Title of the Invention: **A control-lines protecting construct**

Abstract Title: **A control line protecting clamp**

The present invention relates to a control line protecting clamp 100 to be used for protecting wires running along tubing strings located in a wellbore of an oil well. The clamp 100 consists of a housing member 110 hinged to a strap members 120. The housing 110 has a conduit 130 formed longitudinally on the inner surface for enveloping control lines. An external, longitudinal, curved recess 150 is formed on the exterior of the housing 110 for engagement with another tube string 240 and prevent any damage caused by lateral movement of the tube strings. A second embodiment is described where the clamp housing has a geometrically shaped profile (650, fig. 9) for interlocking with another clamp having the same profile (650a, fig. 9).
A CONTROL-LINES PROTECTING CONSTRUCT

Field Of Invention
The present invention relates to a construct for protecting control lines or wires disposed in a wellbore together with tubing strings in oil harvesting. More specifically, the disclosed invention equipped with features to interlock two parallel arranged tubing string in dual tubings installation and is capable of reducing likelihood of being damaged due to lateral movement of the tubing strings.

Background Of The Invention
To harvest petroleum from its reservoirs, a through passage or wellbore defined by longitudinal metal casing normally extends from the ground surface deep into the oil bearing zone and tubing strings are positioned within the metal casing for oil extraction using mechanical pumps or natural flow. The tubing string is built by joining a plurality of elongate tubes in an end to end fashion through a coupling member which results local increase in diameter of the tubing string. Generally, the tubing string requires installation of valves, monitoring devices and/or submersible pumps in the wellbore to manage its operation of oil extraction that control lines have to run down into the wellbore from the surface alongside with the tubing string to control these valves, monitoring devices and/or pumps. Positioned inside the confined wellbore, movement of the tubing string tends to inflict crushing and abrasion damage towards the control-line leading to dysfunction of the well, particularly when the control lines are trapped between the surface of the metal casing and the coupling. The condition can be significantly worsened with two tubing strings running parallel in a similar wellbore. Thus, protectors are devised to safe guard the control line shielding it from being severed by the tubing strings. Apart from protection, the control lines protector also offers local support for the weight of the control lines to avoid excessive slackness. Particularly, these protectors adapt the form of clamping device to mount around the coupling that one or more channels are defined within the protectors to position the control lines For example, United States patent application no. 4601334 discloses a control line protector comprising flexible straps having an axially-directed channel to receive and protect the control lines. The clamping
engagement of the flexible straps is regulated through trunnions. Another disclosure on control lines protector can be found in International patent publication no. 9411609 with improved locking mechanism which is robust and convenient for assembly in various condition. Neff describes another type of protector in United States patent application no. 6023027. Whilst solution to avoid damaged control lines can be provided from the mentioned prior arts, the use of these protectors presents some significant flaws on its own. Particularly, breakage of the protectors inside the wellbore is common owing to occasional lateral movement of the tubing string inside the metal casing. Considering the overall length of the tubing string and the weight of other protectors mounted on the string, knocking the protectors onto the inner surface of the metal casing due to lateral movement creates significant momentum which is sometimes sufficient to break the protectors. Not only the broken protectors needs to be replaced incurring additional operation cost, the broken pieces can somehow block the wellbore to end up in disrupting the operation of the oil extraction especially in a condition where two tubing strings are running parallel in the wellbore. Consequently, it is much desired to have protector featuring improved design to reduce the likelihood of protector breakage especially inflicted by lateral movement of the tubing strings.

Summary Of The Invention

One of the objects of the present invention is to provide a protective construct for guarding control lines coupled to tubing strings in a wellbore for harvesting petroleum.

Another object of the present invention is to provide a protective construct to be used in wellbore operating using two tubing strings. More specifically, the disclosed construct is equipped with unique feature to interlock the parallel running tubing strings within the metal casing without suffering from dislocation upon subjected to laterally applied force and at the same time allow the coupling to pass through or move in relative to the protector axially.

