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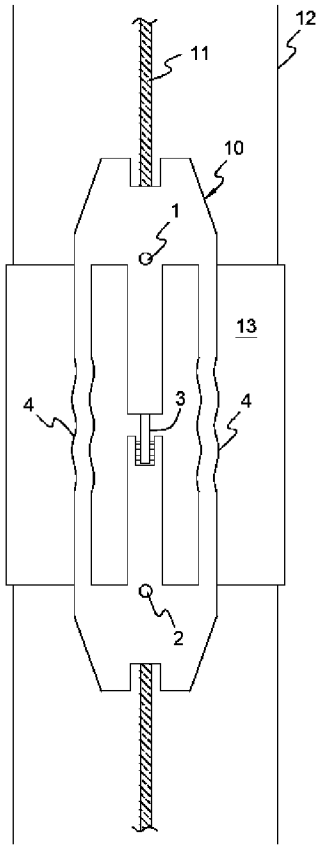
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(54)	Title	**CABLE PROTECTING DEVICE**
(56)	References Cited:	US 9500042 B2, DE 924141 C, WO 2016/190747 A1, US 2016/0290835 A1
(57)	Abstract	

Cable protecting device for protecting cables extending over a feature on a pipe surface, said feature a known length outside said pipeline circumference and having a first and second end surface, the cable protecting device having a length in the direction of the pipeline being longer than the said feature, and comprising a channel for enclosing the cable to be protected and a recess in the inner surface adapted for containing at least a part of the feature and the features first and second end surfaces, the ends of said device at least partially covering the corresponding parts of the feature ends, wherein the length of the recess corresponds essentially to the length of the feature, each end of said recesses being provided with engaging means adapted to engage with the corresponding end surfaces of the feature thus fixing the protecting device to the feature, and wherein the protecting device is made in one piece, including a flexible spring section in the section extending over the recess, between the first and second ends of the device.



CABLE PROTECTING DEVICE

The present invention in general relates to a cable protecting device for its application within a well bore, for protecting cables extending downwards through the bore holes.

Particularly, the present invention relates to a cable protecting device, which can be easily and rigidly mounted on pipes, especially on features like collars or sleeves over connections in downhole pipes or tubing and the like.

TECHNICAL BACKGROUND OF THE INVENTION

Extending cables down through wellbores, is a very common exercise, especially in hydrocarbon production/injection and exploration operations. Cable protecting devices in various forms are also known for rigidly holding the cable, to transfer its weight to the well bore conduit or tubing during operation. Such devices also serve to prevent the cable from moving within the well bore, so that it does not undergo abrasion or wearing by impact or rubbing with the well wall or casing. Such movement may take place for example, when a motor of a submerged electric pump, to which the cable is connected, is put on or put off, which trigger vibrations within the well bore. Such movement may also take place during lifting/lowering of any equipment with the cable attached.

The cable protecting devices known in the art are usually mounted on pipes, such as, but not limited to production tubing. The cables may be banded or strapped to the production tubing at intervals, for transferring the weight of the cable on the production tubing, e.g. as described in GB2377717B and WO1994/011609. A similar solution is shown in DE924141C where springs are clipped around the pipe to keep a device in place.

The mounting of the protection devices above is, however, time consuming. This is particularly true, because fairly a large number of such devices, are required in each well. A solution to this problem has been proposed in US9500042 which clamps the protection unit to the ends of a feature on the pipe such as a collar or sleeve enclosing a pipe coupling point, without the need for straps or similar extending around the pipe.

The solution described in US9500042 is, however, relatively complex including several different parts, which both increases the cost and the chance of failure in some component, increasing the risk of falling inside the well, which obviously requires substantially expensive, recovery and corrective operations.

Prior art also depends to a large extent on human intervention to be mounted on the pipe. The area on an installation where the Cable protection device is normally mounted is the Drill floor and more specific an area of the Drill floor often designated as the “red zone” due to its risk classification for operating personnel.

