Oct. 9, 1962 G. G. GRIMMER 3,057,407

ANCHORING DEVICES FOR WELL TOOLS

Filed April 21, 1959 3 Sheets-Sheet 1

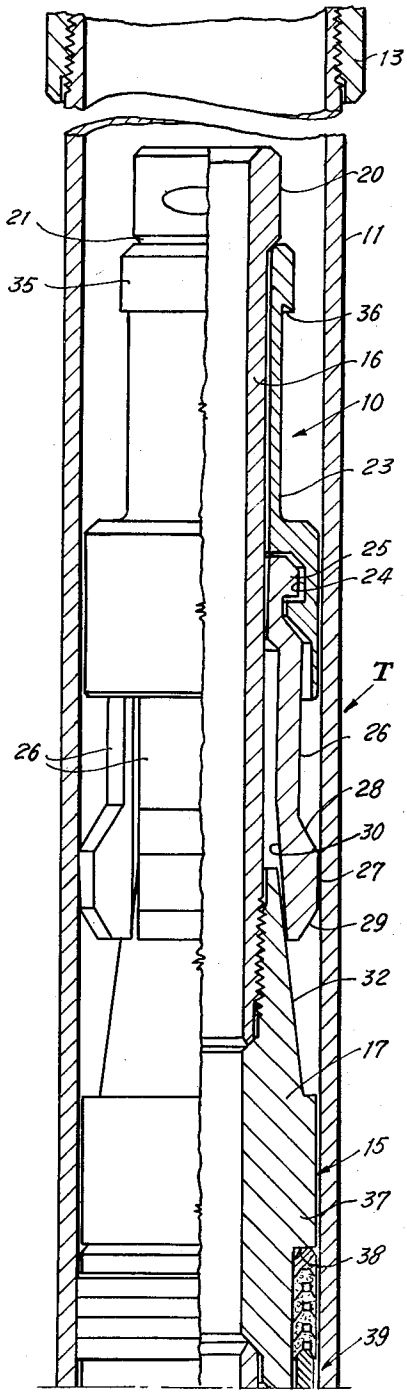


Fig. 1

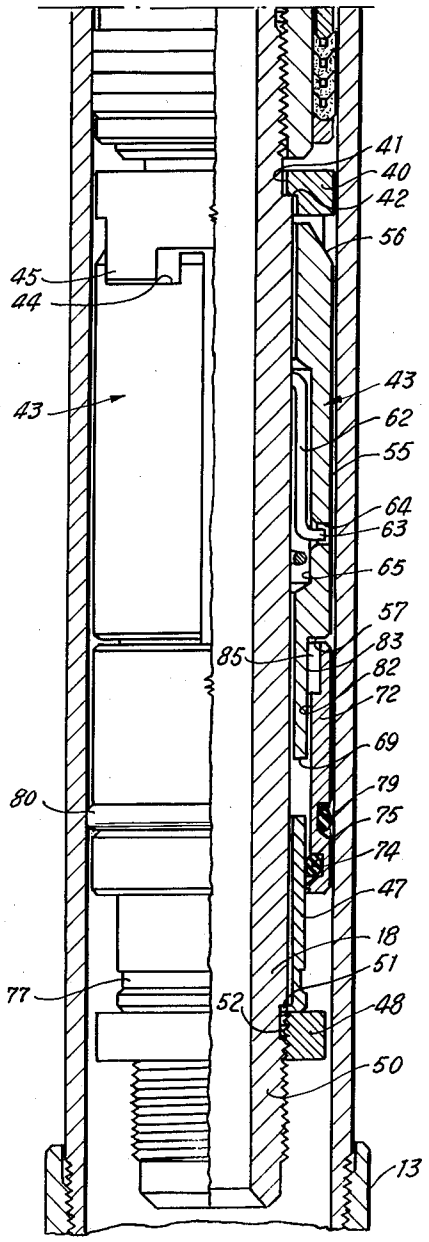


Fig. 2

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ANCHORING DEVICES FOR WELL TOOLS

