Jan. 12, 1960 J. V. FREDD 2,920,704

WELL DEVICES

Filed April 8, 1957 3 Sheets-Sheet 1

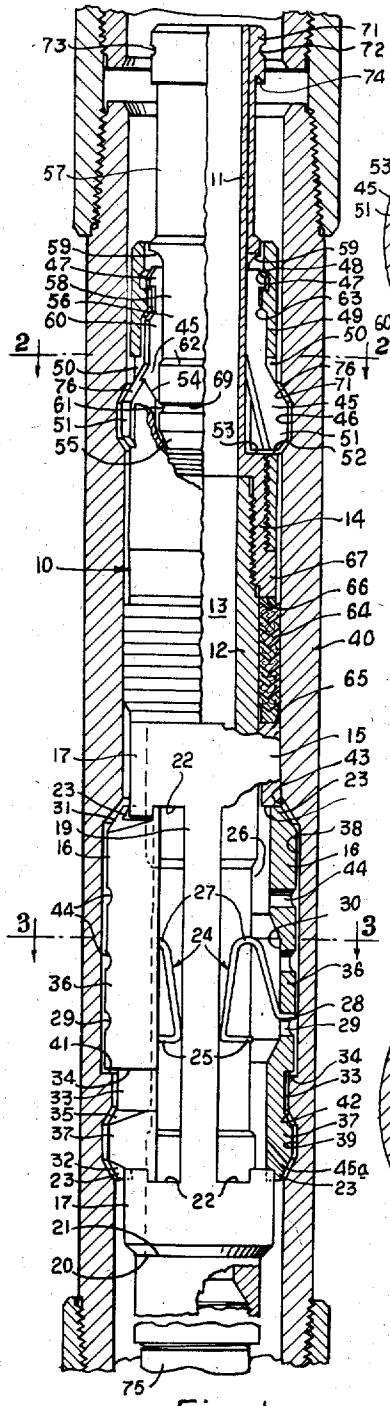


Fig. 1

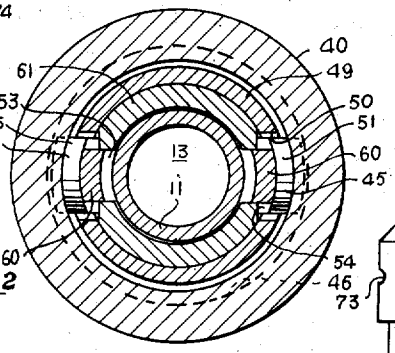


Fig. 2

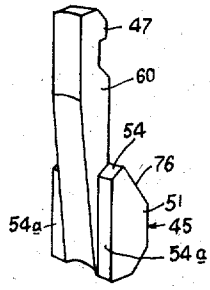


Fig. 5

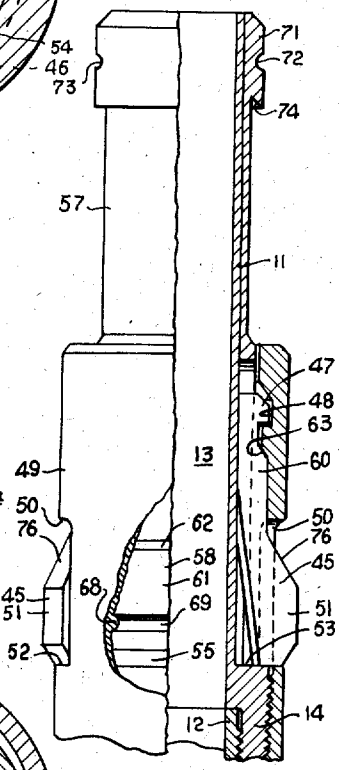


Fig. 4

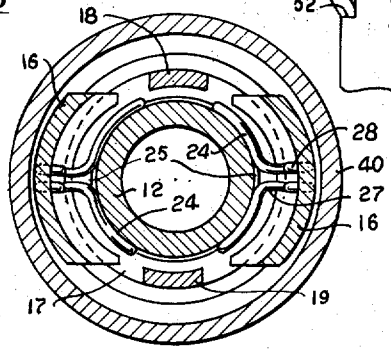


Fig. 3

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WELL DEVICES

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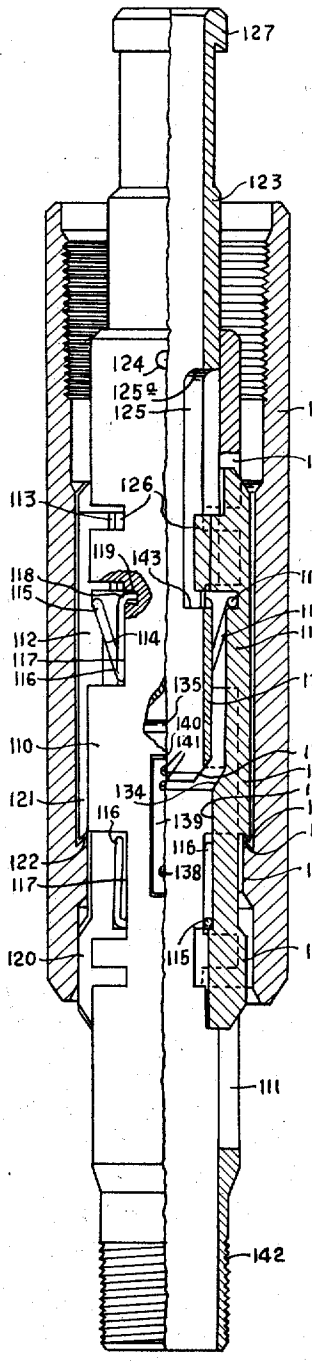


Fig. 8

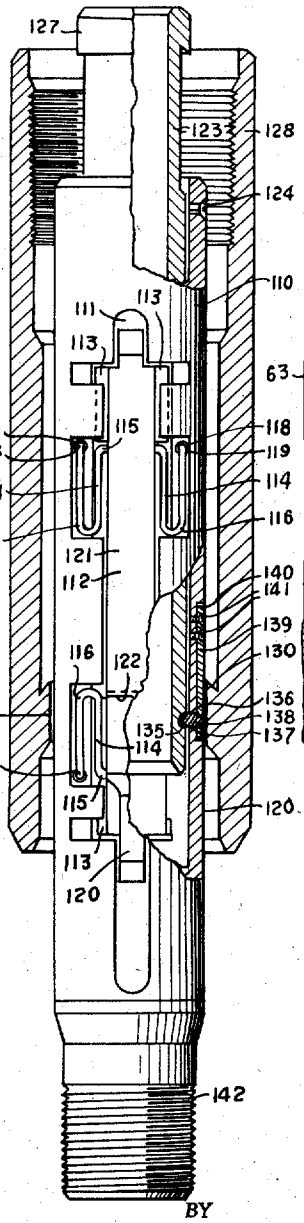


Fig. 9

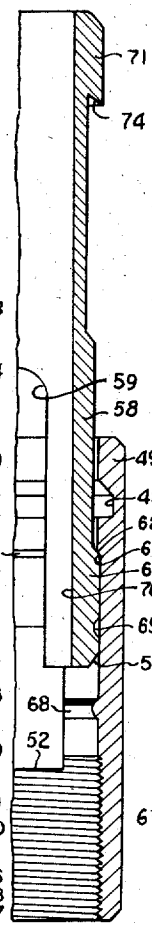