Further object of the present is to provide a structurally strong control lines protecting construct (100) used for dual tubing strings that the construct is made of cast steel.
Still another object of the present invention is to offer control lines protective construct for dual tubing strings that the disclosed construct is capable to translate lateral movement of the tubing strings into a rotational movement therefore greatly reduces likelihood of construct breakage.

At least one of the preceding objects is met, in whole or in part, by the present invention, in which one of the embodiments of the present invention is a control-lines protecting construct for mounting around a coupling on a first tubing string in a metal casing of an oil wellbore comprising a housing member; a strap member hingably joined to the housing member and pivotally moveable in relative to the housing member in a locked or an open position that the housing member and the strap member encircle the first tubing string enclosing the coupling within a substantially tubular structure provided in the locked position; and a conduit formed longitudinally on the inner surface of the housing member by the housing member, peripheries of the coupling and peripheries of the first tubing string upon encircling the first tubing string, wherein one or more control lines are allowed to be arranged within the conduit; characterized in that the external surface of the housing member is fabricated to bear a longitudinally extending concave curvature which is sized to allow a second tubing string to be positioned in parallel with the first tubing string inside the curvature and able to translate any lateral movement of the first and/or second tubing strings into a rotational movement within the metal casing. Preferably, the curvature has a circumferential extent of 50° to 90° in order to securely hold the second tubing string in place.

In further aspect, the control-lines protecting construct may comprise a secondary conduit for lining of a secondary wire formed longitudinally on the inner surface of the housing member by the housing member and optionally together with the peripheries of the coupling and the peripheries of the first tubing string in the locked position.
In further aspect, the curvature is configured to avoid dislocation of the second tubing string from the curvature within the metal casing.

Still, in another aspect, the inner surface of the housing member is fabricated with a recess to accommodate the coupling.

Preferably, in another embodiment, the control-lines protecting construct for mounting around a coupling of a first tubing string in a metal casing of an oil wellbore may comprise a housing member; a strap member hingably joined to the housing member and pivotally moveable in relative to the housing member in a locked or an open position that the housing member and the strap member encircle the first tubing string enclosing the coupling within a substantially tubular structure provided in the locked position; and a conduit formed longitudinally on the inner surface of the housing member by the housing member, peripheries of the coupling and peripheries of the first tubing string upon encircling the first tubing string; wherein one or more control lines are allowed to be arranged within the conduit; characterized in that the construct is sized and fabricated with a geometrical profile on the external surface of the housing member that longitudinally mating the geometrical profile of the construct with a compatible geometrical profile born on another substantially identical construct mounted on a second tubing string in the oil wellbore allows the mated constructs to interlock one another within the metal casing without dislocation when subjected to a lateral force, and the interlocked constructs are able to translate any lateral movement of the first and/or second tubing strings into a rotational movement within the metal casing.

**Brief Description Of The Drawings**

Figure 1  shows top view of one embodiment of the present invention;

Figure 2  shows back perspective view of the embodiment shown in figure 1;

Figure 3  shows front perspective view of the embodiment shown in figure 1;
Figure 4 shows side view of the embodiment shown in figure 1;

Figure 5 shows top view of the embodiment shown in figure 1 engaging a second tubing string in the metal casing of wellbore;

Figure 6 shows top view of another embodiment of the disclosed construct equipped with a geometrical profile which allows interlocking onto another substantially identical construct bearing a corresponding geometrical profile;

Figure 7 shows back perspective view of the embodiment shown in figure 6;

Figure 8 shows front perspective view of the embodiment shown in figure 6; and

Figure 9 is a top view of two interlocked constructs shown in figure 6 within the metal casing of wellbore.

**Detailed Description Of The Invention**

It is to be understood that the present invention may be embodied in other specific forms and is not limited to the sole embodiment described herein. However modification and equivalents of the disclosed concepts such as those which readily occur to one skilled in the art are intended to be included within the scope of the claims which are appended thereto.

