Jan. 18, 1966 H. E. SIMPSON ETAL 3,229,997

DISENGAGEABLE LATCH MEANS FOR DUAL STRING PACKERS

Filed July 5, 1962 2 Sheets-Sheet 1

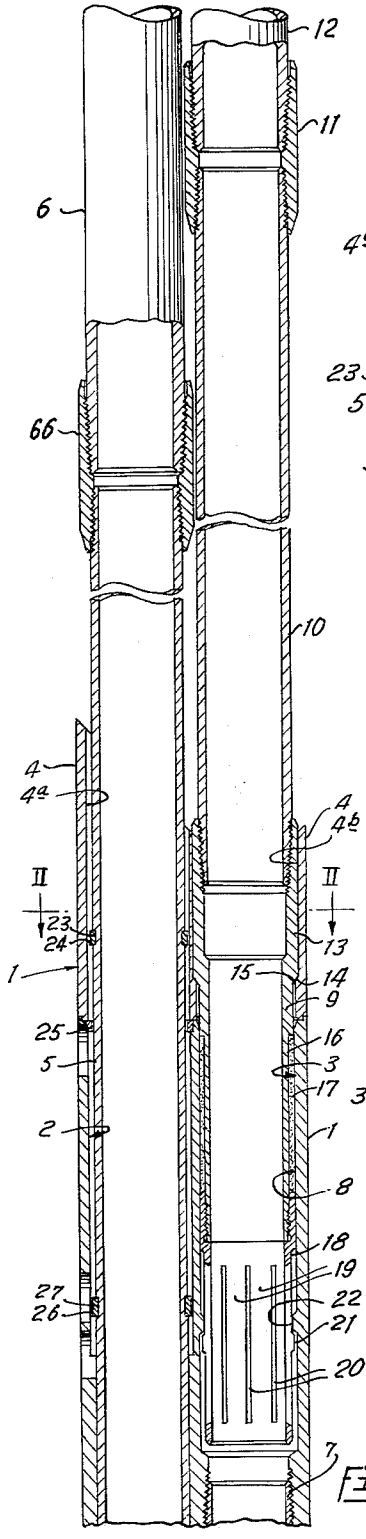


Fig. I

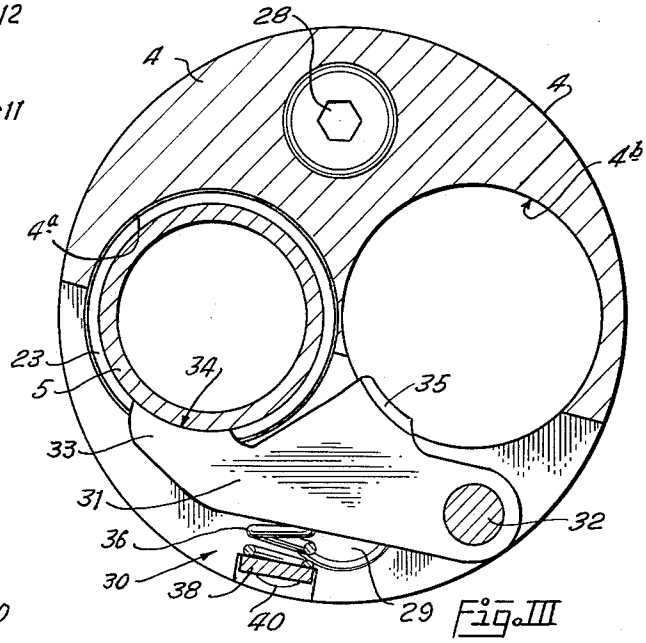


Fig. III

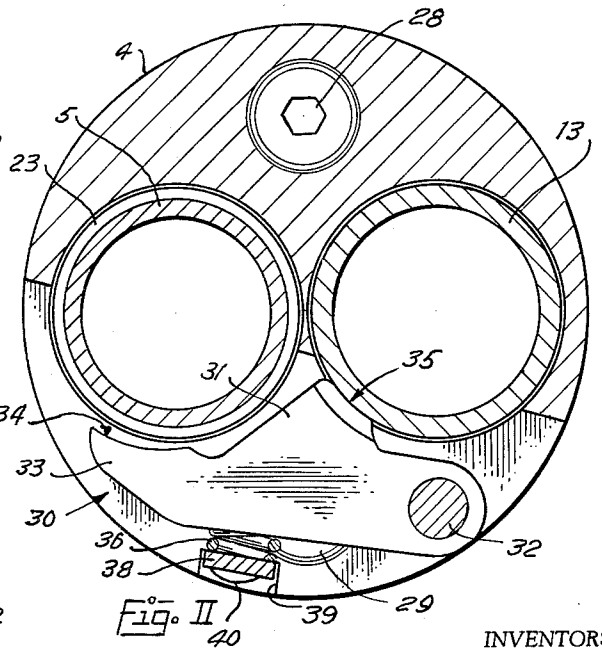


Fig. II

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DISENGAGEABLE LATCH MEANS FOR DUAL STRING PACKERS

Filed July 5, 1962 2 Sheets-Sheet 2

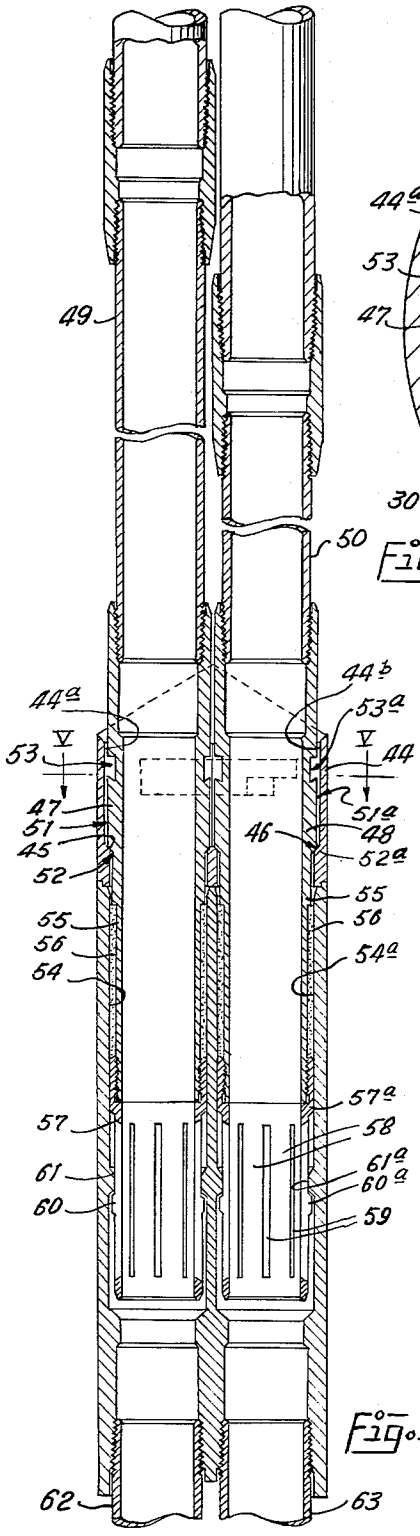


Fig. IV

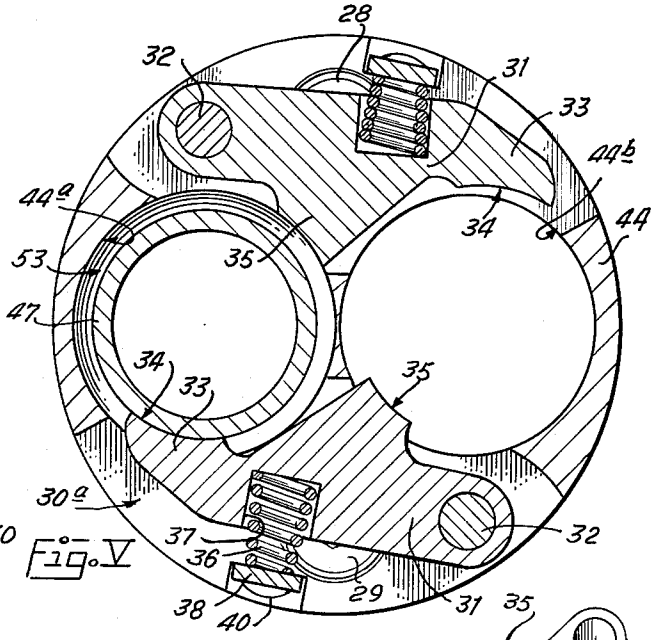


Fig. V

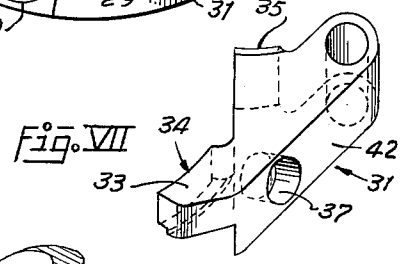


Fig. VII

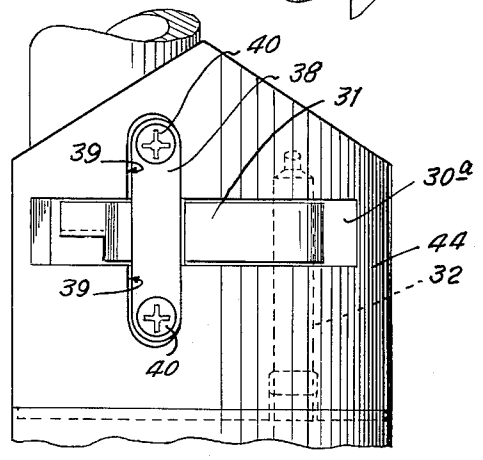


Fig. VI

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DISENGAGEABLE LATCH MEANS FOR DUAL STRING PACKERS

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12 Claims. (Cl. 285—137)

This invention is concerned with improvements in well packers, and is particularly concerned with disengageable latch means for latching an insertable member in the body of a dual packer or other supporting body therefor, either to prevent telescoping movement of the body with relation to the tubular mandrel