Thus it is an objective of this invention to provide a simplified and inexpensive cable protecting device for protecting cables which has a simple arrangement for rigidly mounting it on a pipe joint(or collar), especially on a connection in a down hole pipe, so that the mounting and removal operation of the cable protecting device is not time consuming and simultaneously being sufficiently secure to reduce the chances of parts falling off of the device or its parts and fall into the well bore. It is also desired to minimize or eliminate the need for human interaction to ensure less risk of injury to personnel. The present invention will allow for robotic installation hence reducing human interaction considerably. The objective of the invention is obtained with a cable protection device according to the accompanying claims.

Thus the present invention provides cable protection, including a channel for at

least one cable extending along the length of the device in the direction of the pipe. The protecting device extends over a collar, sleeve or similar feature on a pipe or pipeline and may be produced in one single part. The feature extends along the length of the pipe and has a first and second end surface protruding outside the collar outer surface.

The cable protecting device or clamp according to the invention is longer than the feature and defines a recess in the clamp for enclosing the outer surface and ends of the feature, where the device has engagement means adapted to engage in said features in opposite directions , preferably wedge shaped for engaging between a collar and a pipe or by applying a force towards said feature ends.

The present invention will be described below with reference to the accompanying drawings, illustrating the invention by way of example.

Figure 1 illustrates an embodiment of the invention as seen from above.

Figure 2 illustrates a cross section of the embodiment illustrated in figure 1.

Figure 3 illustrates an alternative embodiment of the invention.

Figure 4 illustrates the mounting of a device as illustrated in figure 3

In figure 1 the protection device or clamp 10 according to the invention is illustrated being mounted in a collar 13 along a pipe 12. A cable 11 passes under a channel in the device and is thus protected over the collar 13.

The device 10 is made in one piece with a middle portion in the direction of the pipe having two spring sections 4 and connection points 1,2 for coupling to a mounting tool. The mounting tool may be of any type suitable for applying a force on the device by stretching the device in the longitudinal direction before positioning onto the collar 13.

This is illustrated in figure 2 where the device has engaging means 5,6 that

engaging into the collar 13 ends when the mounting tool has released the stretch on the device. The engaging means may be wedge shaped or similar being capable of engaging into corresponding recess in the collar ends or into a space between the collar and pipe, or the spring force from the spring sections may simply provide and maintain a sufficient grip on the collar ends to keep the device in place when the force on the spring section is released.

In the illustrated embodiment the spring sections are symmetrically positioned on both sides of the channel containing the cable 11, and in order for the device to expand in the longitudinal direction the channel is provided with an interruption or opening 3 that allows the first and second end of the channel to move in relation to each other.

Other solutions are also possible, e.g. with a spring section extending over the middle part of the device and also covering the cable channel.

Although a collar is shown and discussed here it is clear that the device may be clamped onto any feature along a pipe having corresponding end parts that can provide a grip for the engaging means.

This way the present invention simplifies casting/machining and installation of a cable protection device considerably. It will consist of one part only. The part may be cast in an initial raw state. Various heat treatments may be applied to the clamp (or parts thereof) to achieve desired mechanical properties. This may be for example elasticity or hardness changes.

After casting and, if necessary de-burring and surface finish the clamp may be further improved by machining of lip shaped engaging means 5,6 to grip on the collar to desired tolerance. The center part of the clamp need to be cut 3 to allow for independent movement of the end pieces. Necessary holes or recesses 1, 2 or other suitable connection parts need to be made at both ends of the device to allow for a mounting/dismounting tool to be attached.

Hence the clamp 10 is mounted on an installation tool (not shown) via recess/holes 1,2 and the tool will be designed to elongate the clamp sufficiently for the lip shaped engaging means 5,6 to be further apart than the length of the collar to fit the clamp to.

In mounting, the cable or cables to be protected is placed in a channel between the clamp and the collar, and the clamp is pushed towards the collar. Still holding the clamp and cable towards the collar the mounting tool releases the grip allowing the clamp to firmly engage the lips against the space between the collar and the pipe.

The holes/recesses 1,2 may be designed such that the mounting tool may be used to verify that the clamp is firmly gripping prior to releasing the mounting tool from the clamp.