Fig. 6

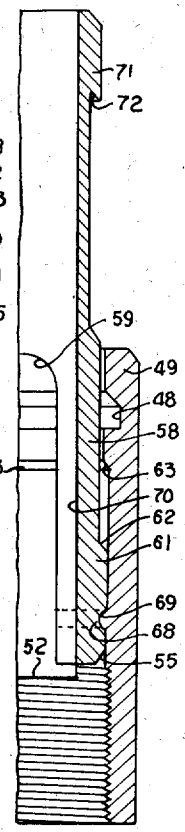


Fig. 7

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WELL DEVICES

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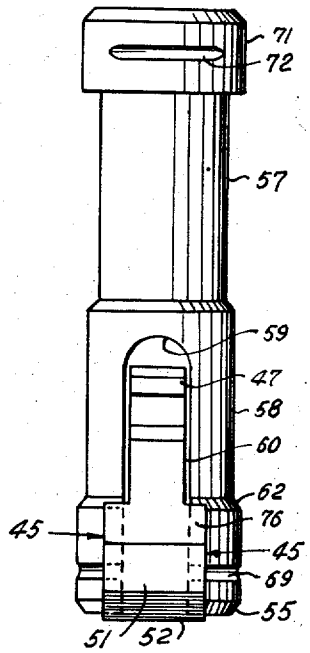


Fig.6a

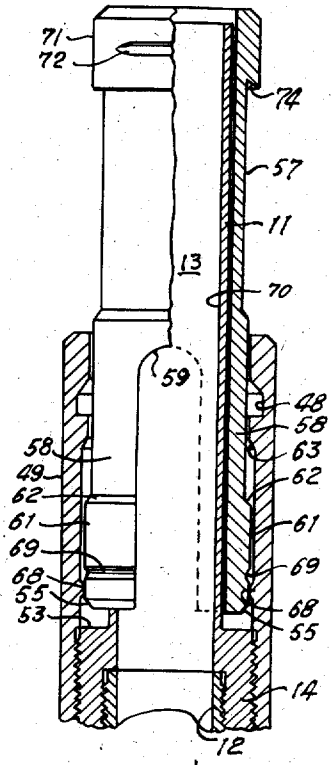


Fig.6b

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2,920,704

WELL DEVICES

John V. Fredd, Dallas, Tex., assignor to Otis Engineering Corporation, Dallas, Tex., a corporation of Texas

Application April 8, 1957, Serial No. 651,440

8 Claims. (Cl. 166—125)

This invention relates to new and useful improvements in well devices.