extending through the packer, to prevent premature setting of the packer while it is being run, or to support the body and equipment suspended therebelow while the packer is being run.

One form of dual string well packer is customarily run into the well on a primary string of tubing, and after reaching the position in the well where it is to be set, a secondary string is run into the well and latched in the other passage through the packer, and downward force is exerted on the secondary string to disengage the packer body from the mandrel attached to the primary string, either by shear pins or actuating other disengageable attachment means, to allow the packer body to move downwardly over the mandrel to expand the packer sleeve into sealing engagement with the casing wall and anchor the packer thereto.

Another form of dual string packer is set by moving the body of the packer and the mandrels downwardly with reference to a slip joint to expand the slips and the packer sleeve.

It has been found from experience in the use of the first indicated packer that the body of the packer often becomes accidentally disengaged from the mandrel attached to the primary string while running the packer into the well by reason of shearing the shear screws attaching same thereto, or disengaging the disengageable attachment member, by reason of striking obstructions in the well bore or exerting force thereupon to pull up after lowering into a tight place in the well bore. Such accidental disengagement of the packer body from the primary mandrel allows the packer body to telescope with relation to the primary mandrel, prematurely anchoring the packer against the casing, necessitating shear out procedure, or other expensive operations to dislodge and remove the packer, or at least requires the retrieval of the prematurely actuated packer and the running of another packer.

This invention is intended to provide a disengageable latch means to positively support the packer body against downward telescoping movement with relation to the primary mandrel while the packer is being run, which disengageable latch member is disengaged only by the running of the stinger or attachment member of the secondary string into the secondary passage through the packer.