Figures 3 and 4 illustrates an alternative way of mounting the device 10 using a mounting tool 20 that engages into the connection parts 1,2 and bends it backward in order to opening the recess so as to fit onto the collar 13, the spring force providing a grip against the collar ends or forcing the engaging means in between the collar and pipe or possibly into structures in the collar ends.

A further alternative method of mounting the device is by applying a radial force, pushing the cable protecting device hard against the collar. Having slightly sloped corner at clamp and/or collar will then force the cable protector to stretch or bend at the flexible section, allowing the clamp to be pushed in place and then be locked in place by a grip against the collar ends or by forcing the engaging means in between the collar and pipe. In this latter design, it will be apparent that the couplings points (1,2) will not be required or may be constituted by grips for a the mounting tool for holding the device.

To summarize, the present invention relates to a cable protecting device for protecting cables or other equipment extending over a feature, such as a collar covering a pipe connection, on a pipe surface. The feature having a known

length outside said pipeline circumference and having a first and second end surface. The cable protecting device having a length in the direction of the pipeline being longer than the said feature, and comprises a channel for enclosing the cable(s) to be protected and a recess in the inner surface adapted for containing at least a part of the feature and the features first and second end surfaces, the ends of said device at least partially covering the corresponding parts of the feature ends.

The length of the recess corresponds essentially to the length of the feature, each end of said recesses being provided with engaging means adapted to engage with the corresponding end surfaces of the feature thus fixing the protecting device to the feature. The protecting device according to the invention is made in one piece, including a flexible spring section in the section extending over the recess, between the first and second ends of the device. The spring section may allow extension of the device length and/or bending the device as well as a force or grip against the feature end surfaces 5,6.

The device according to the invention may include at least one coupling point 1,2 on each side of the spring section for a mounting tool forcing the device ends away from each other .

The spring section may be adapted to be forced by the mounting tool in the direction along the pipe direction, thus forcing the end parts away from each other and, when the mounting tool release the spring the engaging means engaging into the feature ends. Alternatively the spring section is adapted to be bent by the mounting tool in a direction away from the pipe, thus engaging into the collar when the force is released. Or in a further alternative design, the clamp is forced to bend or stretch by applying a force in the radial direction.

The spring part may be adapted to provide a force through the engaging means to the feature or collar ends, or at least one of said engaging means 4 is adapted to engage into the interface zone between the collar 2 and the pipe 1, for example by proving wedge shaped engaging ends to the engaging means 4.

The spring section or sections may have different shapes such as one spring section on each side of the channel in the longitudinal direction, where the channel is provided with an interruption with a chosen length so as to allow movements between the first and second ends of the device. Alternatively the spring section may extend over the width of the device.

The cable channel extending along the device length for holding the cable may have a serrated surface or other suitable patterns to enable the device to grip the cable thus preventing movement of cable relative to pipe.

In a similar manner the contact surface between the device 10 and the pipe 12 and/or collar 13, may have a serrated surface or other suitable pattern to increase surface friction to prevent rotational movement of the Cable protecting device 10 relative to the pipe 12 or collar 13.

Claims

1. Cable protecting device (10) for protecting cables (11) extending over a feature (13) on a pipe (12) surface, said feature (13) having a known length outside said pipe circumference and having a first and second end surface, the cable protecting device (10) having a length in the direction of the pipe(12) being longer than the said feature (13), and comprising a channel for enclosing the cable (11) to be protected and a recess in the inner surface adapted for containing at least a part of the feature (13) and the features first and second end surfaces, the ends of said protecting device (10) at least partially covering the corresponding parts of the feature (13) ends,

wherein the length of the recess corresponds essentially to the length of the feature (13), each end of said recess being provided with engaging means (5,6) adapted to engage with the corresponding end surfaces of the feature(13), thus fixing the cable protecting device (10) to the feature (13), and

c h a r a c t e r i s e d i n that the cable protecting device (10) is made in one piece, including a flexible spring section (4) in the section extending over the recess, between the first and second ends of the cable protecting device (10).

2, Cable protecting device (10) according to claim 1, including at least one coupling point (1,2) on each side of the spring section(4) for a mounting tool (20) forcing the cable protecting device (10) ends away from each other .