One object of the invention is to provide a new and improved anchoring device adapted for use in a well flow conductor to support subsurface well devices in predetermined position in said well flow conductor.

An important object is to provide an anchoring device having locking means thereon which are positively held in locking position by a member movable longitudinally into position to engage said locking means to positively hold said locking means in locking position, and wherein means is provided for releasably positively restraining or locking said member in such position to prevent undesired or accidental release of said locking means.

Another object is to provide, in an anchoring device of the character described, resilient means for holding the actuating member in position to hold the locking means in locking position, said actuating member being movable from such position upon the application of a predetermined upward force thereto.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of devices constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

Figure 1 is a view partly in elevation and partly in section of one form of the anchoring device, showing the same locked in position in a landing nipple forming a section of a well flow conductor;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1;

Figure 4 is an enlarged fragmentary view, partly in section, of the upper portion of the anchoring device of Figure 1;

Figure 5 is a perspective view of one of the locking elements of the anchoring device;

Figure 6 is an enlarged fragmentary sectional view showing the dog expander and dog holder of the anchoring device in non-locking position wherein the locking elements are free to move to retracted position;

Figure 6*a* is an enlarged view of the dog expander and dog holder of the locking device of Figures 1 through 6 and showing the same with a locking dog positioned in operative relationship with respect to the dog holder portion of the member:

Figure 6*b* is a view similar to Figures 6 and 7, showing the dog expander and dog holder being moved from upper non-locking position downwardly toward locking position;

Figure 7 is a view similar to Figure 6 and showing the dog expander and dog holder in inter-locked position in which the dog expander holds the locking elements in locking position;

Figure 8 is a view, partly in section and partly in elevation, of a modified form of anchoring device, showing the same in unlocked position in a landing nipple forming a section of a well flow conductor; and

Figure 9 is a view similar to Figure 8, taken at right angles to Figure 8 and showing the anchoring device in the locked position.

This application is a continuation-in-part of my copending applications, Serial No. 346,974, filed April 6, 1953, now United States Letters Patent No. 2,798,559, issued July 9, 1957, and Serial No. 385,248, filed October 9, 1953.

Referring now to the drawings, particularly to Figures 1 through 7, the numeral **10** designates an elongate mandrel or carrier member comprising an upper section **11**, a lower section **12**, and a central bore **13**. The lower end portion **14** of the upper mandrel section is enlarged and internally threaded to receive the upper threaded end portion of the lower mandrel section. A positioning or locating assembly is mounted on the lower mandrel section and includes a key carrier **15** and a plurality of selector keys **16**. The key carrier comprises a pair of spaced annular members **17** joined by a pair of internal connecting ribs **18** and **19**, the lower annular surface **20** of the lower annular member resting on the annular shoulder **21** of the lower mandrel section.

The annular members **17** of the key carrier have a plurality of opposed vertical guide slots **22** in which are received the studs or guides **23** of the selector keys **16**, the guides and guide slots cooperating to permit outward and inward movement of the selector keys perpendicular to the longitudinal axis of the mandrel into expanded and retracted positions.

The selector keys are biased outwardly by springs **24**, each having an inner curved portion **25** which bears against a reduced portion or outer groove **26** of the lower mandrel section, a bight portion **27** disposed between the lower mandrel section and its adjacent key, and an outturned end portion **28** which projects into a lateral aperture **29** of the key. It will be apparent that the springs urge or bias the keys outwardly away from the mandrel, and that springs of other forms than that shown may be employed for the purpose.

Each key is provided with an internal groove or recess **30** which is positioned in aligned relation with the outer groove **26** of the lower mandrel section, and the spring **24** is disposed in and between these two grooves. The two grooves are formed in the lower mandrel section and in the keys to provide sufficient operating room for the springs.

The upper and lower ends of the keys are provided with inwardly beveled surfaces **31** and **32** which tend to cam the keys inwardly when they come into contact with obstructions as the anchoring device is moved through a well flow conductor.