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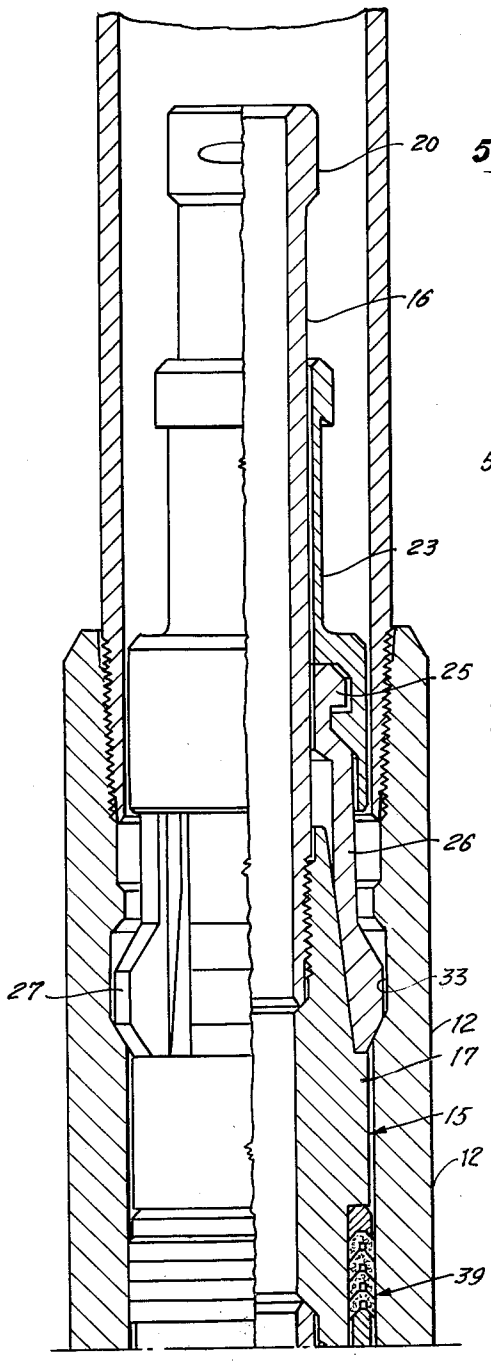


Fig. 3

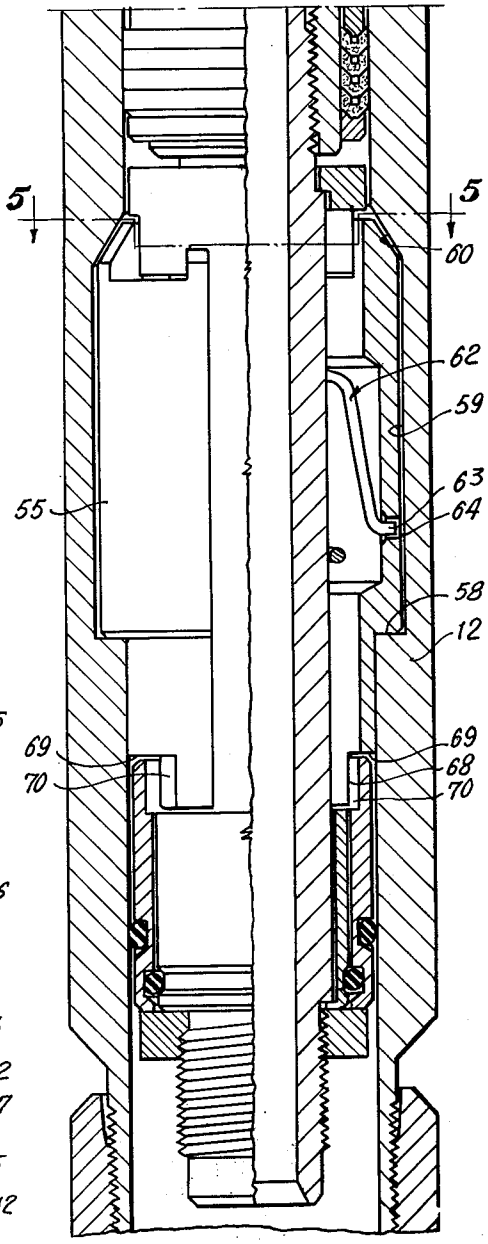


Fig. 4

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ANCHORING DEVICES FOR WELL TOOLS