In the use of the improvement comprehended by the invention in the running of packers of the second indicated type, a disengageable latch means is associated with each passage through the supporting body for the packer, wherein a latch member is engaged with the tubular support member extending into one of the passages while there is no tubular support member in the other passage, and wherein upon the disposition of both tubular support members in both passages of the body, both of the latch members are unlatched from engagement with the tubular support members. However, upon removal of either of the tubular support members from a passage through the body, the latch associated with the other passage, will engage the tubular support member in said other passage. Therefore, the body and equipment suspended therebelow may be supported on either string of tubing by disengageable latch means, and either string may be removed from the packer to allow suspension of the packer on the other string so that the packer may be run on one string and retrieved on the other string.

It is, therefore, a primary object of the invention to provide disengageable latch means which will support a dual packer body with relation to the mandrel therethrough while the packer is being run into the well to prevent premature setting of the packer.

Another object of the invention is to provide such disengageable latch means which may be actuated and disengaged from the primary mandrel through the packer only by inserting the stinger attached to the lower end of the secondary string.

A still further object of the invention is to provide disengageable latch means to latch the stingers attached to both strings of tubing in both passages through a packer support body, which are only latched to a stinger in a passage while there is no stinger in the other passage, whereby the packer body is supported while being lowered on one string of tubing, but wherein the latch is disengaged from the running in string by the running of the second string to permit either string to be withdrawn after the packer is set.

A still further object of the invention is to provide disengageable latch means associated with each tubular attachment member insertable into passages of the dual packer which latch members are released for engagement with one of the tubular attachment members upon the removal of the other tubular attachment member from the passage, so that the packer may be run upon either string and retrieved upon either string.

Suitable embodiments of the invention are shown in the attached drawings, wherein:

FIGURE I is a cross-sectional, elevational view of a dual string packer mandrel extending into one of the passages through the body of the packer, and showing the disengageable stinger attached to the secondary string extending into the other passage through the dual packer body;

FIGURE II is a sectional view taken along the line II—II of FIGURE I, showing the disengageable latch member moved out of engagement with the stop ring carried by the primary mandrel by engagement therewith by the stinger attached to the secondary string, inserted into the secondary passage of the packer body;

FIGURE III is a sectional view similar to FIGURE II, showing the spring urged latch member in engagement with the upper surface of the stop ring attached to the primary mandrel, as it would appear while the packer is being run in the well on the primary string, and before the stinger attached to the secondary string is inserted into the secondary passage to move the latch member out of engagement with the stop ring;

FIGURE IV is a cross-sectional, elevational view of a modified form wherein disengageable stingers are attached to both strings of tubing and are inserted into passages through the body below which is supported a dual packer, with coinciding annular grooves about the stingers engageable with disengageable latch members attached to the body to allow support of the body against movement in either direction and which permits disengageable suspension of the packer body, and elements suspended therebelow, on either string;

FIGURE V is a cross-sectional view taken along the line V—V of FIGURE IV showing one of the latch members disengageably attached to a stinger extending into one of the passages of the packer support body;

FIGURE VI is a side elevational view showing the mounting of a typical disengageable latch member with

relation to the body, scoop, or other support member to which it is attached; and

FIGURE VII is a perspective view of a typical latch which may be employed with both forms of the invention shown herein.

Numeral references are employed to designate the various parts shown in the drawings, and like numerals indicate like parts throughout the various views of the drawings.

Referring first to the form shown in FIGURES I–III, the numeral **1** indicates a generally cylindrical packer body having a primary cylindrical passage **2** and a secondary cylindrical passage **3** therethrough.

The body **1** includes an entry scoop **4** having a primary passage **4***a* and a secondary passage **4***b* therethrough. The entry scoop **4** has tapered entry surfaces in the respective passages **4***a* and **4***b* at the upper end thereof, to guide the stinger, hereinafter described, into the secondary passage **4***b*, for attachment therein.