Each of the keys is also provided with an external groove **33** which forms a downwardly facing stop shoulder **34** extending substantially perpendicularly to the longitudinal axis of the mandrel and a beveled or tapered upwardly facing surface **35** which extends outwardly and downwardly. The external groove of each key divides the outer portion of the key into an upper key portion **36** and a lower boss portion **37**. The vertical or longitudinal dimensions of the key portion and the boss portion of the keys of each anchoring device are so chosen that the keys may move outwardly into expanded position in the well flow conductor only when these portions of the keys are aligned with corresponding annular key grooves **38** and **39** of like dimensions and configuration in a particular landing nipple **40** connected in a well flow conductor or string.

The key groove **38** of the landing nipple defines an annular upwardly facing shoulder **41** which is adapted to be engaged by the downwardly facing stop shoulders **34**

of the keys when they are in expanded position to stop further downward movement of the anchoring device through the landing nipple. The beveled surface **35** of the boss portion and the beveled surface **31** of the key portion of the keys are adapted to cam the keys inwardly by engagement with the annular beveled surfaces **42** and **43**, defined by the internal key grooves **39** and **38** of the landing nipple, when the anchoring device is moved upwardly in the landing nipple. It will thus be seen that the keys serve to stop or limit downward movement of the anchoring device through the well flow conductor but permit upward movement of the device.

Each of the keys is provided with a plurality of lateral ports **44** as well as the lateral aperture **29** and an inwardly and upwardly extending flow or drain aperture **45***a*.

In order to lock the anchoring device in such predetermined position against upward movement, a plurality of expansible locking members or dogs **45** are mounted on the upper mandrel section for movement into an annular internal locking groove **46** provided in the landing nipple **40**. The dogs have hooks **47** at their upper ends which extend into an annular groove **48** in a tubular dog holder **49**, which is threaded at its lower end portion onto the externally threaded enlarged portion **14** of the upper mandrel section **11** to form a part of the carrier member. The dog holder is provided with a plurality of longitudinally extending circumferentially spaced slots **50** in which are disposed outwardly extending bosses **51** of the dogs **45**. The lower end portions of the slots **50** are defined by end surfaces **52** which are aligned with the annular stop surface **53** formed by the enlarged portion **14** of the upper mandrel section.

The bosses **51** of the dogs have downwardly and inwardly extending beveled camming surfaces or shoulders **54** which are engaged by upwardly and outwardly beveled lower surfaces **55** on the lower end portion of a dog expander **56**. The dog expander has an upper tubular sleeve portion **57** slidably mounted on the upper mandrel section and a lower enlarged split or collet portion **58** having slots **59** in which the shanks **60** of the dogs are disposed.

The collet portion has an enlarged lower locking portion **61** which provides upwardly facing outwardly and downwardly inclined or beveled shoulders **62** adapted to engage the internal annular shoulder **63** in the bore of the dog holder to limit upward longitudinal movement of the dog expander relative to the mandrel and the dog holder. The dogs are moved to expanded positions when the dog expander is moved downwardly on the upper mandrel section to the position shown in Figure 1.

A packing assembly **64** is mounted on the lower mandrel section above the upper annular member **17** of the key carrier to seal between the mandrel and the well flow conductor. The packing assembly is confined between the upper end **65** of the upper annular member **17** and the lower annular surface **66** formed by the extreme lower enlarged portion **67** of the upper mandrel section.

The dog holder **49** is provided with an arcuate inwardly extending projection or detent member **68** which is adapted to engage in the arcuate grooves or recesses **69** in the outer locking surfaces of the lower collet portion **58** of the dog expander. The dog expander is formed of metal so that the collet portion **58** thereof may be flexed slightly inwardly by the arcuate projections as the lower end of said expander is moved downwardly in the dog holder from the position shown in Figure 6 to the position shown in Figure 7, and then outwardly when the arcuate recesses **69** become aligned with the arcuate projection **68**. There is sufficient space between the inner surfaces **70** of the collet portion of the dog expander and the external surface of the upper section **11** of the mandrel to permit said collet portion to flex inwardly slightly so the detent or projection may engage in the recesses of the locking surfaces.

The projection **68** and the arcuate recesses **69** cooperate

to releasably hold or lock the dog expander to the dog holder to prevent accidental upward displacement of the dog expander relative to the dogs. Since both the recesses and the projection are arcuate in form, a relatively strong upward pull exerted on the dog expander will cause the collet portions **58** to be cammed inwardly to disengage said collet portions from the arcuate projections and permit upward movement of the dog expander. Of course, the dog expander could be provided with arcuate projections instead of recesses, in which case the dog holder would be provided with a corresponding arcuate recess.

The anchoring device is lowered into a well conductor by a running tool (not shown) similar to that disclosed in my copending application Serial No. 346,974, said running tool being secured to an outwardly extending flange **71** at the upper end of the dog expander by means of shear pins (not shown) extending through the parallel tangential grooves **72** and **73** provided on opposite sides of said flange. The flange is undercut to provide an upwardly and inwardly inclined surface **74** which may be engaged by a suitable fishing tool.