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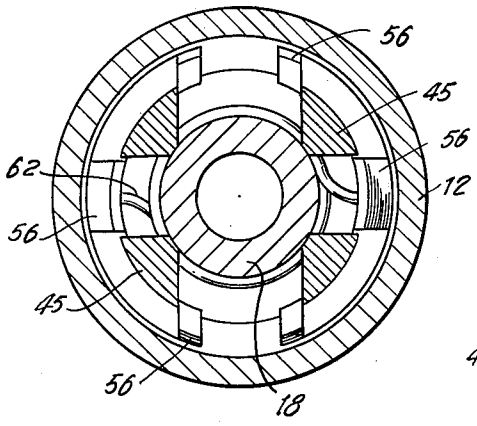


Fig. 5

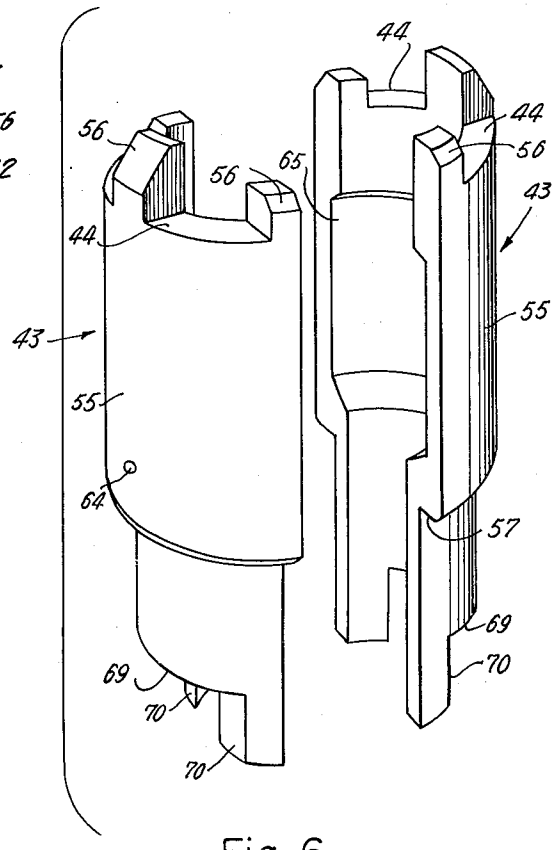


Fig. 6

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United States Patent Office 3,057,407 Patented Oct. 9, 1962

3,057,407

ANCHORING DEVICES FOR WELL TOOLS

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Filed Apr. 21, 1959, Ser. No. 807,821
11 Claims. (Cl. 166—125)

This invention relates to well tools and more particularly to well tools for securing sub-surface well devices in preselected positions in a well flow conductor, such as a string of well tubing. It is an important object of the invention to provide a new and improved well tool adapted for use in a well flow conductor to support sub-surface well devices in predetermined position in the well flow conductor.

Another object of the invention is to provide a new and improved well tool for releasably anchoring well devices in a well flow conductor.

Still another object of the invention is to provide an improved device for releasably anchoring well devices in a well flow conductor, the anchoring device having locator keys which are maintained in a retracted position until the anchoring device is lowered to a position below the position in which it is to be located, whereby the locator keys are protected from wear which would otherwise occur if they were free to move to expanded positions to rub the well flow conductor as the anchoring device is lowered therethrough.

A further object of the invention is to provide an improved device for releasably anchoring well devices in a well flow conductor, the anchoring device having locator keys held in retracted positions by a retracting means which is movable out of engagement with the locator keys upon upward movement of the anchoring device in the well flow conductor, to free the locator keys for movement to expanded positions for engagement with a downwardly facing obstruction of the well flow conductor to limit downward movement of the anchoring device in the well flow conductor, to limit downward movement of the anchoring device in the well flow conductor.

Another object of the invention is to provide an improved device for releasably anchoring well devices in a well flow conductor. At any one of a plurality of spaced identical internal annular locator grooves of the well flow conductor, the anchoring device having locator keys which are expandable into any one of the plurality of locator grooves upon upward movement of the anchoring device in the well flow conductor, such upward movement moving a retractor ring out of engagement with the locator keys to free the keys for outward movement into any one of the locator grooves.

Still another object is to provide an anchoring device which can be disengaged from locked position in any one of the locator grooves of the well flow conductor for movement to a higher locator groove of the well flow conductor and locking engagement therewith.