A primary tubular mandrel **5** extends through the primary passage **2** of the packer body **1** and is attached to the packer body by disengageable attachment means, such as shear screws, or expandable and retractable ring (not shown), so that by exerting downward force on the body **1** the body may be disengaged from the mandrel **5** to permit telescoping movement between the body **1** and the mandrel **5** to expand slips (not shown) and a packer sleeve (not shown) into engagement with the casing (not shown).

The primary mandrel **5** is attached to the primary tubing string **6** by means of a suitable coupling **66**, on which the packer is lowered into the casing from the surface of the earth.

The packer body also includes a stinger receptacle **8** which is a part of the secondary passage through the packer, and a secondary mandrel **7** is threadedly attached to the lower end of the stinger receptacle **8**. The secondary mandrel **7** extends through the packer to form a part of the secondary passage therethrough.

A tubular stinger **9** is attached to the lower end of the secondary tubing string **10**. Tubing string **10** is made up of a plurality of pipe sections, such as that indicated at **12**, joined together by means of couplings, such as indicated at **11**.

The stinger **9** includes a tubular member having an enlarged diameter **13** provided with an annular tapered stop shoulder **14** thereon, which is arranged to come into contact with a coinciding shoulder **15** in the bore **4***b* of the scoop **4**, to limit the downward movement of the stinger into the stinger receptacle **8**.

The stinger **9** also includes the reduced diameter portion **16** about which is disposed suitable resilient seal material **17**, which may be slidably and sealingly engaged with the inner surface of the bore of the stinger receptacle **8**.

A stinger collet **18** is threadedly engaged to the lower end of the stinger body, the upper end of which provides a base for the sealing material **17**, said sealing material being confined between the upper end of the collet **18** and the shoulder provided by the reduced diameter portion **16** of the stinger body.

The stinger collet **18** includes annularly spaced spring segments **19** which are formed by longitudinal slits **20** provided through the wall thereof. The collet body **18** is made of spring-like material so that the segments **19** may spring inwardly for engagement in the stinger receptacle **8**.

A peripheral exterior rib **21** is provided about the spring segments **19** of collet **18**, and an inwardly extending annular rib **22** is provided in the bore of the stinger receptacle **8**.

The stinger **9** may be lowered into the secondary passage **4***b* through the scoop **4** and into the bore of the stinger receptacle **8**. As the rib **21** engages the rib **22**, the weight of the secondary tubing string **10**, or force exerted thereupon, will cause the spring segments **19** to spring inwardly to allow the rib **21** to pass over and below the rib **22**, and after passing thereover, the spring segments **19** will relax, to permit the rib **21** to move outwardly below the rib **22**, thereby disengageably locking the stinger **9** in the stinger receptacle **8**.

A support ring **23** is secured about the primary mandrel **5** by being inserted in a groove **24** formed thereabout.

A stop ring **25** is attached to the packer body **1** by being clamped between the lower end of the scoop **4** and the upper end of the body section **1**.

A pick-up ring **27** is attached about the primary mandrel **5** by being inserted in an annular groove **26** formed thereabout.

In the event the packer sleeve and anchoring slips will not retract in the normal manner for removal of the packer assembly from the casing, the mandrel **5** may be detached from the slip housing (not shown) by exerting an upward pull on the primary string **6** sufficient to break shear screws attaching the mandrel to said slip housing.

This permits the mandrel **5** to be moved upwardly in the primary passage **2** until the pick-up ring **27** engages the stop ring **25**, whereupon the packer body **1** is suspended on the primary string mandrel **5**, and the packer may be retrieved from the well thereupon.

As shown in FIGURES II and III, the entry scoop **4** of the body **1** is attached to the body by means of cap screws **28** and **29** extending longitudinally through the wall of the scoop **4**, and are threadedly engaged in the upper end of the wall of the body **1**.

A peripheral slot or window **30** is provided in the wall of the scoop **4**, in which is pivotally mounted a latch **31**, the detail construction of which is shown in FIGURE VII. The latch **31** is pivotally mounted at one end by means of a pivot pin **32** extending longitudinally into the wall of the scoop **4**, or **44**, as the case may be. The typical mounting of a latch member **31** is shown in FIGURES V and VI, even though such figures show a modified form wherein two such latches are mounted with reference to the supporting body.