3, Cable protecting device (10) according to claim 2, wherein the spring section (4) is adapted to be forced by the mounting tool (20) in the

direction along the pipe direction..

4, Cable protecting device (10) according to claim 2, wherein the spring section (4) is adapted to be bent by the mounting tool (20) in a direction away from the pipe, thus engaging into the collar (13) when the force is released.

5. Cable protecting device (10) according to claim 1, wherein at least one of said engaging means (4) is adapted to engage into the interface zone between the collar (2) and the pipe (1).

6. Cable protecting device (10) according to claim 5, wherein the engaging end of the engaging means (5,6) is wedge shaped.

7. Cable protecting device (10) according to claim 1, including one spring section (4) on each side of the channel in the longitudinal direction, the channel being provided with an interruption (3) with a chosen length so as to allow movements between the first and second ends of the device.

8. Cable protecting device (10) according to claim 1, wherein the spring section (4) extends over the width of the cable protecting device (10).

9 Cable protecting device (10) according to claim 1, wherein the cable channel has serrated surface or other suitable patterns to enable the cable protecting device (10) to grip the cable (11) thus preventing movement of cable (11) relative to pipe (12).

10 Cable protecting device (10) according to claim 1, wherein the surface in contact with the pipe (12) or the collar (13) has a serrated surface or other suitable pattern to increase surface friction to prevent rotational movement of the Cable protecting device (10) relative to the pipe (12) or collar (13).

Krav

1. Kabelverninnretning (10) for å beskytte kabler (11) som strekker seg over en struktur (13) på overflaten av et rør (12), der strukturen (13) har en kjent lengde på utsiden av rørets omkrets og har en første og en andre endeflate, der kabelverninnretningen (10) har en lengde i retningen til røret (12) som er lenger enn strukturen (13), og omfatter en kanal for omslutting av kabelen (11) som skal beskyttes og en utsparing i den indre overflaten innrettet til å inneholde i det minste en del av strukturen (13) og strukturens første og andre endeflater, der endene av kabelverninnretningen (10) i det minste delvis dekker de tilsvarende delene av strukturens (13) ender,

   Der lengden til utsparingen i det vesentlige tilsvarer lengden på strukturen (13), der hver ende av utsparingen er forsynt med gripemidler (5,6) for å gå i inngrep med de tilsvarende endeflatene på strukturen (13), og dermed feste kabelverninnretningen (10) til strukturen (13), og

   k a r a k t e r i s e r t v e d at kabelverninnretningen (10) er laget i ett stykke, inkludert en fjærseksjon (4) i seksjonen som strekker seg over utsparingen, mellom de første og andre endene på kabelverninnretningen (10).

2. Kabelverninnretning (10) ifølge krav 1, omfattende minst et koblingspunkt (1,2) på hver side av fjærseksjonen (4) for et monteringsverktøy (20) som presser endene på kabelverninnretningen (10) fra hverandre.

3. Kabelverninnretning (10) ifølge krav 2, der fjærseksjonen (4) er innrettet til å presses av monteringsverktøyet (20) i retningen langs rørets retning.

4. Kabelverninnretning (10) ifølge krav 2, der fjærseksjonen (4) er innrettet til å bøyes av monteringsverktøyet (20) i en retning fra røret, og dermed gjøre inngrep i strukturen (13) når den slippes.

5. Kabelverninnretning (10) ifølge krav 1, der minst et av gripeinnretningene (5,6) er innrettet til å gripe inn i en overgangssone mellom strukturen (13) og røret (12).

6. Kabelverninnretning ifølge krav 5, der gripeenden på gripemidlene (5,6) er kileformet.

7. Kabelverninnretning (10) ifølge krav 1, omfattende minst en fjærseksjon (4) på hver side av kanalen i den langsgående retningen, der kanalen er forsynt med et avbrudd (3) med en bestemt lengde for å tillate bevegelser mellom første og andre ende av innretningen.

8. Kabelverninnretning (10) ifølge krav 1, der fjærseksjonen (4) strekker seg over hele bredden av kabelverninnretningen (10).