A well device, such as a length of extension tubing **75**, may be secured to the threaded lower end of the lower mandrel section **12**.

The anchoring device is supported by the running tool in the manner described in my co-pending application Serial No. 346,974, so that the dog expander **56** in turn supports the mandrel **10** by the engagement of its shoulders **62** with the annular shoulder **63** in the bore of the dog holder **49**. In this uppermost position of the dog expander, the enlarged portion **61** of the dog expander is disposed above the bosses **51** of the dogs, and the dogs are free to remain in their retracted position.

The running tool, the anchoring device and the tubing extension are then lowered into the well flow conductor by means of a flexible line or the like, in the usual manner. The keys **16** are in their retracted positions but are biased outwardly to contact the inner walls of the well fluid conductor. The beveled surfaces **32** at the lower ends of the keys insure that the keys will be cammed inwardly whenever they encounter any obstructions, such as the ends of pipe sections, in the well fluid conductor during downward movement of the anchoring device.

When the anchoring device moves downwardly into the landing nipple **40** having the key grooves **38** and **39** corresponding to the keys **16** of said device, said keys are moved outwardly into said grooves, and the stop shoulders **34** of the keys abut the annular shoulder **41** of the landing nipple. This engagement of the stop shoulders **34** with the annular shoulder **41** prevents further downward movement of the anchoring device and thus positions and supports said device in a predetermined position in the well flow conductor, the weight of the anchoring device and the extension tubing now being supported not by the flexible line but by engagement of the key stop shoulders with the annular shoulder **41**.

The anchoring device, however, is still free to move upwardly since the dogs **45**, whose bosses **51** are now aligned with the locking groove **46** of the landing nipple, are in their retracted positions. Downward jarring blows imparted through the flexible line operating mechanism to the dog expander cause said expander to move downwardly relative to the mandrel, the dog holder and the dogs. During this downward movement of the dog expander, the beveled surface **55** at the lower end of the dog expander engages the corresponding beveled shoulders or surfaces **54** of the dogs, causing said dogs to pivot outwardly about their hooks **47** so that the bosses **51** extend into the locking groove **46** of the landing nipple. The locking portion **61** of the collet portion of the expander then engages the inner or rear surfaces **54***a* of the bosses of the dogs to positively hold the bosses in locking position in the locking groove.

As the dog expander moves further downwardly in

the dog holder, the beveled surface **55** of the dog expander engages the arcuate inwardly extending projection **68** in said dog holder whereby the lower collet portion **58** of the expander is cammed resiliently inwardly. As the dog expander moves to its lower limit of travel wherein it engages the upwardly facing shoulder **53** on the upper mandrel section, the projection **68** in the dog holder enters the corresponding arcuate recesses **69** in the dog expander. The dog expander now holds the dogs in expanded position and the dog expander is releasably restrained or held in position in the dog holder against accidental upward displacement therefrom.

The running tool is released from the anchoring device by shearing the shearable pins which attach said running tool to said anchoring device in the manner as set forth in my co-pending application Serial No. 346,974, now Patent No. 2,798,559, and the running tool is then removed upwardly from the well flow conductor by means of the flexible line, the anchoring device supporting and holding the depending well device in position in the well. As pointed out in my co-pending application, the shearable pins attaching the running tool to the anchoring device are sheared by downward jarring blows so that no upward force need be exerted on said anchoring device while said device is being installed and locked in position.

When it is desired to remove the anchoring device from the well tubing, any suitable retrieving or pulling tool (not shown) is lowered through the well flow conductor to engage the surface **74** of the flange **71** on the upper end of the dog expander. An abrupt upward pull exerted on the upper end of the dog expander causes the lower collet portion to be cammed inwardly by the projection **68** in the dog holder, whereby the arcuate recesses **69** in the dog expander are disengaged from said projection. The dog expander is then moved upwardly relative to the dogs and the dog holder to position the enlarged locking portion **61** above the inner surfaces **54***a* of the bosses of the dogs so that said dogs will be free to move into their retracted position. Further upward movement of the dog expander causes the shoulder **62** to engage the downwardly facing annular surface **63** of the dog holder so that continued upward movement of the fishing tool causes an upward pull to be exerted on the dog holder and therefore on the mandrel. As the dogs are moved upwardly by the dog holder, their downwardly and outwardly inclined upper surfaces **76** engage the correspondingly inclined surface **77** of the locking groove **46** to cam said dogs inwardly. At the same time, the beveled upper surfaces **31** and **35** of the keys engage the beveled annular surfaces **43** and **42**, respectively, of the landing nipple to cam said keys inwardly to retracted position. The anchoring device and the attached extension tubing **75** can then be lifted from the well.