A further object of the invention is to provide an anchoring device provided with locator keys held in retracted position by a retractor means which is movable out of engagement with the locator keys upon upward movement of the anchoring device in a well flow conductor, the locator keys upon expansion being engageable with an upwardly facing obstruction of the well flow conductor to limit downward movement of the anchoring device in a well flow conductor, the anchoring device having releasable locking means for preventing upward movement of the anchoring device, the releasable locking means being operable when the locator key has located the anchoring device in a predetermined position in the well flow conductor.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of a device 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 the upper portions of a well tool embodying the anchoring device of the invention showing the well tool as it appears during its downward passage through the well flow conductor;

FIGURE 2 is a view similar to FIGURE 1 being a continuation thereof and showing the lower portion of the well tool;

FIGURES 3 and 4 are views similar to FIGURES 1 and 2, showing the well tool anchored in a predetermined position in a landing nipple of the well flow conductor;

FIGURE 5 is a cross-sectional view taken on line 5—5 of FIGURE 4; and

FIGURE 6 is a perspective view of the locator keys of the well tool.

In the drawing, the numeral **10** designates a well tool embodying the invention as it appears during its downward movement in a well flow conductor of the tubing string T. The tubing string includes a plurality of tubing sections **11** and landing nipples **12** which are connected at adjacent ends thereof to form the tubing string. It will be understood that adjacent ends of the tubing sections **11** are connected together by the usual coupling collars **13**.

The well tool **10** includes an elongate mandrel **15** having an upper section **16**, an intermediate expander section **17** and a lower section **18**. The upper mandrel section **16** is threaded in the upper end of the intermediate expander section **17** and its upper end has an external flange **20** which provides a downwardly facing stop shoulder **21**. A dog holder **23** is slidably mounted on the upper mandrel section **16** and is provided with an internal annular groove **24** into which extend the hooks **25** provided on the upper ends of expansible locking members or dogs **26**. The dogs have external bosses **27** adjacent their lower ends which have outwardly convergent upper and lower cam shoulders **28** and **29**. The lower ends of the dogs are provided with downwardly and outwardly extended inner bevelled camming surfaces **30** which are engaged by the upwardly and inwardly extending outer bevelled surface **32** of the intermediate expander section **17**.

It will be apparent that when the dog holder **23** moves downwardly on the mandrel **15** from the position illustrated in FIGURE 1 to the position illustrated in FIGURE 3, the engagement of the camming surfaces **30** and **32** of the dogs and of the mandrel moves the lower ends of the dogs outwardly into expanded positions and into the annular internal locking groove **33** of the landing nipple **12**. The upper end of the dog holder has an external flange **35** providing an undercut annular shoulder or flange **36** which may be engaged by a suitable running or pulling tool when it is desired to remove the well tool from the well flow conductor.

The intermediate expander section **17** of the mandrel has an external flange **37** which provides an annular downwardly facing shoulder **38** which limits upward movement of the packer assembly **39** disposed about the intermediate expander section.

A positioning or locating assembly is mounted on the lower mandrel section **18** and includes a key retainer ring **40** which is provided with an internal annular flange **41** whose lower surface engages an upwardly facing annular shoulder **42** of the lower mandrel section to limit downward movement of the key retainer ring on the lower mandrel section. Upward movement of the key retainer

ring is limited by the lower end of the intermediate expander mandrel section.

The positioning and locating assembly also includes a plurality of keys 43 having upwardly open slots 44 at the upper ends in which are received the peripherally spaced downward projections 45 of the key retainer ring which serve to limit outward displacement or movement of the keys. A stop ring 47 disposed about the lower mandrel section below the locator keys is held against movement thereon by a lock ring 48 threaded on the reduced lower end portion 50 of the lower mandrel section, the stop ring having an internal flange 51 at the lower end thereof which is engaged between the lock ring 48 and an annular downwardly facing shoulder 52 of the lower mandrel section. The stop ring limits downward movement of the keys on the lower mandrel section since its upper end is adapted to engage the bottom ends of the keys.