The typical latch which may be employed in both forms of the device is shown in FIGURE VII, and includes a nose or tongue portion **33** having an arcuate inner surface **34** thereon arranged to generally conform to the exterior surface of a tubular member such as **5** inserted in the passage **4***a* or **44***a*, respectively. As shown in FIGURE VII, the tongue portion **33** of the latch member is thinner than the remaining portion of the body **42** of the latch **31**, which has a particular function in relation to the modified form of FIGURES IV–VI, hereinafter described.

The latch member **31** also includes a cam extension **35** which is arranged to extend into the secondary bore **4***b* of the scoop **4**, with the tongue **33** in engagement with the support ring **23** on the primary mandrel **5**.

A coil spring **36** has an inner end thereof resting in a bore **37** in the outer face of the latch body **42**, and the outer end of such spring is confined behind the elongated retainer member **38**. The spring retainer **38** has opposite ends thereof disposed in aligned slots **39** provided in the wall of the scoop **4** or **44**, as the case may be, and is secured therein by means of suitable screws **40**.

The spring **36** normally urges the latch member **31** inwardly.

As shown in FIGURE III, the tongue **33** is disposed above, and in engagement with, the support ring **23** being urged inwardly to such position by the spring **36**. It will be noted that in such position, the cam extension **35** extends into the secondary bore **4***b* of the entry scoop **4**.

This is the position of the latch **31** in relationship to the mandrel **5** while the packer suspended to the primary string **6**, is being lowered into the casing. It will thus be seen that the assembly, made up of the scoop **4** and

body 1, is suspended to the primary mandrel on the latch 31, so that the body cannot move downwardly with relation to the mandrel, while the packer is being run to prematurely expand the slips and packer into engagement with the casing. The only manner in which the latch 31 can be released is to run a pipe or other cylindrical member into the secondary passage 4*b*, to retract the latch.

When the packer reaches the position at which it is to be set, the stinger 9 is lowered into the casing on the secondary string 10 and guided into the passage 4*b* of entry scoop 4. When the enlarged diameter portion 13 of the stinger 9 comes into contact with the cam extension 35, the latch 31 will be pushed outwardly, moving the tongue 33 out of engagement with the upper surface of the support ring 33. After the stinger has been latched in the stinger receptacle 8 in the manner hereinbefore described, further downward force upon the primary string 10 will cause the packer body 1 to be disengaged from the mandrel 5 to move the body downwardly to expand the slips and set the packer.

Thus it will be seen that the packer body is supported against telescopic movement with relation to the primary mandrel while the packer is being lowered into the well, but the latch member 31, supporting same, is automatically disengaged when the stinger on the lower end of the secondary string is lowered into latching engagement in the secondary passage of the packer body.

Upon removal of the stinger 9 from the secondary passage, after relaxing the packer for removal from the well, the tongue 33 of latch 31 will move back into engagement with the upper surface of the support ring 23 to prevent the packer body from telescoping with relation to the mandrel while the packer is being retrieved from the well. Thus the packer is prevented from prematurely setting while being lowered into the well, and while being retrieved from the well, thus virtually eliminating the possibility that the packer will become lodged in the well upon running or retrieval.

In the modified form of FIGURES IV–VI, a scoop body 44 is provided, having primary and secondary passages 44*a* and 44*b*, respectively therethrough.

Annular upwardly-facing beveled shoulders 45 and 46 are provided in the passages 44*a* and 44*b*, respectively, which are arranged to receive the corresponding downwardly facing beveled shoulders 52 and 52*a* on the stinger bodies 47 and 48, respectively, to limit downward movement of the stingers into the passages 44*a* and 44*b*.

Each of the stingers 47 and 48 are attached to tubing strings 49 and 50, respectively, which are made up and extended from the surface of the well.

