movement relative to the body.

It is to be understood, of course, that where the shoes tilt or work relative to each other, as between positions such as are shown in Figs. 3 and 5, clearance is provided or allowed in the keyed engagement or engagements, above described, so that the keying does not interfere with the working or rocking of the shoes in the course of their operation either outwardly or inwardly. Furthermore, it will be apparent that in practice the various keyed parts or key fits are preferably made loose or free so that danger of binding or locking is eliminated.

In the form of the invention first described the shoulders established on the body by the flanges 57 locate the members that hold the expansible sleeve so that these members form guides confining the shoes against axial displacement and allowing them to move freely radially of the body. In the form of the invention last described the shoulders on the body stop or locate the sleeves so that the inner ends of the sleeves confine the shoes against axial shifting and guide them for radial movement.

Having described only typical manners of carrying out the method of my invention and only typical preferred forms of apparatus embodying my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A tubing anchor engageable in a casing and including, an elongate tubular body having a port therein, like shoes each free to move radially of the body and each with an outer casing gripping face and with a concave face opposing the casing, the shoes being grouped around the body and in overlapping engagement with each other in a continuous annular series, and a sleeve of expansible material around the body and engaging the concave faces of the shoes and adapted to be expanded by fluid pressure from the body communicated to the exterior of the sleeve through said port in the body to move the shoes radially of the body into engagement with the casing, each shoe being an elongate rigid member extending longitudinally of the body and having straight longitudinally disposed inwardly divergent sides one of which has a face adjacent the concave face of the shoe and engaging and bearing upon one of the diverging sides of the next adjacent shoe whereby the shoes continuously encircle the sleeve at all times.

2. A tubing anchor including, an elongate tubular body with a port therein, a plurality of rigid elongate shoes extending longitudinally of the body and having outer faces adapted to engage a casing, means on the body mounting the shoes in a group around the body for movement radially of the body between expanded and contracted positions, a member between the body and the shoes adapted to be operated radially of the body by fluid from within the body and passed by the port and adapted to operate the shoes to the expanded position, and wedge means engaging the shoes and adapted to operate them to the contracted position including wedge members carried by the body to shift relative thereto and having wedging engagement with the end portions of the shoes.

3. A tubing anchor including, an elongate tubular body having a port therein, a plurality of rigid elongate shoes extending longitudinally of the body and having outer faces shaped to engage a casing, means on the body mounting the shoes in a group around the body for movement between expanded and contracted positions, an expansible member between the body and the sleeves adapted to be operated radially of the body by fluid from within the body and passed by the port and adapted to operate the shoes to the expanded position, wedge means engaging the shoes and adapted to operate them to the contracted position, and springs normally tending to operate the wedge means.

4. A tubing anchor engageable in a casing and including, an elongate tubular body, shoes grouped around the body and movable radially of the body, spring actuated members at the ends of the group of shoes normally tending to contract the group of shoes relative to the body, and operating means for the shoes adapted to move the shoes radially of the body into engagement with the casing including, an expansible sleeve around the body within the group of shoes, clamp members at the ends of the expansible sleeve holding the ends of the expansible sleeve tight to the body, and sleeves slidable on the body engaging the clamp members and adapted to hold the clamp members in operating position, the body having a port admitting fluid from within the body to within the expansible sleeve to operate it.

5. A tubing anchor engageable in a casing and including, an elongate tubular body, couplers threaded on the ends of the body, like shoes adapted to be maintained substantially parallel with the body and grouped in a continuous annular series around the body, elements surrounding the body and engaging the group of shoes at the ends thereof and adapted to hold the shoes assembled, and operating means for the shoes adapted to move the shoes radially of the body into engagement with the casing including, an expansible member around the body within the group of shoes and substantially coextensive therewith longitudinally of the body, clamp members holding the ends of said member tight to the body, sleeves slidable on the body and retained by the couplers engaging the clamp members and adapted to hold the clamp members in operating position, and springs surrounding the sleeves and operating said elements toward the shoes, the body having a port admitting fluid from within the body to within the said member to expand it, each shoe being an elongate rigid concavo-convex member extending longitudinally of the body with its convex face engaging the casing and its concave face opposing said member, each shoe having inwardly divergent sides one of which has a face adjoining the concave face of the shoe and bearing upon one of the diverging sides of the next adjacent shoe.

6. A tubing anchor engageable in a casing and including, an elongate tubular body, a plurality of like elongate rigid shoes extending longitudinally of the body and grouped around the body, holders around the body at the ends of the group of shoes holding the shoes around the body and having portions having wedging engagement with the shoes at the ends thereof, means adapted to operate the shoes radially outward relative to the body into engagement with the casing, and spring means engaging and operating the holders whereby the holders normally yieldingly urge the shoes to a retracted position.

7. A tubing anchor engageable in a casing including, an elongate tubular body, shoes grouped around the body, an expansible shoe expanding sleeve on the body behind the shoes, clamps holding the ends of the sleeve tight to the body, the body having a port admitting fluid from within the body to within the sleeve, a member surrounding the body and engaging the shoes and movable lengthwise of the body, and means adapted to operate said member relative to the body and shoes to retract the shoes relative to the body.