The locator keys have external bosses 55 provided at their upper ends with upwardly and inwardly bevelled cam surfaces or shoulders 56 and at their lower ends with abrupt downwardly facing shoulders 57. The downwardly facing shoulders are adapted to engage the abrupt upwardly facing shoulder 58 of the annular locator recess 59 of a landing nipple 12. The locator groove 59 of the landing nipple has at its upper end an upwardly and inwardly extending cam shoulder 60 of configuration similar to the upper cam shoulders 56 of the keys whereby upon upward movement of the well tool from the position illustrated in FIGURE 2, the engagement of the shoulders 56 and 60 cams the keys inwardly against the resistance of the springs 62 which bias the locator keys outwardly toward expanded positions. The springs 62 may be of the type illustrated in the patent to J. V. Fredd, 2,798,559, and have free outer ends 63 which are received in lateral apertures 64 of the locator keys. The keys have internal intermediate grooves 65 in which the springs 62 are received when the keys are in the retracted positions illustrated in FIGURE 2. The locator keys have lower reduced end portions 68 which provide downwardly facing shoulders 69, spaced below the downwardly facing shoulders 57 of the bosses 55 of the locator keys, and the step down surfaces 70.

The keys are adapted to be held in their retracted positions by a retractor sleeve 72 whose lower end telescopes over the stop ring 47. The retractor sleeve has an internal annular groove 74 in which is disposed an O-ring 75 which frictionally engages the stop ring 47. The O-ring 75 is partially received in the external annular groove 77 of the stop ring when the retractor sleeve is in the lower position on the stop ring illustrated in FIGURE 4. The O-ring, when it is located in the external annular groove 77 of the stop ring, tends to prevent upward displacement of the retractor sleeve on the stop ring relative to the locator keys once the retractor sleeve has been moved to the lowermost position illustrated in FIGURE 4. The shoulder defining the lower end of the internal groove extends inwardly and downwardly so that the O-ring 75 is moved outwardly when the retractor sleeve is moved upwardly on the stop ring and thus the friction tending to prevent such upward displacement is increased. The retractor sleeve also has an external annular recess 79 in which is disposed an O-ring 80 which extends outwardly of the retractor sleeve to engage the inner surfaces of the landing nipple 12, which has a smaller internal diameter than the tubing section 11, as the well tool is lowered therethrough to maintain the retractor sleeve in its upper operative position illustrated in FIGURE 2 wherein the annular inner surface 82 of the retractor sleeve engages the intermediate surface 83 between the downwardly facing shoulders 57 and 69 of the locator keys. The lower shoulder of the recess 79 extends downwardly and outwardly so that the O-ring 80 is cammed outwardly upon the upward movement of the well tool and of the retractor sleeve in the landing nipple in order that the friction between the O-ring and the landing nipple is increased to cause the retractor sleeve to resist upward movement in the landing nipple.

It will be apparent that when the retractor sleeve 72 is in its upper position on the lower mandrel section the locator keys are held inwardly in the retracted positions illustrated in FIGURE 2 against the force exerted by the springs 62. When the retractor sleeve 72 is in the lower position illustrated in FIGURE 4, its upper end is below the downwardly facing shoulders 69 and its enlarged recess 85 adjacent its upper end is aligned with the step down lower end portion surfaces 70 of the locator keys so that the locator keys are then free to move outwardly to the expanded position illustrated in FIGURE 4, but engagement of the step down surfaces 70 of the keys limits such outward movement of the lower ends of the key.

In use, when it is desired to locate the well tool 10 in a predetermined landing nipple 12 of the well flow conductor or tubing string T, it being understood that any number of identical landing nipples may be connected in and form portions of the tubing string at vertically spaced positions, the locator keys are moved to retracted positions and the retractor sleeve is moved upwardly to the position illustrated in FIGURE 2 wherein its internal surface 82 abuts the outer surfaces 83 of the keys to hold the keys in their retracted positions. The outer surfaces of the bosses 55 are now held inwardly of and out of contact with the internal surfaces of the well flow conductor so that they do not contact the well flow conductor and thus are safeguarded against undue wear during downward movement of the well tool 10 through the well flow conductor. If desired, any suitable sub-surface well device may be connected to the lower end of the mandrel 15, the externally threaded reduced lower end portion 50 of the lower mandrel section providing the means of attachment. The dog holder 23 is then raised to its upper position on the upper mandrel section 16, as illustrated in FIGURE 1, and the assembly is lowered into the tubing string T or well flow conductor by means of a flexible line and any suitable running tool connected in the usual manner to the flange 20 on the upper end of the upper mandrel section. The dogs 26 are now disposed above the expander surface 32 and are free to move to their upper retracted positions on the mandrel upon meeting any upwardly facing obstructions in the well flow conductor, the upwardly and outwardly bevelled cam surfaces 26 thereof camming the keys inwardly and upwardly on the mandrel toward retracted positions upon meeting such obstructions.