9. Kabelverninnretning (10) ifølge krav 1, der kabelkanalen har en taggete overflate eller tilsvarende mønster for å gjøre det mulig for kabelverninnretningen (10) å gripe kabelen (11) og dermed unngå bevegelser mellom kabelen (11) og røret (12).

10. Kabelverninnretning (10) ifølge krav 2, der overflaten i kontakt med røret (12) eller strukturen (13) har en taggete overflate eller annet passende mønster for å øke overflate friksjonen og unngå rotasjonsbevegelse mellom kabelverninnretningen (10) og røret (12) eller strukturen (13).

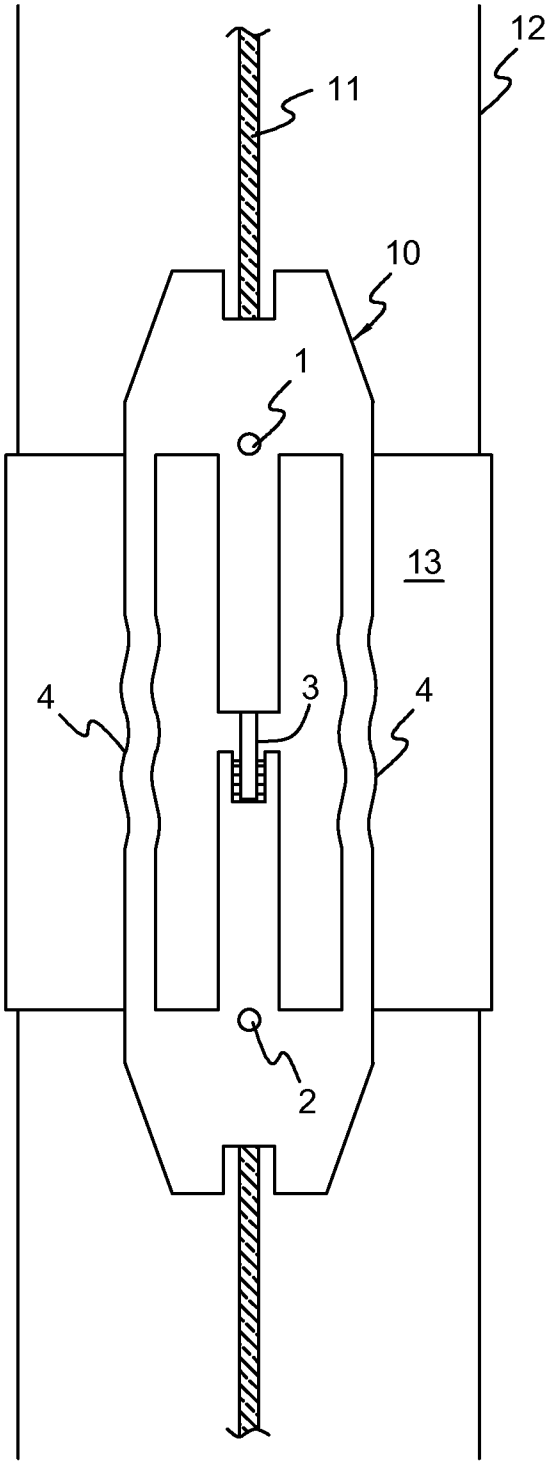


FIG. 1

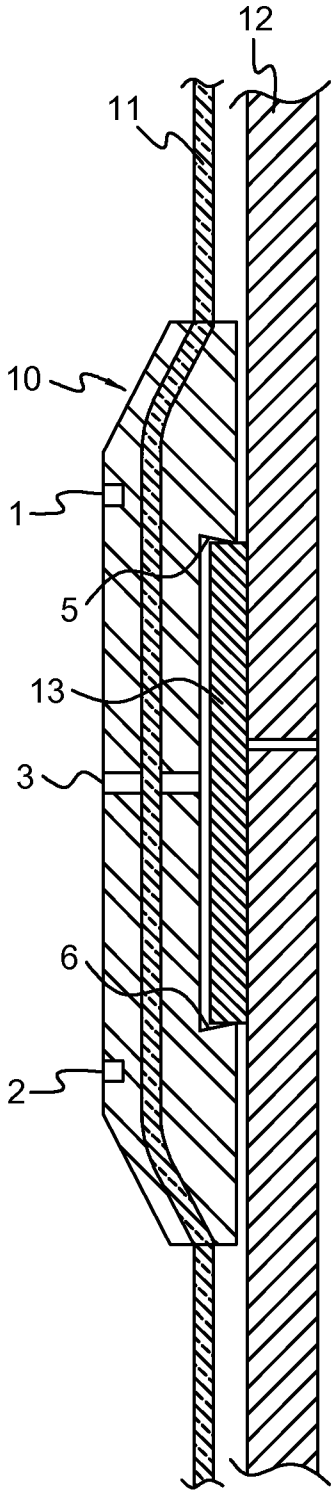


FIG. 2

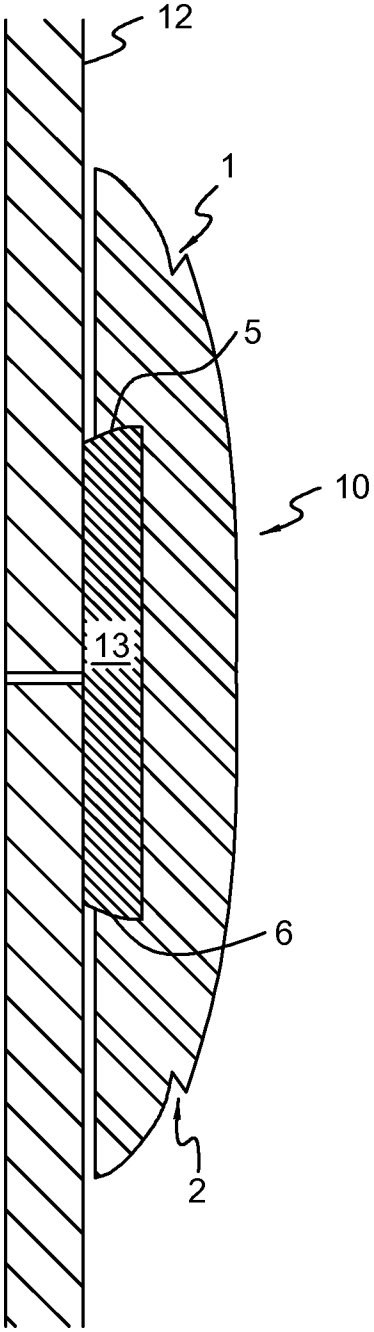


FIG. 3

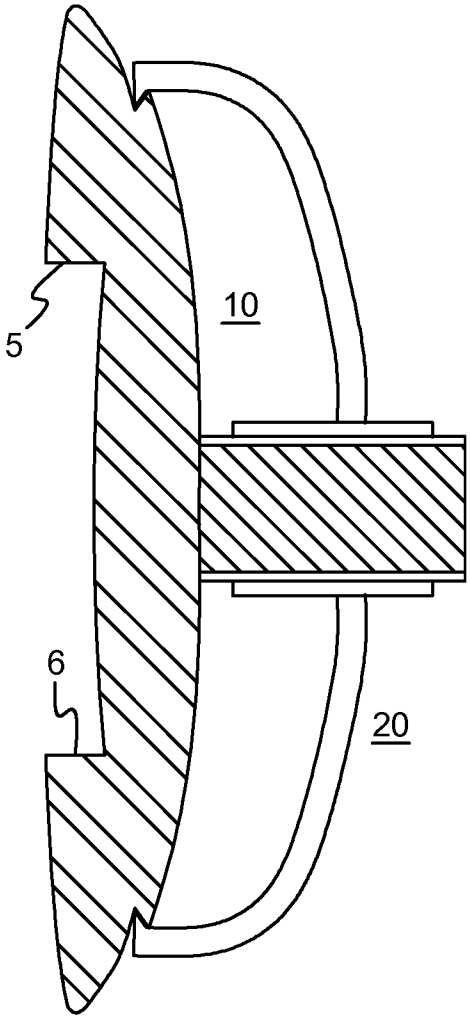


FIG. 4