It will be seen that an anchoring device has been shown and described which includes a mandrel provided with a plurality of locking dogs movable into expanded locked positions to prevent movement of the mandrel in either upward or downward direction from the selected position, and a dog expander which moves the dogs into and locks them in expanded positions on downward movement of said expander relative to the mandrel, and wherein means has been provided on the dog expander and on the dog holder for releasably positively holding said dog expander in such locking position. It will be seen that the dog expander is releasable from its lower locking position upon application of a sufficient upward force thereto and that the dogs are thereby released for inward movement from expanded to retracted positions.

A modified form of the anchoring device is shown in Figures 8 and 9, which includes an elongate tubular body **110** provided with a pair of laterally opposed longitudinal windows or key slots **111** through which a pair of locking members, locking lugs or keys **112** extend. Each key has at its opposite ends lateral projections or wings **113** which are adapted to engage and bear against the inner walls of the body to limit outward movement of the keys. Each key is biased outwardly by a pair of springs **114** whose central bight portions **115** bear against the keys, whose laterally spaced bent portions **116** are disposed in recesses **117** formed in the body on each side of the key slots, and whose ends **118** are received and held in suitable catch holes **119** in the wall of the body. On the lower end of each of the keys is a guide boss **120** having outwardly convergent beveled upper and lower shoulders, and an elongate selector and stop boss **121** is formed on each key above the guide boss and provides a downwardly facing stop shoulder **122** at the lower end of said stop boss.

A tubular lock mandrel or inner member **123** is slidable in the stop body and is secured in an upper nonlocking position in said stop body by a shear pin **124**. The lock mandrel has a pair of opposed longitudinally extending windows **125** which receive internal projections **126** on the upper ends of the keys for a purpose to be more fully hereinafter described.

In use, the anchoring device is lowered into a tubing string by means of any suitable running tool (not shown) which engages the flange **127** on the upper end of the lock mandrel. The keys **112** are free to move inwardly against the outward force of the springs **114** whenever the guide bosses encounter any obstructions in the tubing string, the lower beveled shoulders of said bosses camming the keys inwardly on meeting such obstructions.

When the anchoring device reaches the landing nipple **128** connected to the lower end of the tubing string, the guide boss moves past an internal stop flange **129** in the bore of the landing nipple, but the downwardly facing stop shoulder **122** of the stop boss of the key engages the undercut upper shoulder **130** of the stop flange, thereby stopping downward movement of the anchoring device.

Downward jarring blows are then delivered to the lock mandrel by means of the usual flexible line operated tool (not shown) to which the running tool is attached to shear the pin **124** and move said lock mandrel downwardly in the body **110**. The lower end portion of the lock mandrel is provided on opposite sides with flattened surfaces **131** below the windows **125**, and when moved sufficiently downwardly said flattened surfaces are positioned between and disposed to engage internal lock surfaces **132** on the lower portions of the keys and thus positively hold said keys in expanded positions. A beveled annular shoulder **133** on the lower end of the lock mandrel and similarly beveled shoulders **134** at the upper ends of the lock surfaces of the keys cooperate to positively move said keys fully outwardly if for any reason said keys have not previously been moved to fully expanded positions by the springs **114**. Downward movement of the lock mandrel in the body is limited by the engagement of the upper ends **125***a* of the windows in the mandrel with the internal projections **126** on the upper ends of the keys.

An external annular arcuate lock recess or groove **135** is formed in the lower portion of the lock mandrel below the windows **125**. A lock plunger, latch or detent **136** having a rounded nose **137** is attached at its rear end as by riveting **138** to a leaf spring **139**, and said plunger is inserted through a hole in the wall of the body, the spring being retained in a longitudinal external recess **140** in the body wall by means of the countersunk screws **141** through its upper end.

The rounded nose of the plunger or detent protrudes into the bore of the body whereby, as the lock mandrel is moved downwardly in said body to locking position, the detent is cammed outwardly by the beveled annular shoulder **133** at the lower end of said lock mandrel. The nose of the detent enters the groove **135** under the biasing

force of the leaf spring when the lock mandrel has moved to its lower position in the body, and releasably restrains or holds said lock mandrel in such lower position to prevent undesired or accidental retraction of the locking keys from locking position. The lower surface of annular groove **135** in the lock mandrel is so inclined or curved downwardly that the detent may be cammed outwardly from its engagement with said groove when a sufficient upward pull is exerted on the lock mandrel, but the lock mandrel is effectively held in its locking position until said sufficient upward force is exerted thereon.