The present invention discloses a control-lines protecting construct (100), as illustrated in figure 1 and 5, for mounting around a coupling (210) on a first tubing string (220) in a metal casing (230) of an oil wellbore comprising a housing member (110); a strap member (120) hingably joined to the housing member (110) and pivotally moveable in relative to the housing member (110) in a locked or an open position that the housing member (110) and the strap member (120) encircle the first tubing string (220) enclosing the coupling (210) within a substantially tubular
structure provided in the locked position; a conduit (130) formed longitudinally on the
inner surface (112) of the housing member (110) by the housing member (110),
peripheries of the coupling (210) and peripheries of the first tubing string (220) upon
encircling the first tubing string (220); wherein one or more control lines are allowed
to be arranged within the conduit (130); characterized in that the external surface
(111) of the housing member (110) is fabricated to bear a longitudinally extending
concave curvature (150) which is sized to allow a second tubing string (240) to be
positioned in parallel with the first tubing string (220) inside the curvature (150) and
able to translate any lateral movement of the first (220) and/or second tubing string
(240)s into a rotational movement within the metal casing (230). It is important to be
noted that the second tubing string (240) to be mounted in this embodiment of the
construct (100) is preferably free of parallel control lines and the curvature (150)
available on the housing member (110) is able to hold and secure such tubing string in
the metal casing (230) without having the second tubing string (240) dislocated from
the curvature (150). Preferably, the disclosed embodiment is a single construct (100)
system applicable for a dual tubing strings in a single wellbore.

Preferably, the housing member (110) has a generally arched configuration so that the
inner surface (112) can mate with the peripheries of the first tubing string (220) for
encircling the first tubing string (220). A longitudinal part of the housing member
(110) slightly sets back from the rest of the housing member (110) forming a recess
section (115). The recess section (115) contains void area (116) spacing in between
the inner surface (112) of the housing member (110) and the first tubing string (220)
as well as the coupling (210) mounted on the first tubing string (220) once the first
tubing string (220) is enclosed by the construct (100). The void area (116) available in
the recess section (115) defined by the inner surface (112) the housing member (110)
and peripheries of the tubing string (220) together with the coupling (210) forms the
conduit (130) for arranging the control lines and shielding the control line from being
severed by the first (220) and/or second tubing strings (240). Moreover, at least one
longitudinal extending rib (140) may be located in the conduit (130) in one of the
embodiments. Specifically, a pair of longitudinal ribs (140) may be disposed at the
recess section (115) around the longitudinal ends of the housing member (110)
respectively in one embodiment to further compartmentalize the conduit (130) as shown in figure 1, 3 and 5. These ribs (140) guide and align different control line entering and exiting the conduit (130) according to a predetermined fashion. The ribs (140) also free the control lines from entanglement due to occasional movement of the control lines at the ground surface. Nevertheless, other embodiment of the disclosed construct (100) may further include a secondary conduit (130) for lining of a secondary wire formed longitudinally on the inner surface (112) of the housing member (110) by the housing member (110) and optionally together with the peripheries of the coupling (210) and the peripheries of the first tubing string (220) in the locked position.

