

LINE CLAMP

The present invention relates to devices used in the petroleum industry to clamp line. More particularly, this invention relates to a clamping device for wireline, which is pressure operated and may be remotely operated repeatedly to clamp and suspend line and prevent the line with tools from falling into a well.

Many such devices are known which will prevent cut or broken line from falling into and being lost in a well when performing service operations in the well using slick or braided line. Use of such devices can prevent time consuming and costly fishing operations in a well. One example of these devices is covered by U. S. Patent 3,467,224 to W.L. and Billy D. Curtis. This device employs an electric switch to sense a wireline break and uses fluid pressure to move slips into and out of clamping engagement with the line.

U. S. Pat. 4,498,563 to Trahan discloses a "WIRELINE CATCHER" having mechanical sensing means admitting pressured fluid to an actuator which moves laterally to clamp the line when the line breaks.

A similar device is disclosed in a patent application entitled "WELL SERVICING SYSTEM", mailed to the U. S. Patent and Trademark Office January 29, 1988 for inventors Kwok-Ping Wong and Peter Cowan. This device is remotely operated and

utilizes fluid pressure to release slips from a not clamping-position and a compressed spring and fluid pressure to move the slips into clamping position. This clamp may not be operated repeatedly.

5       The present invention provides a pressure operable clamp device having a passage for line therethrough comprising a housing having a lower camming surface therein, means mounted within said housing for clamping line, said means longitudinally moveable from a position  
10 not-clamping line to a position clamping line, said clamping means including slip segments for forming a line-clamping bore with a friction surface, each segment having a camming surface engageable with said housing camming surface, biasing means for biasing said clamping means to  
15 the position not-clamping line, and pressure responsive means in said housing displaceable generally parallel to said passage for moving said clamping means to the position clamping line.

      The clamp may be attachable to a wellhead or used in a  
20 well servicing lubricator. The pressure responsive means may comprise a piston within the housing which moves the slip segments into clamping position in response to increased fluid pressure acting on the piston.

      To complement the action of the biasing means an  
25 expander may be provided in the housing to move the segments apart when completely in not-clamping position.

      When there is a need to clamp wireline passing through the clamp housing, pressure increased in the conduit

supplying pressured fluid to the piston to move the slip segments down off the expander. At the same time a biasing spring is compressed, until camming surfaces on the slip  
5 segments contact camming surfaces in the housing. Further downward movement of the piston cams the segments inwardly to clamp the line. On release of piston pressure, the spring moves the segments and piston upwards towards a not-clamping position. Further upward movement

of the segments onto the expander moves the segments further apart and completely into not clamping position.

An object of this invention is to provide an improved pressure operated line clamp device which may be remotely operated repeatedly.

An example of a clamping device according to the invention is shown in the accompanying drawings. In these:

FIG. 1 is a drawing in partial section showing the clamping device of this invention not clamping line passing through.

FIG. 2 is a drawing in cross section along line 2-2 of Figure 1.

FIG. 3 is a partially sectioned drawing showing the invention device clamping line.

FIG. 1 shows a clamp 10 of this invention with line L passing through the clamp. The clamp has a housing 11, which includes bores 11a, 11b and 11c, and threads 11d and 11e. A piston 12 is slidably mounted in the housing and is sealed in bore 11b with resilient seal 13 and in bore 11c with resilient seal 14 to form a variable volume pressure chamber 15 with the housing. A conduit (not shown) is connected into housing thread 11d to supply pressured fluid from a remote source to housing chamber 15. Positioned in body bore 11a by a retaining ring 16 in a groove in the bore is an expander 17.

The expander has a bore 17a and a camming surface 17b. A guide 18 is positioned by a retaining ring 19 in a groove in bore 17a. Slidably mounted in a piston bore 12a is a ring 20

having pins 21 protruding into flange slots 22a in each slip segment 22 (see also FIG.2). Pins 21 maintain radial position of the slip segments. Slip segments 22 each have a camming surface 22b and teeth are shown cut into friction surface 22c. Friction surface 22c must be sufficiently rough to stop the line when segments 22 are in clamping position. Sufficient surface roughness may also be obtained by coating or plating surface 22c. Connected to housing thread 11e is an appropriate connector 23 for connecting clamp 10 to a wellhead or well servicing lubricator. The connector positions lower housing 24 in contact with the lower end of housing 11.

The lower housing has a camming surface 24a, which is engageable with segment camming surface 22b, a shoulder 24b, a thread 24c and a bore 24e. A set screw 25 is connected in thread 24c. This screw may be screwed in by hand to clamp the line. A lower guide 26 is positioned in lower housing bore 24e by retaining ring 27 in a groove in bore 24e. The upper and lower guides 18 and 26 cooperate to center line being run through the clamp and prevent wear on internal parts of the clamp.