The anchoring device is thus locked in position in the landing nipple by the lock mandrel and the locking keys, and neither an upward nor a downward force acting on the body can dislodge it. Further the lock mandrel is held in locking position by the detent **136** and the groove **135** against accidental upward movement from locking position. The running tool is then disengaged from the lock mandrel by downward jarring and is removed from the tubing string, leaving the anchoring device in position in said tubing string. It will be noted that the lock mandrel is tubular whereby the flow of gases and liquids through the tubing string is not substantially restricted by the anchoring device.

Manifestly, the landing nipple **128** could be connected in the tubing string at a point spaced from the lower end of said tubing string, if desired. Further it will be noted that any desired well tool such as a temperature or pressure recorder or the like may be attached to the anchoring device, by threads **142** at the lower end of the body, for suspension in the well.

When it is desired to remove this form of anchoring device from the well, a suitable fishing tool (not shown) is lowered into the tubing string on a flexible line to engage the flange **127** at the upper end of the lock mandrel. An upward jarring blow is then delivered to the lock mandrel through the pulling tool by the customary set of flexible line operated tools to which said running tool is attached to cam the detent **136** out of the groove **135** and move the lock mandrel upwardly in the body. As the lock mandrel moves upwardly, the flattened surfaces **131** on said mandrel are removed from between the internal lock surfaces of the keys, whereby said keys are freed for inward movement. The projections **126** of the keys which extend through the windows **125** of the mandrel engage the lower edges **143** of said windows to limit upward movement of the lock mandrel relative to said keys, so that further upward movement of the fishing tool and lock mandrel will cause the body **110** to move upwardly. The upper beveled shoulders of the selector bosses and the guide bosses of the keys cam the keys inwardly to enable them to pass any obstructions they may encounter during upward movement through the tubing string.

It will thus be apparent that a modified form of anchoring device has been illustrated and described for positioning well tools in tubing strings at a selected location therein and which includes a plurality of selector and stop keys **112** biased for outward movement to positions for engagement with corresponding grooves of a landing nipple forming part of the tubing string, and an expander mandrel which is moved downwardly between the keys to a locking position to engage and hold said keys in expanded positions, whereby the anchoring device is prevented from movement in either upward or downward direction from the selected location in the tubing string. It will further be seen that means has been provided on the expander mandrel and on the body of the anchoring device for releasably holding said expander mandrel in position locking the keys in expanded locking position, and that said expander mandrel may be moved upwardly from said locking position by the application of a sufficient force thereto. It will additionally be seen that the expander mandrel is retained in locking position against accidental or undesired movement therefrom until such upward force has been applied thereto.

The foregoing description of the invention is explanatory only, and changes in the details of the constructions illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. A well tool comprising: a carrier member including an outer tubular member; a locking member mounted on said carrier member for lateral movement between projecting locking and retracted non-locking positions thereon; an elongate inner tubular member slidable longitudinally of said carrier member and having a locking surface slidable within said outer tubular member to engage with said locking member to hold said locking member in projecting locking position; said elongate inner tubular member being slidable in said outer tubular member between a position in which said locking surface is positioned to engage said locking member and a position wherein said locking surface is not engageable with said locking member; spaced shoulder means on said carrier member and said inner tubular member engageable with one another for limiting movement of said inner tubular longitudinally of said carrier member to movement between said positions; restraining groove means on said inner tubular member and projecting latch means on said carrier member movable into engagement with each other to restrain said inner tubular member against longitudinal movement with respect to said carrier member and in said position in which said locking surface is disposed in position engaging and holding said locking member in locking position.

2. A well tool comprising: a carrier member; a locking member mounted on said carrier member for lateral movement between projecting locking and retracted non-locking positions thereon; an elongate inner tubular member slidable longitudinally in said carrier member and engageable with said locking member to hold said locking member in projecting locking position; spaced shoulder means on said carrier member and said tubular member engageable with one another for limiting movement of said tubular member longitudinally of said carrier member; an external groove in said tubular member; and a resilient member on said carrier member having inwardly projecting catch means thereon engageable in the groove in said tubular member to restrain said tubular member against longitudinal movement with respect to said carrier member and in position engaging and holding said locking member in locking position.

3. A well tool comprising: an outer tubular member; a locking member mounted on said outer tubular member for lateral movement between projecting locking and retracted non-locking positions thereon; an elongate inner tubular member slidable longitudinally in said outer tubular member and engageable with said locking member to hold said locking member in locking position; spaced shoulder means on said outer tubular member and said inner tubular member engageable with one another for limiting movement of said inner tubular member longitudinally of said outer tubular member; an external groove in said inner tubular member; and a resilient member on said outer tubular member having inwardly projecting catch means thereon engageable in the groove in said inner tubular member to restrain said inner tubular member against longitudinal movement with respect to said outer tubular member and in position engaging and holding said locking member in locking position; and packing means mounted exteriorly of said outer tubular member spaced from and operable independently of said locking member.