The rest of the parts of the housing member (110) are integrally stretching out in an arched way from the sides of the recess section (115) developing into two other different sections namely a hinge section (117) and a locking section (113). The vertical edge of the housing member (110) at the hinge section (117) provides an anchorage point for the strap member (120) to hingably attach onto the housing member (110), while the vertical edge the locking section (113) carries a locking mechanism to allow the strap member (120) to detachably fasten onto the housing member (110) to form a substantial tubular structure as described in the foregoing. As illustrated in figure 3, in one embodiment, the hinge section (117) is constituted of an upper part (118a) and a lower part (118b) archly extending out from the side of the recess section (115) horizontally. Each part is composed of two hollow cylinder barrels spaced apart by a gap in between that the strap member (120) possesses corresponding hollow cylinder barrel to fit into the gap and can be joined to the cylinder barrels on the housing member (110) by inserting a rod through aperture found on the hollow (180) cylinder barrel to collectively form a barrel hinge (197). The formed barrel hinges (197) at the upper and lower part s realize pivot movement of the strap member (120) in relative to the housing member (110) in the open or locked position. Nevertheless, one skilled in the art shall appreciate the fact that there are various ways to facilitate pivot movement between the housing (110) and strap members (120) and such modification shall not depart from the scope of the present invention. Still, in one embodiment, the housing member (110) and the strap member
(120) respectively bear a compatible locking mechanism to secure the strap member 
(120) onto the housing member (110). Preferably, fastening of the strap member (120) 
on the housing member (110) can be achieved using bolts (190). More specifically, 
the vertical edge of the housing member (110) at the locking section (113) and the 
non-hinged free vertical edge of the strap member (120) each at least carries a pair of 
corresponding threaded holes where both members can be joined together by 
threading bolts (190) through the threaded holes (191) on both members. To reduce 
unnecessary weight and manufacturing cost of the disclosed construct (100), parts of 
the housing member (110) are made to be hollow (180) as illustrated in figure 4. 
Specifically, the hollow (180) is defined within the locking section (113) dividing the 
locking section (113) into two separated portions, an upper portion (114a) and a lower 
portion (114b). Each of these portions bears a threaded holes (191) to accommodate 
the bolt (190) to secure the strap member (120). Further, a longitudinal extending strut 
(181) connects the upper (114a) and lower portions (114b) as well as offers additional 
mechanical strength to these portions (114) to sustain vertically applied compressive 
force.

Referring to figure 3, the strap member (120) consists of an upper (121) and a lower 
arched arms (126) having void area (129) presented in between the bottom edge of the 
upper arm (121) and the top edge of the lower arm (126). Each arm (121 or 126) has 
one side end hinged to the hinge section (117) of the housing member (110) and 
another side end readily to secure onto the locking section (113) of the housing 
member (110) to collectively form a substantial tubular structure together with the 
housing member (110). The side end of the arms (121 and 126) to be detachably 
locked onto the locking section (113) contains the locking mechanism compatible to 
the one disposed on the locking section (113), preferably horizontally directed 
threaded holes. Accordingly, each arm (121 and 126) of the strap member (120) can 
pivotaly move independently from one another. Yet, in another embodiment, both 
arms (121 and 126) form an integral piece particularly being joined together through a 
strut longitudinally adjacent to one of the side edges adopting a substantially C- 
shaped or an inverted C-shaped piece. It is important to be noted that it is possible to 
shape the strap member (120) as a single stretch piece without having any void area.
Nonetheless, such design is less preferred considering significant increase in material cost and dead load to the disclosed construct (100) with only minor improvement in mechanical integrity.

As in the foregoing, the disclosed construct (100) is fabricated to have a longitudinal curvature (150) on the external surface (111) of the housing member (110). The curvature (150) serves as a platform to hold the second tubing string (240) in place, more preferably securing the second tubing string (240) at a prefixed location in relative to the first tubing string (220) avoiding the likelihood of the first (220) and second tubing strings (240) knocking onto one another, when subjected to lateral-oriented force, which may lead to breakage of the protective construct (100). In the preferred embodiment, the disclosed construct (100) positions the curvature (150) around the locking section (113) adjacent to the recess section (115) as shown in figure 2 and 4 that the part of the curvature (150) may intersect with the hollow (180) defined within the locking section (113). The curvature (150) made available at the upper (114a) and lower portions (114b) of the locking section (113) forms a C-shaped grip, as illustrated in figure 5, to hold the second tubing string (240) particularly at the two longitudinal edges of the curvature (150). To sufficiently hold the second tubing string (240), the curvature (150) made on the construct (100) preferably has a circumferential extent of 50° to 90°. The circumferential extent of the curvature (150) largely depends on the depth of the curvature (150) carved into the housing member (110). Despite the circumferential extent and the location of the curvature (150) plays an important role in determining functionality of the disclosed invention, size of the disclosed construct (100) is important as well. Preferably, joint diameter of the disclosed construct (100) enclosing the first tubing string (220) and the parallel juxtaposed second tubing string (240) is equal to or slightly smaller than the inner diameter of the metal casing (230). In the case where the joint diameter is much shorter than the inner diameter of the metal casing (230), the disclosed construct (100) fails to retain the second tubing string (240) in the curvature (150) once subjected to lateral force nor it is able to translate the lateral force to rotational force because presence of sufficient room in the metal casing (230) to set the second tubing loose. With adequate length in the joint diameter, the curvature (150) in the disclosed
construct (100) is configured to avoid dislocation of the second tubing string (240) from the curvature (150) within the metal casing (230) when at least one of the tubing strings (220 or 240) is pushed by lateral force.