The stingers 47 and 48 have enlarged diameters portions 51 and 51*a*, respectively, thereon and reduced diameter portions 55 therebelow about which are disposed suitable resilient packing material 56 to seal against the inner surface of the bores of the stinger receptacles 54 and 54*a*, respectively.

Horizontally aligned annular grooves 53 and 53*a* are provided about the enlarged diametrical portions 51 and 51*a* of stingers 47 and 48, for the purpose hereinafter described.

Collets 57 and 57*a* are attached to the lower ends of the stingers 47 and 48, said collets having spring ribs 58 spaced thereabout formed by spaced slots 59 extending longitudinally thereof.

The collets 57 and 57*a* have annhlar ribs 60 and 60*a* thereabout, which are arranged to be sprung over the internal ribs 61 and 61*a* inside the passages through the stinger receptacles 54 and 54*a*.

Tubular sections 62 and 63 are attached in the passages through the stinger receptacles 54 and 54*a*, said tubular sections being the mandrels of a packer suspended therebelow. The packer employed is of the type wherein the mandrels move downwardly with the body inside a slip joint to expand the slips and packer sleeve.

As shown in FIGURE V, two of the latch members 31 are pivotally attached to the scoop body 44 by means of pivot pins 32. The latch members are operable in the same manner as hereinbefore described. However, it will be noted that they are turned in opposite direction so that the respective tongues 33 thereon are extendable into the passages 44*a* and 44*b* at opposite sides thereof, and the cam extensions 35 are extendable into the passages 44*a* and 44*b* at opposite sides thereof.

The packer may be lowered into the well suspended below the latch body, made up of scoop 44 and stinger receptacles 54–54*a*, suspended to either one of the tubing string 49 or 50. As shown in FIGURE V, the packer is lowered into the well suspended on tubing string 49. It will be noted that in such position, as shown in FIGURE V, the tongue 33 of one of the latch members 31, extends into the annular groove 53, preventing upward or downward movement of the tubing string with relation to the body 44. The cam extension 35 on the other latch 31 cannot enter the slot 53 because it is wider than same. Upon lowering the secondary tubing string 50 and latching the stinger 48 in the passage 44*b*, the enlarged diameter 51*a* thereof contacts the inwardly extending cam extension 35 of the latch 31 and disengages the tongue 33 from the groove 53, thereby unlatching both tubing strings from the body 44.

The latch may be made of sufficient strength to support a greater load below the packer while it is being run and pulled than was heretofore the case wherein a bolt was employed to attach the body to the tubing string, and has the added advantage of enabling both strings to be unlatched for running the packer or retrieving same on etiher string.

Upon removal of either stinger 47 or 48 from the passage in which it is disposed, the tongue 33 of the latch associated with such passage will be caused to move inwardly by relaxation of the spring 36 associated therewith, to permit the tongue 33 to enter the groove 53 or 53*a*, as the case might be, to latch the body 54 to the stinger for retrieval of the packer from the well. Therefore, the packer may be run upon one string and retrieved upon the other by means of the disengageable latch means hereinbefore described.

It will thus be seen that we have provided disengageable attachment means between the body of a packer or other device having dual passages therethrough, wherein the body may be prevented from moving downwardly with relation to the support member on which it is mounted, or a suspending body for a packer latched to other strings against upward or downward movement with relation thereto in a modification thereof, but in both instances the latch member is latched and unlatched by the placement within, or removal from, a tubular member in a parallel passage, with which it is associated.

It will be understood that other and further embodiments of the invention may be devised without departing from the spirit and scope of the appended claims.

Having described our invention, we claim:

1. In a device of the class described,

a body having parallel longitudinal passages therethrough with a wall thereabout; a latch; means pivotally attaching the latch to the wall of the body;

said latch having a portion on the inner side thereof movable into one of the passages

and another portion on the inner side of said latch spaced from the first named portion and movable into the other passage, said portions being arranged to enter the passages from the same sides thereof;

and spring means arranged between the body and the latch to urge the latch inwardly of the passages.