4. A well tool comprising: an elongate outer tubular member; a locking member carried by said tubular member for lateral movement between projecting locking and

retracted non-locking positions thereon; spring means on said tubular member engaging said locking member and biasing said locking member toward projecting position; an inner member in said tubular member slidable longitudinally of said tubular member and having an external locking surface thereon engageable with said locking member to hold said locking member in projecting locking position; spaced shoulder means on said inner member and said locking member engageable with one another for limiting movement of said inner member longitudinally of said tubular member; and external groove means on said inner member and internal projecting catch means on said tubular member co-engageable for releasably holding said inner member against longitudinal movement with respect to said tubular member and in position engaging and holding said locking member in locking position.

5. A well tool comprising: an elongate outer tubular member; a locking member carried by said outer tubular member for lateral movement between projecting locking and retracted non-locking positions thereon; spring means on said outer tubular member engaging said locking member and biasing said locking member toward projecting position; an inner member in said outer tubular member slidable longitudinally of said outer tubular member between an upper position and a lower position therein; locking surfaces on said inner member and on said locking member, said locking surfaces being disengaged from one another to permit movement of said locking member to non-locking position when said inner member is in said upper position and being engaged with one another to hold said locking member in locking position when said inner member is in said lower position; spaced shoulder means on said inner member and said locking member engageable with one another for limiting movement of said inner member longitudinally of said outer tubular member; and internally projecting catch means on said tubular member and external groove means on said inner member co-engageable when said inner member is in said lower position for restraining said inner member in said lower position and with the locking surfaces on said sleeve member and on said locking member engaged holding said locking member in projecting locking position.

6. A well tool for use in a well string having means providing a downwardly facing lock shoulder and an upwardly facing stop shoulder, said tool including: a tubular outer carrier member; a plurality of locking members on said tubular outer carrier member movable laterally with respect to said tubular outer member between retracted and projecting positions; an upwardly facing lock shoulder on each locking member engageable with said downwardly facing lock shoulder in said well string when said locking members are moved laterally outwardly relative to said member to projecting position; an elongate inner tubular member slidably disposed in said tubular outer member; means on said elongate inner tubular member movable longitudinally therewith to a locking position for engaging and holding said locking members in expanded position to engage said downwardly facing lock shoulder to limit upward movement of said tool; external groove means on said elongate inner tubular member and internal projecting means on said tubular outer member coengageable for restraining said inner member in locking position wherein said inner tubular member engages said locking members to hold said locking members in projecting expanded locking position; and means on said tool engageable with said upwardly facing stop shoulder of the well string for limiting downward movement of said tool in said well string.

7. An anchoring device including: an elongate mandrel having a tubular dog holder mounted exteriorly thereof and concentric with the longitudinal axis of said mandrel, said dog holder having a plurality of longitudinally extending slots; a plurality of dogs carried by said dog holder and having outwardly extending bosses movable outwardly of said dog holder through said slots; a dog expander slidably mounted on said mandrel and having a locking portion movable with said mandrel between said dogs to engage and hold said dogs in laterally projecting expanded positions; cooperating means on said dog expander and said dog holder for limiting upward movement of said dog expander relative to said dog holder; and shoulder means on said mandrel providing a downwardly facing stop shoulder adapted to engage an upwardly facing stop shoulder in a well flow conductor to stop downward movement of said mandrel therein; said dog expander being movable downwardly on the mandrel to move said locking portion on said dog expander and said dogs into cooperating engagement with each other only after downward movement of said mandrel has been stopped by said stop shoulder of said mandrel and while said stop shoulder of said mandrel is so engaged with said stop shoulder of said tubing; and internal projecting catch means on said dog holder and external groove means on said dog expander co-engageable when said expander is moved downwardly to position said locking portion between said dogs for releasably locking said dog expander to said dog holder in a downward position wherein said dogs are held in expanded positions.

8. A well tool comprising: an elongate outer tubular member; a locking member carried by said tubular member for lateral movement between projecting locking and retracted non-locking positions thereon; an inner member in said tubular member slidable longitudinally of said tubular member between a first position and a second position therein; locking surfaces on said inner member and on said locking member, said locking surfaces being engageable with one another to hold said locking member in locking position when said inner member is in said second position and being disengaged from one another to permit movement of said locking member to non-locking position when said inner member is in said first position; spaced shoulder means on said inner member and said locking member engageable with one another for limiting movement of said inner member longitudinally of said tubular member to movement between said first and second positions; external groove means on said inner member and internal projecting catch means on said tubular member coengageable resiliently when said inner member is in said second position for restraining said inner member against longitudinal movement with respect to said elongate tubular member and in said second position in said tubular member; and means on said tubular member and said inner member initially releasably holding said inner member in said first position.

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