Apart from the rotational movement, the disclosed construct (100) holding the second tubing string (240) also allows the parallel-juxtaposed first (220) and second tubing string (240) to move upward or downward in relative to one another. Though the disclosed construct (100) is designed to limit the lateral movement of the parallel running tubing strings (220 and 240) while holding the second tubing (240) in the provided curvature (150), small spaces do exist in between the curvature (150) and the held second tubing string (240) to favor vertical axis movement of the first (220) and/or second tubing string (240) in relative to one another without creating much hindrance and friction. Thus, the tubing strings (220 and 240) have the full latitude to move in the vertical axis.

Pursuant to another preferred embodiment which is able to accommodate dual tubing strings each having distinct control lines running along, the disclosed construct (600) is adaptably modified to replace the curvature (150) with a geometrical profile (650) imparting the construct (600) with the capability to interlock with a substantially identical construct (600) carrying identical geometrical profile (650) once both constructs (600 and 600a) are juxtaposed in the wellbore. The disclosed embodiment, as shown in figure 6 to 9, is a dual constructs (600) system which two constructs (600) bearing the identical geometrical profile (650) mate and interlock one another in the metal casing (730). Preferably, the disclosed control-lines protecting construct (600) for mounting around a coupling (710) of a first tubing string (720) in a metal casing (730) of an oil wellbore comprising a housing member (110); a strap member (620) hangably joined to the housing member (610) and pivotally moveable in relative to the housing member (610) in a locked or an open position that the housing member (610) and the strap member (620) encircle the first tubing string (720) enclosing the coupling (710) within a substantially tubular structure provided in the locked position; a conduit (630) formed longitudinally on the inner surface (112) of the housing member (610), peripheries of the coupling (710) and
peripheries of the first tubing string (720) upon encircling the first tubing string (720); wherein one or more control lines are allowed to be arranged within the conduit (630); characterized in that the construct (600) is sized and fabricated with a geometrical profile (650) on the external surface (611) of the housing member (610) that longitudinally mating the geometrical profile (650) of the construct (600) with a compatible geometrical profile (650) born on another substantially identical construct (600) mounted on a second tubing string (740) in the oil wellbore allows the mated constructs (600 and 600a) to interlock one another within the metal casing (730) without dislocation when subjected to a lateral force, and the interlocked constructs (600 and 600a) are able to translate any lateral movement of the first (720) and/or second tubing strings (740) into a rotational movement within the metal casing (730).

Preferably, the basic structure of the disclosed construct (700) utilized in the dual constructs system is substantially similar to the described construct (100) in the single construct system except bearing the geometrical profile (650). Referring to figure 8, the strap member (620) consists of an upper (621) and a lower arched arms (626) having a stretch of void area (629) presented in between. Each arm (621 or 626) has one side end hinged to the hinge section (617) of the housing member (610) and another side end readily to secure onto the locking section (613) of the housing member (610) to collectively form a substantial tubular structure together with the housing member (610). The side end of the arm to be detachably locked onto the locking section (613) contains the locking mechanism compatible to the one disposed on the locking section (613), preferably horizontally directed threaded holes (691). Preferably, each arm (621 or 626) of the strap member (620) can pivotally move independently from one another. Yet, in another embodiment, both arms (621 and 626) form an integral piece particularly being joined together through a strut (181) longitudinally adjacent to one of the side edges adopting a substantially C-shaped or an inverted C-shaped piece. It is important to be noted that it is possible to shape the strap member (120) as a single stretch piece without having any void area (116).