A compressed spring 28 bears on lower housing shoulder 24b and pushes ring 20 and slip segments 22 upwardly to a position where expander camming surface 17b has entered slip bore 22d and moved the segments fully outward to a position not clamping line L.

To operate the clamp of this invention to clamp line L as often as required, pressure in chamber 15 acting on piston 12

is increased sufficiently to move the piston, slip segments 22 and ring 20 downwardly compressing spring 28. Continued piston movement downwardly moves the segments below the end of expander 17 and engaged camming surfaces 22b and 24a cam the segments inwardly until segment friction surfaces 22c seize the outside surface of line L clamping the line to prevent upward or downward movement of the line.

To unclamp the line and allow clamp parts to return to a position not clamping line, pressure in chamber 15 is reduced until spring 28 moves ring 20 and slips 22 upwardly. The slip segments move outwardly along camming surface 24a as they travel upwardly unclamping the line. Just before ring 20 and segments 22 have moved completely upward, camming surface 17b on the expander enters segment bore 22d and cams the segments further outwardly into the position not clamping line as shown in FIG. 1. The line clamp of this invention may now be pressure operated to clamp line again.

CLAIMS

1. A pressure operable clamping device having a passage  
for line therethrough comprising:
  - 5 (a) a housing having a lower camming surface therein;
  - (b) means mounted within said housing for clamping  
line, said means longitudinally moveable from a  
position not clamping line to a position clamping  
line, said clamping means including slip segments  
10 for forming a line-clamping bore with a friction  
surface, each segment having a camming surface  
engageable with said housing camming surface;
  - (c) biasing means for biasing said clamping means to  
the position not clamping line; and
  - 15 (d) pressure responsive means in said housing  
displaceable generally parallel to said passage  
for moving said clamping means to the position  
clamping line.
2. The clamp device as defined in claim 1 wherein the  
20 pressure responsive means comprises a member extending  
around said passage.
3. The clamping device as defined in claim 2 wherein each  
slip segment has a flange and said flanges form a  
radially outer peripheral ring on which said pressure-  
25 responsive means bears.



4. The clamp as defined in any one of the preceding claims wherein the means for clamping line further includes means radially positioning the slip segments.
5. The clamp as defined in claim 3 together with claim 4 wherein the radial positioning means comprise:
  - (a) a ring around the slip segments below the segment flanges; and
  - (b) pins in the ring protruding into slots in the segment flanges.
- 10 6. The clamp as defined in any one of the preceding claims wherein the biasing means extend around the slip segments.
7. The clamp as defined in claim 3 together with claim 6 wherein the pressure-responsive means and the biasing means act through opposite faces of said flanges.
- 15 8. The clamp device as defined in claim 6 wherein the biasing means includes a shoulder in the housing below the ring around the slip segments and a spring mounted between said shoulder and said ring.
- 20 9. The clamp as defined in any one of the preceding claims wherein the pressure responsive means comprise:



10. The clamping device as defined in any one of the preceding claims wherein an expander is mounted within the housing for urging the slip segments apart when they are not clamping line.
- 5 11. The clamping device as defined in claim 9 together with claim 10 wherein the guiding means comprise an upper guide positioned in the expander and a lower guide positioned in the housing.
- 10 12. The clamp as defined in any one of the preceding claims wherein the pressure responsive means comprise:
- (a) a piston slidably and sealably mounted within said housing, said piston forming a variable volume chamber with said housing; and
- (b) an inlet in the housing for conducting pressured fluid to said chamber.
- 15 13. The clamp as defined in any one of the preceding claims wherein the clamp further includes a screw threaded laterally into the housing below the housing camming surface for manually clamping the line.
- 20 14. The clamp as defined in any one of the preceding claims wherein said friction surfaces have teeth.



15. A pressure operable clamp having a passage for line therethrough comprising:

(a) a housing having an expander mounted therein, an upper line guide mounted in said expander, a lower camming surface, a screw threaded laterally into said housing below said camming surface and a lower line guide mounted in said housing;

(b) means mounted within said housing for clamping line, said means longitudinally moveable from a position not clamping line to a position clamping line, said clamping means including slip segments each having a bore, a friction surface in said bore, a flange on each segment and a slot through each flange, a camming surface on each segment engageable with said housing camming surface, means radially positioning said slip segments including a ring around the slip segments below the slip segment flanges and pins in the ring protruding into the segment flange slots;

(c) biasing means for biasing the clamping means to the position not clamping line including a shoulder in the housing below said ring and a spring mounted between said shoulder and said ring; and

(d) pressure responsive means mounted in said housing for moving said clamping means to the position clamping line, said means including a piston sealably mounted in said housing and slidable



generally parallel to said passage, said piston forming a variable volume pressure chamber with said housing, and an inlet in said housing for conducting pressured fluid to said chamber.

- 5 16. A pressure operable clamp constructed and arranged for use and operation substantially as described herein with reference to the accompanying drawings.
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