8. A tubing anchor engageable in a casing including, an elongate tubular body, a plurality of elongate like shoes extending lengthwise of the body and grouped around the body, an expansible shoe expanding sleeve on the body between the body and the shoes, clamps holding the ends of the sleeve tight to the body, the body having a port admitting fluid from within the body to within the sleeve, wedge members surrounding the body and overlying the shoes at their ends and having cooperative engagement with the shoes, and spring means adapted to operate said members to normally yieldingly urge the wedge members toward the shoes to effect retraction thereof.

9. A tubing anchor engageable in a casing including, an elongate tubular body, couplers threaded on the ends of the body, shoes grouped around the body, an expansible sleeve around the body between the body and the shoes and adapted to expand the group of shoes, clamps holding the ends of the sleeve tight to the body, retainer sleeves on the body and held thereon by the couplers and retaining the clamps in operating position, members movable lengthwise of the body surrounding the retainer sleeves and engaging the shoes, and springs surrounding the retainer sleeves and adapted to operate said members to retract the shoes, the body having a port admitting fluid from within the body to within the expansible sleeve to operate it.

10. A tubing anchor engageable in a casing including, an elongate tubular body with flanges thereon, couplers threaded on the ends of the body, a plurality of like elongate shoes around the body and overlapping each other circumferentially of the body, the shoes having curved inner faces concentric with the body when the shoes are expanded into engagement with the casing, an expansible sleeve around the body between the body and the shoes, clamps engaged with flanges of the body and holding the ends of the sleeve tight to the body, retainer sleeves on the body held on the body by the couplers and retaining the clamps in engagement with the body flanges, members movable longitudinally of the body, surrounding the retainer sleeves and having wedge engagement with the end portions of the shoes, and springs surrounding the retainer sleeves and operating said members to normally yieldingly hold the shoes retracted, the body having a port admitting fluid from within the body to within the expansible sleeve.

11. A tubing anchor engageable in a casing and including, an elongate tubular body, shoes grouped around the body, an expansible sleeve between the body and the group of shoes, means joining the ends of the sleeve to the body, and sleeves on the end portions of the body spaced axially from said means and having opposed radially disposed faces guiding the shoes radially of the body, the

body having a port admitting fluid from within the body to within the expansible sleeve.

12. A tubing anchor engageable in a casing and including, an elongate tubular body having longitudinally spaced shoulders thereon, a group of relatively movable rigid elongate shoes around the body, an expansible sleeve around the body between the body and the group of shoes, clamp members slidable on the body from its ends and holding the ends of the sleeve to the body, the clamp members being positioned by the shoulders and having opposed faces adjacent the shoes and guiding the shoes radially of the body, and spring actuated wedge members engaging the shoes at the ends thereof and adapted to normally yieldingly tend to collapse the group of sleeves, the body having a port admitting fluid from within the body to within the expansible sleeve.

13. A tubing anchor engageable in a casing and including, an elongate tubular body having longitudinally spaced shoulders thereon, couplers threaded on the body at the ends thereof, a group of relatively movable rigid elongate shoes around the body, an expansible sleeve around the body between the body and the group of shoes, clamp members engageable on the body from the ends thereof and surrounding the body and holding the ends of the sleeve, the clamp members being positioned by the shoulders and having opposed faces guiding the shoes radially of the body, and sleeves slidable on the end portions of the body and normally held in position by the couplers holding the clamp members engaged with the shoulders, spring actuated wedge members engaging the shoes at the ends thereof and adapted to normally yieldingly tend to collapse the group of sleeves, the body having a port admitting fluid from within the body to within the expansible sleeve.

14. A tubing anchor engageable in a casing and including, an elongate tubular body with a port therein, a plurality of like shoes grouped around the body, fluid pressure actuated means adapted to expand the group of shoes by pressure from the casing, holders shiftable relative to the shoes and having wedging engagement with the shoes, springs normally yieldingly urging the holders to contract the group of shoes, means keying the holders against rotation on the body, and means keying the shoes against rotation relative to the holders.

15. A tubing anchor engageable in a casing including, an elongate tubular body, couplers threaded on the ends of the body, shoes grouped around the body, an expansible element around the body behind the shoes, means joining the ends of said element to the body, sleeves on the end portions of the body and retained on the body by the couplers, members carried on the sleeves and cooperatively engaging the shoes, and springs surrounding the sleeves and adapted to operate said members to effect retraction of the shoes, the body having a port admitting fluid from within the body to within the expansible sleeve, the sleeves having faces engaged by the shoes and guiding the shoes radially of the body.

16. A tubing anchor including, an elongate tubular body, a group of shoes around the body, means adapted to expand the group of shoes relative to the body, sleeves around the end portions of the body, means keying the sleeves to the body against rotation thereon, and members keyed to the sleeves and having keyed engagement with the shoes, said members cooperating with the shoes to normally hold them retracted.

17. A tubing anchor including, an elongate tubular body, a group of shoes around the body, means adapted to expand the group of shoes including an expansible sleeve around the body and within the group of shoes, sleeves around the end portions of the body, means keying the sleeves to the body against rotation thereon, members keyed to the sleeves and having keyed and wedge engagement with the shoes, and spring means normally yieldingly tending to operate said members to retract the shoes, the body having a port passing fluid into the expansible sleeve.

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