Likewise, the housing member (610) is also a generally arched configuration having a longitudinal part of the housing member (610) slightly sets back from the rest of the
housing member (610) to form a recess section (615). The recess section (615) contains void area (616) spaced in between the inner surface (612) of the housing member (610) and the first (720) tubing string as well as the coupling (710) mounted on the tubing string (720) once the tubing string is enclosed by the construct (100). The void area (616) available in the recess section (615) defined by the inner surface (612) the housing member (610) and peripheries of the tubing string (720) together with the coupling (710) forms the conduit (630) for arranging the control lines and shielding the control line from being severed by the first (720) and/or second tubing strings (740). Moreover, at least one longitudinal ribs (640) may be disposed at the recess section (615) around the longitudinal ends of the housing member (710) respectively in one embodiment to further compartmentalize the conduit (630) as shown in figure 6 and 9. These ribs (640) guide and align different control line entering and exiting the conduit (630) according to a predetermined fashion. The ribs (640) also free the control lines from entanglement due to occasional movement of the control lines at the ground surface. Nevertheless, other embodiment of the disclosed construct (600) may further include a secondary conduit for lining of a secondary wire formed longitudinally on the inner surface (612) of the housing member (610) by the housing member (610) and optionally together with the peripheries of the coupling (710) and the peripheries of the first tubing string (720) in the locked position.

The rest of the parts of the housing member (710) are integrally stretching out as an arc structure from the sides of the recess section (615) developing into two other different sections namely a hinge section (617) and a locking section (613). The vertical edge of the housing member (610) at the hinge section (617) provides an anchorage point for the strap member (620) to hingably attach onto the housing member (610), while the vertical edge the locking section (613) carries a locking mechanism to allow the strap member (620) to detachably fasten onto the housing member (610) to form a substantial tubular structure as described in the foregoing. As illustrated in figure 7 and 8, in one embodiment, the hinge section (617) is constituted of an upper part (618a) and a lower part (618b) archly extending out from the side of the recess section (615) horizontally. These parts (618a and 618b) respectively engages with an upper (628a) and lower hollow cylinder barrel (628b) found on one
side edge of the strap member (620) using a rod to form an upper and a lower barrel hinge (697). The formed barrel hinges (697) at the upper (628a) and lower parts (628b) realize pivot movement of the strap member (620) in relative to the housing member (610) in the open or locked position. Still, in one embodiment, the housing member (610) and the strap member (620) respectively bear a compatible locking mechanism to secure the strap member (620) onto the housing member (610). Preferably, fastening of the strap member (620) onto the housing member (610) can be achieved using bolts (690). More specifically, the vertical edge of the housing member (610) at the locking section (613) and the non-hinged free vertical edge of the strap member (620) each at least carries a pair of corresponding horizontal-orientated threaded holes where both members (610 and 620) can be joined together by threading bolts (690) through the threaded holes on both members. To reduce unnecessary weight and manufacturing cost of the disclosed construct (600), parts of the housing member (610) are made to be hollow (680) as illustrated in figure 7.

Specifically, the hollow (680) is defined within the locking section (613) dividing the locking section (613) into two separated portions, an upper portion (614a) and a lower portion (614b). Each of these portions bears a threaded holes (691) to accommodate the bolt (690) to secure the strap member (620). Further, a longitudinal extending strut (681) connects the upper and lower portions as well as offers additional mechanical strength to these portions to sustain vertically applied compressive force.