As the well tool 10 moves downwardly through the well flow conductor the external O-ring 79 of the retractor sleeve does not contact the internal surfaces of the tubing sections but does engage the internal surfaces of the landing nipple when it is moved thereinto. The frictional engagement therebetween then tends to hold the retractor sleeve in its upper operative key retracting position.

When the well tool reaches a position slightly below the position in which it is desired to lock it, the well tool is moved upwardly in the well flow conductor whereupon the frictional engagement of the O-ring 79 retards upward movement of the retractor sleeve so that the mandrel and the locator keys move upwardly relative to the retractor sleeve until the lower end of the retractor sleeve engages the upper end of the lock ring 48. The internal O-ring 74 of the retractor sleeve is then aligned with and extends partially into the external annular groove 77 of the stop ring 47. The internal recess 85 of the upper end of the retractor sleeve is now aligned with the step-down surfaces 70 of the locator keys so that the locator keys are now free to move outwardly toward expanded positions into which they are urged by their springs 62. When the locator keys are now moved into alignment with a locator recess 59 of a landing nipple 12 the locator keys move outwardly into the locator recess and thereafter prevent downward movement of the well tool through

such landing nipple since the downwardly facing shoulders 67 of the locator keys now engage the upwardly facing abrupt shoulder 58 of the locator recess.

The dog holder 23 is then moved downwardly on the upper mandrel section by jars imparted to the mandrel through the running tool. Such downward movement of the dog holder causes the bosses 27 of the dogs 26 to move into the lock recess 33 and the dogs thereupon prevent longitudinal movement of the mandrel in the landing nipple since the dogs are now held against inward movement by the engagement of their cam surfaces 30 with the expander cam surface 32 of the mandrel. Thus the well tool is locked in the landing nipple against both upward and downward movement. The packing assembly 39 of course seals between the mandrel and the landing nipple preventing a flow of well fluids therepast so that flow of fluids may take place only through the bore of the mandrel 15.

When it is desired to remove the well tool from a particular landing nipple 12 and either remove it entirely from the tubing string or move it to a higher landing nipple 12 of the tubing string, a suitable pulling tool is lowered into the tubing string to engage the undercut shoulder 36 of the dog holder and thus pull the dog holder and the dogs upwardly relative to the mandrel. Such upward movement of the dog holder relative to the mandrel also moves the dogs 26 upwardly on the mandrel and during such movement the upper downwardly and outwardly bevelled cam shoulders 28 of the dogs engage the upwardly and inwardly bevelled upper shoulder of the locking groove to cam the dogs inwardly toward retracted position so that the dogs move out of the lock recess 33.

When the upper end of the dog holder during its upward movement of the mandrel engages the downwardly facing stop shoulder 21 of the flange 20 of the mandrel, further upward movement of the pulling tool causes the mandrel itself to move upwardly. Upon such upward movement of the mandrel the upper cam shoulders 56 of the locator keys engage the upper shoulder 60 of the locator recess and such engagement cams the locator keys inwardly to retracted positions to permit upward movement of the mandrel in the tubing string.

If it is desired thereafter to locate the well tool in a higher landing nipple, the well tool is raised into such landing nipple into a position wherein the locator keys are again aligned with the locator recess of such landing nipple and expand thereinto to again prevent downward movement of the well tool in such landing nipple. The dog holder then is again moved downwardly on the mandrel by means of the pulling or running tool to cause the dogs to move into expanded positions in the locking recess or groove of such landing nipple whereupon the well tool is again locked in a predetermined position in the well flow conductor against movement in either longitudinal direction therein. It will be apparent that if it is not desired to position the well tool in any higher landing nipple of the well flow conductor the well tool is merely pulled upwardly through the well flow conductor, the upper camming shoulders 56 of the keys during such upward movement biasing them inwardly to retracted positions upon meeting any downwardly facing obstructions of the well flow conductor, such as the upper cam shoulders 60 of any landing nipples disposed of the well flow conductor.