2. The combination called for in claim 1 wherein one of the portions of the latch movable into a passage comprises

a tongue on the outer end thereof which is less in thick-

ness than the other portion movable into the other passage.

3. In a device of the class described,
a body having parallel longitudinal passages therethrough with a wall thereabout;
a pair of latches pivotally attached to the body;
means pivotally attaching the latches to opposite walls of the body;
each said latch having spaced portions on the inner sides thereof the portions on each latch being movable into separate passages at opposite sides of the passages;
and spring means arranged between the body and each of the latches
to urge the latches inwardly of the passages.

4. The combination called for in claim 3 wherein
the outer end of each latch is provided with a tongue less in thickness than the body of the latch,
which tongue comprises one of the portions movable into one of the passages.

5. In a device of the class described,
a body having parallel longitudinal passages therethrough;
an elongated lateral slot through the wall of the body communicating with both of the passages at one side of the body;
a latch member pivotally attached in the elongated slot;
a latch tongue on the latch member movable into one of the passages;
a cam extension on the latch member on the same side thereof as the latch tongue movable into the other said passage;
and a spring engaged at its outer end with the body and having its inner end engaged with the latch member, said spring being arranged to urge the latch tongue and cam extension into the bores of the respective passages.

6. The combination called for in claim 5 wherein
the latch member is pivoted at one end,
the spring is abutted against a spring stop secured at opposite ends to the body and extending across the elongated slot,
and the inner end of the spring is disposed in a recess formed in the outer surface of the latch member.

7. In a device of the class described
a body having parallel longitudinal passages therethrough;
a pair of oppositely disposed elongated lateral slots provided through the wall of the body
communicating with the longitudinal passages through the body;
a latch pivotally attached in each such elongated slot, each said latch having
a tongue on the one end thereof movable into one of the longitudinal passages through the body,
and a cam extension thereon movable into the other longitudinal passage through the body;
and spring means engaged between the body and each of said latches
arranged to urge the tongues and cam extensions inwardly of the passages through the body.

8. The combination called for in claim 7 wherein
the tongue on each such latch is less in thickness than the cam extension.

9. In a device of the class described
a body having parallel longitudinal passages therethrough;
a latch member pivotally attached to the body and having an end portion movable into one of the passages
and an intermediate portion movable into the other passage;

a tubular member extending through one of the passages and having an annular shoulder thereon in position so that the one end of the latch member will engage the upper surface of the shoulder
to prevent downward movement of the body with respect to the tubular member;
a tubular member insertable into the bore of the other passage,
having an enlarged diameter portion on the upper end thereof
engageable with the intermediate portion on the latch member
to push the end of the latch member outwardly out of engagement with the shoulder;
and spring means arranged between the body and the latch member to urge the latch member inwardly of the passages.

10. In a device of the class described,
a body having parallel longitudinal passages therethrough;
a pair of latch members pivotally attached to the body
each latch having a portion on the outer end thereof movable into one of the passages,
and an intermediate portion movable into the other passage;
spring means arranged between the body and each of the latch members
to urge the latch members inwardly of the passages; a tubular member insertable into each of said passages, each tubular member having an enlarged diameter portion thereon
arranged to contact the intermediate portions of the latch members
to move same outwardly of the passages; and an annular groove provided about the enlarged diameter portion of each such tubular member, each groove being arranged to receive the end portion on each latch member,
whereby when either of the tubular members is removed from its respective passage
the end portion on a latch member will engage the groove in the other tubular member.

11. The combination called for in claim 10 wherein
the end portion on each latch member is less in thickness than the intermediate portion thereof.

12. The combination called for in claim 10 wherein
each latch member is disposed in an elongated lateral slot provided through the wall of the body
extending into the passages through the body;
the latch members are pivotally mounted in the slots;
a spring stop is secured to the outer surface of the body extending across each of the lateral passages;
and spring recesses are provided in the outer surface of the latches;
the said springs having one end positioned behind the spring stop and the other end positioned in the recess.

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