As in the setting forth, the geometrical profile (650) fabricated on the external surface (611) of the construct (600) equips the disclosed construct (600) with the capability to interlock onto a substantially identical construct (600a) carrying a compatible geometrical profile (650a) by mating the profiles (650 and 650a) within the metal casing (730) of the wellbore. It is important to be noted that the disclosed construct (600) can adapt geometrical profile (650) of various designs to attain the similar outcome. More preferably, the geometrical profile (650) used in the embodiment shown in figure 6 to 9 is a corrugated fold or plurality of corrugated folds. Referring to this embodiment, the geometrical profiles (650 and 650a) on both mating constructs (600 and 600a) are not only compatible but rather identical to facilitate the interlocking. Profile (650) with such design is more preferable given its convenience
to be used and manufactured. Yet, the compatible geometrical profiles (650 and 650a) are not necessarily identical. In one embodiment, the geometrical profile (650) is located, but not limited to, around the locking section (613) adjacent to the recess section (615) as shown in figure 7 and 8 that the part of the profile (650) may intersect with the hollow (680) define within the locking section (613). Despite the geometrical profile (650), size of the disclosed construct (600) is important as well. Preferably, joint diameter of the two mated constructs (600 and 600a) enclosing respectively the first and the second tubing string (240)s is substantially equal to or slightly smaller than the inner diameter of the metal casing (230). In the case where the joint diameter is much shorter than the inner diameter of the metal casing (730), the mated geometrical profiles (650 and 650a) fail to retain the interlocked constructs (600 and 600a) once subjected to lateral force nor it is able to translate the lateral force to rotational force because presence of sufficient room in the metal casing (730) to set the mated constructs (600 and 600a) to dislodge from the engagement. With adequate length in the joint diameter, the mated geometrical profiles on the two constructs (600 and 600a) are configured to avoid disengagement within the metal casing when at least one of the tubing strings (720 or 740) is pushed by lateral force. Further, the mated constructs (600 and 600a) are able to translate the lateral movement caused by a lateral force into a rotational movement by having arched peripheries matching the inner contour of the metal casing (730) forming the wellbore.

Apart from the rotational movement, the mated constructs (600 and 600a) also allows the parallel-juxtaposed first (720) and second tubing string (740) to move upward or downward in relative to one another. Though the disclosed construct (600) is designed to limit the lateral movement of the parallel running tubing strings (720 and 740) while realizing the interlocking feature, the mated constructs (600 and 600a) are not snugly fitted in the metal casing (730). Small spaces do exist in between the mated geometrical profile (650)s to favor vertical axis movement of the first (720) and/or second tubing string (740) in relative to one another without creating much hindrance and friction. This, the tubing strings (720 and 740) have the full latitude to move in the vertical axis upon mounting of the present disclosed construct (600).
The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.
1. A control lines protecting construct (100) for mounting around a coupling (210) on a first tubing string (220) in a metal casing (230) of an oil wellbore comprising a housing member (110); a strap member (120) hingably joined to the housing member (110) and pivotally moveable in relative to the housing member (110) in a locked or an open position that the housing member (110) and the strap member (120) encircle the first tubing string (220) enclosing the coupling (210) within a substantially tubular structure provided in the locked position; and a conduit (130) formed longitudinally on the inner surface (112) of the housing member (110) by the housing member (110), peripheries of the coupling (210) and peripheries of the first tubing string (220) upon encircling the first tubing string (220); wherein one or more control lines are allowed to be arranged within the conduit (130); characterized in that the external surface (111) of the housing member (110) is fabricated to bear a longitudinally extending concave curvature (150) which is sized to allow a second tubing string (240) to be positioned in parallel with the first tubing string (220) inside the curvature (150) and able to translate any lateral movement of the first (220) and/or second tubing strings (240) into a rotational movement within the metal casing (230).

2. A control lines protecting construct (100) of claim 1 further comprising a secondary conduit for lining of a secondary wire formed longitudinally on the inner surface (112) of the housing member (110) by the housing member (110) and optionally together with the peripheries of the coupling (210) and the peripheries of the first tubing string (220) in the locked position.

3. A control lines protecting construct (100) of claim 1 or 2 further comprising at least one longitudinal extending rib (140) located in the conduit (130).
4. A control lines protecting construct (100) of claim 1 or 2, wherein the curvature (150) is configured to avoid dislocation of the second tubing string (240) from the curvature (150) within the metal casing (230).