It will now be seen that a new and improved well tool for securing subsurface well devices in preselected positions in a well flow conductor has been illustrated and described which includes a mandrel having locator keys which are adapted to engage in a locator recess of any predetermined one of a plurality of identical landing nipples connected in and forming sections of a well flow conductor.

It will further be seen that the locator keys are held in retracted positions until the well tool has been lowered into a predetermined position in the well flow conductor by a retractor sleeve which is provided with means for frictionally engaging the well flow conductor to hold the retractor sleeve in an upper position on the mandrel wherein it holds the locator keys in a retracted position and out of contact with the internal surfaces of the well flow conductor.

It will further be seen that the mandrel and the locator keys are movable upwardly relative to the retractor sleeve when the well tool is moved upwardly in a well flow conductor since the frictional engagement of the external fricton O-ring tends to hold the retractor sleeve against movement in the well flow conductor whereby an upward movement imparted to the mandrel causes the retractor sleeve to move out of retracting engagement with the locator keys and free the locator keys for movement toward expanded operative positions.

It will further be seen that the retractor sleeve is provided with an internal frictional or locking means which is engageable with a stop ring or member of the mandrel which tends to hold it in its lowermost non-operative position on the mandrel.

It will further be seen that the provision of a retractor sleeve or means which holds the key in retracted non-operative positions until the well tool has been lowered to a predetermined position in a well flow conductor permits the usage of identical mandrels and identical locator keys while permitting the location of the well tool in any one of the plurality of predetermined positions in the flow conductor in which the identical landing nipples are located.

It will further be seen that the well tool includes a locking means, which is operable when the mandrel is located in a landing nipple and held against further downward movement therein by the locator keys, to lock the mandrel against movement in either direction in the landing nipple.

The foregoing description of the invention is explanatory only, and changes in the details of the construction 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 device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel and radially expansible thereon, said locking means when in expanded position on said mandrel being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and the expander means relative to the locking means; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means freeing the key for outward movement when said retractor means is moved downwardly from said upper position to a lower position on the mandrel, said retractor means having means engageable with the internal surfaces of a well flow conductor for causing said retractor means to assume said lower position upon upward movement of said mandrel in a well flow conductor.

2. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement on the mandrel and radial-

ly expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and the expander means relative to the locking means, said locking means when in expanded position on said mandrel being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor; and means on said retractor means for frictionally engaging the well flow conductor to retard upward movement of the retractor means upon upward movement of the mandrel in a well flow conductor.

3. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel and radially expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and said expander means relative to the locking means, said locking means being engageable with a downwardly facing shoulder of a well flow conductor when in expanded position to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor; means on said retractor means for frictionally engaging the well flow conductor to retard upward movement of the retractor means upon upward movement of the mandrel in a well flow conductor; and co-engageable means on the reactor means and the mandrel for holding the retractor means out of retracting engagement with the locator key.

4. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel, said mandrel having expander means for moving said locking means into expanded position upon upward movement of the mandrel relative to the locking means, said locking means when in expanded positions being engageable with a downwardly facing shoulder of a well flow conductor for limiting upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means on the mandrel below the key and movable on the mandrel between an upper key engaging position for holding the key in a retracted position and a lower position wherein the key is free to move to expanded position, said retractor means having means for engaging the well flow conductor to retard upward movement of the retractor means upon upward movement of the mandrel in a well flow conductor.

5. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel, said mandrel having means for moving said locking means into expanded position upon upward movement of the mandrel relative to the locking means, said locking means when in expanded position being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; retractor means on the mandrel below the key and movable on the mandrel between an upper key engaging position for holding the key in a retracted position and a lower position wherein the key is free to move to expanded position; and means on the retractor means for frictionally engaging the well flow conductor to maintain the retractor means in said upper position upon downward movement of the device through the well flow conductor and to cause the retractor means to assume said lower position upon upward movement of the device through the well flow conductor.

6. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement on the mandrel, said mandrel having means for moving said locking means into expanded position upon upward movement of the mandrel relative to the locking means, said locking means when in expanded position being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; retractor means on the mandrel below the key and movable on the mandrel between an upper key engaging position for holding the key in a retracted position and a lower position wherein the key is free to move to expanded position; means on the retractor means for frictionally engaging the well flow conductor to maintain the retractor means in said upper position upon downward movement of the device through the well flow conductor and to cause the retractor means to assume said lower position upon upward movement of the device through the well flow conductor; and means engaging said mandrel and said retractor means for holding said retractor means in said lower position.

7. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement on the mandrel and radially expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and the expander means relative to the locking means, said locking means when in expanded position being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, means

on the retractor means for frictionally engaging the well flow conductor to cause the retractor means to assume a lower position upon upward movement of the device through the well flow conductor, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor, said retractor means comprising a sleeve longitudinally movably mounted on the mandrel, the key having a reduced lower end portion, the retractor sleeve being engageable with the reduced lower portion of the key when the sleeve is in said lower position on the mandrel to limit outward movement of the key.

8. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement thereon and radially expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and said expander means relative to the locking means, said locking means when in expanded positions being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means having means for engaging a well flow conductor to cause the retractor means to assume a lower position on the mandrel upon upward movement of said mandrel in a well flow conductor, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor, said retractor means comprising a sleeve longitudinally movably mounted on the mandrel, the key having a reduced lower end portion, the retractor sleeve being engageable with the reduced lower portion of the key when the sleeve is in lower position on the mandrel to limit outward movement of the key, said key having an intermediate surface engageable by the retractor sleeve when the sleeve is in an upper position on the mandrel to hold the key in retracted position.

9. A device for locating a well tool at a selected level with a well flow conductor comprising: a mandrel; a locator key expansibly mounted on the mandrel with resilient means urging it radially outwardly, said key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and stop surfaces disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel and retractor means longitudinally slidably mounted on the mandrel and engageable with the key for holding the key in retracted position when in an upper position on the mandrel, the retractor means having outwardly extending means for frictionally engaging a well flow conductor to cause said retractor means to assume a lower position on the mandrel upon upward movement of the mandrel in a well flow conductor, the retractor means freeing the key for outward movement upon upward movement of the mandrel in a well flow conductor.

10. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel and radially expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and the expander means relative to the locking means, said locking means being engageable with a downwardly facing shoulder of a well flow conductor for limiting upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor, said retractor means having means for engaging the well flow conductor to cause the retractor means to assume a lower position on the mandrel upon upward movement of said mandrel in a well flow conductor, said retractor means comprising a sleeve, said key having an intermediate surface engageable by the sleeve when the sleeve is in an upper position on the mandrel to hold the key in retracted position.

11. A device for releasably anchoring well tools at a selected level within a well flow conductor comprising: a mandrel; locking means mounted upon the mandrel for limited longitudinal movement relative to the mandrel and radially expansible thereon; expander means on the mandrel for expanding said locking means upon upward movement of the mandrel and the expander means relative to the locking means, said locking means when in expanded position being engageable with a downwardly facing shoulder of a well flow conductor to limit upward movement of the mandrel in the well flow conductor; a locator key expansibly mounted upon the mandrel with resilient means urging it radially outwardly, said locator key having an upper surface inclined outwardly downwardly of the longitudinal axis of the mandrel and a stop surface disposed below the upper surface and substantially normal to the longitudinal axis of the mandrel; and retractor means longitudinally slidably mounted on the mandrel and engageable with the key when in an upper position on the mandrel for holding the locator key in retracted position, the retractor means freeing the key for outward movement upon upward movement of said mandrel in a well flow conductor, said retractor means having means for engaging the well flow conductor to cause the retractor means to assume a lower position on the mandrel upon upward movement of said mandrel in a well flow conductor, said retractor means comprising a sleeve longitudinally movably mounted on the mandrel, the key having a reduced lower end portion, the retractor sleeve being engageable with the reduced lower portion of the key when the sleeve is in lower position on the mandrel to limit outward movement of the key, said key having an intermediate surface engageable by the retractor sleeve when the sleeve is in an upper position on the mandrel to hold the key in retracted position.

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