5. A control lines protecting construct (100) of claim 1 or 2, wherein the curvature (150) has a circumferential extent of $50^0$ to $90^0$.

6. A control lines protecting construct (100) of claim 1 or 2, wherein the housing member (110) and the strap member (120) respectively bear a compatible locking mechanism to secure the strap member (120) onto the housing member (110).

7. A control lines protecting construct (100) of claim 1 or 2, wherein the construct (100) enclosing the first tubing string (220) and the parallel juxtaposed second tubing string (240) have a joint diameter substantially equal to the inner diameter of the metal casing (230).

8. A control lines protecting construct (600) for mounting around a coupling (710) of a first tubing string (720) in a metal casing (730) of an oil wellbore comprising
   a housing member (610);
   a strap member (620) hingably joined to the housing member (610) and pivotally moveable in relative to the housing member (610) in a locked or an open position that the housing member (610) and the strap member (620) encircle the first tubing string (720) enclosing the coupling (710) within a substantially tubular structure provided in the locked position; and
   a conduit (630) formed longitudinally on the inner surface (612) of the housing member (610) by the housing member (610), peripheries of the coupling (710) and peripheries of the first tubing string (720) upon encircling the first tubing string (720); wherein one or more control lines are allowed to be arranged within the conduit (630);
characterized in that the construct (600) is sized and fabricated with a geometrical profile (650a) on the external surface (611) of the housing member (610) that longitudinally mating the geometrical profile (650a) of the construct (600) with a compatible geometrical profile (650b) born on another substantially identical construct (600b) mounted on a second tubing string (740) in the oil wellbore allows the mated constructs (600 and 600b) to interlock one another within the metal casing (730) without dislocation when subjected to a lateral force, and the interlocked constructs (600 and 600b) are able to translate any lateral movement of the first (720) and/or second tubing strings (740) into a rotational movement within the metal casing (730).

9. A control lines protecting construct (600) of claim 8 further comprising a secondary conduit for lining of a secondary wire formed longitudinally on the inner surface (612) of the housing member (610) by the housing member (610) and optionally together with the peripheries of the coupling (710) and the peripheries of the first tubing string (720) in the locked position.

10. A control lines protecting construct (600) of claim 8 further comprising at least one longitudinal extending rib (640) located in the conduit (630).

11. A control lines protecting construct (600) of claim 8, wherein the geometrical profile (650) is corrugated folds.

12. A control lines protecting construct (600) of claim 8, wherein the mated constructs (600 and 600b) enclosing the first (720) and the second tubing string (740) have a joint diameter substantially equal to the inner diameter of the metal casing (730).
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
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<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<tbody>
<tr>
<td>A</td>
<td>1 &amp; 8</td>
<td>US6023027 A (NEFF) Cable guard having a hinge rod and for protecting cables extending along a tubing string; fig 11.</td>
</tr>
<tr>
<td>A</td>
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<td>US7249637 A (WEATHERFORD LAMB) clamp for connecting a control line to a tubular string; fig 3</td>
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<tr>
<td>A</td>
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<td>GB2415932 A (SCHLUMBERGER) An injection moulded control line protector; fig 9</td>
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<tr>
<td>A</td>
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<td>WO93/20327 A (JORDAN) Clamp for mounting a cable or service line in spaced relationship to a tubing string used in producing a well; figs 1-6 &amp; 10-13</td>
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<tr>
<td>A</td>
<td>1 &amp; 8</td>
<td>US4601334 A (WEATHERFORD LAMB) Control line protector for oil well tubing string with hinged-together straps interconnected by screws for adjusting tension. Figs 3-5</td>
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Categories:

X  Document indicating lack of novelty or inventive step
Y  Document indicating lack of inventive step if combined with one or more other documents of same category.
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A  Document indicating technological background and/or state of the art.
P  Document published on or after the declared priority date but before the filing date of this invention.
E  Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:
Search of GB, EP, WO & US patent documents classified in the following areas of the IPC

E21B; F16L
The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

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