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Jackson et al.

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[54] **TUBING INJECTOR AND STUFFING BOX CONSTRUCTION**

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[52] **U.S. Cl.** **166/77**

[51] **Int. Cl.** **E21b 33/03**

[58] **Field of Search** 166/77

[56] **References Cited**

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[57] **ABSTRACT**

A tubing injector base and a tubing stripper are mounted on the top flange of a blowout preventer assembly at the top of a well. The tubing stripper comprises a longitudinally split housing and a removable stripper rubber.

6 Claims, 3 Drawing Figures

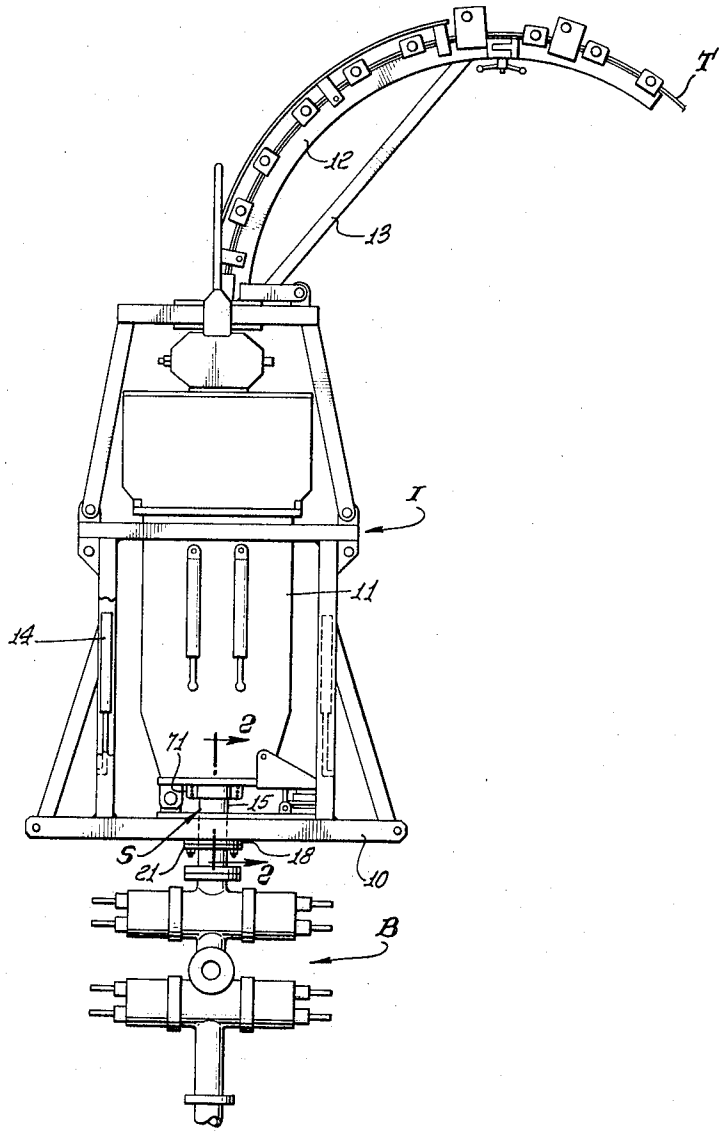


FIG. 1.

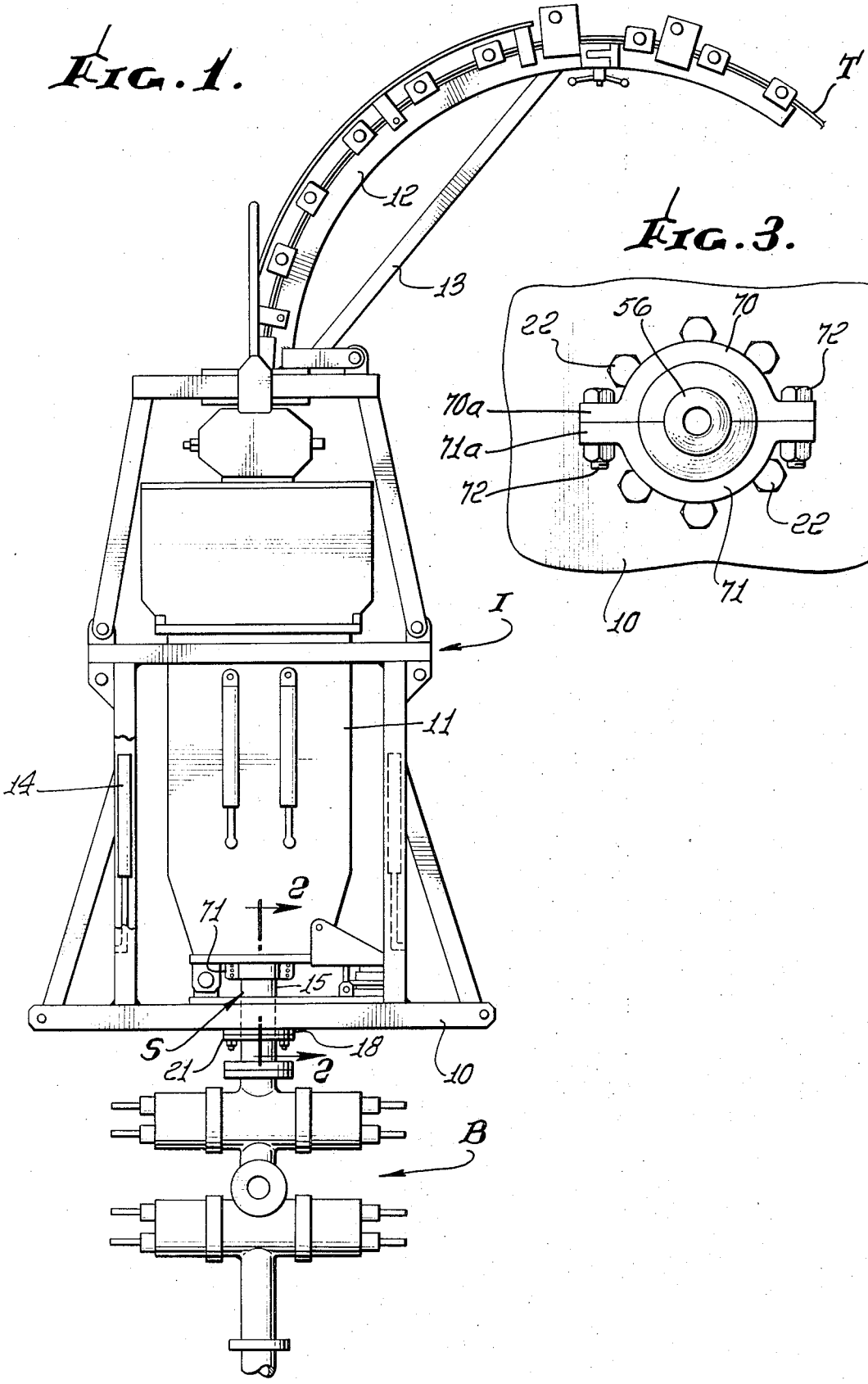


FIG. 3.

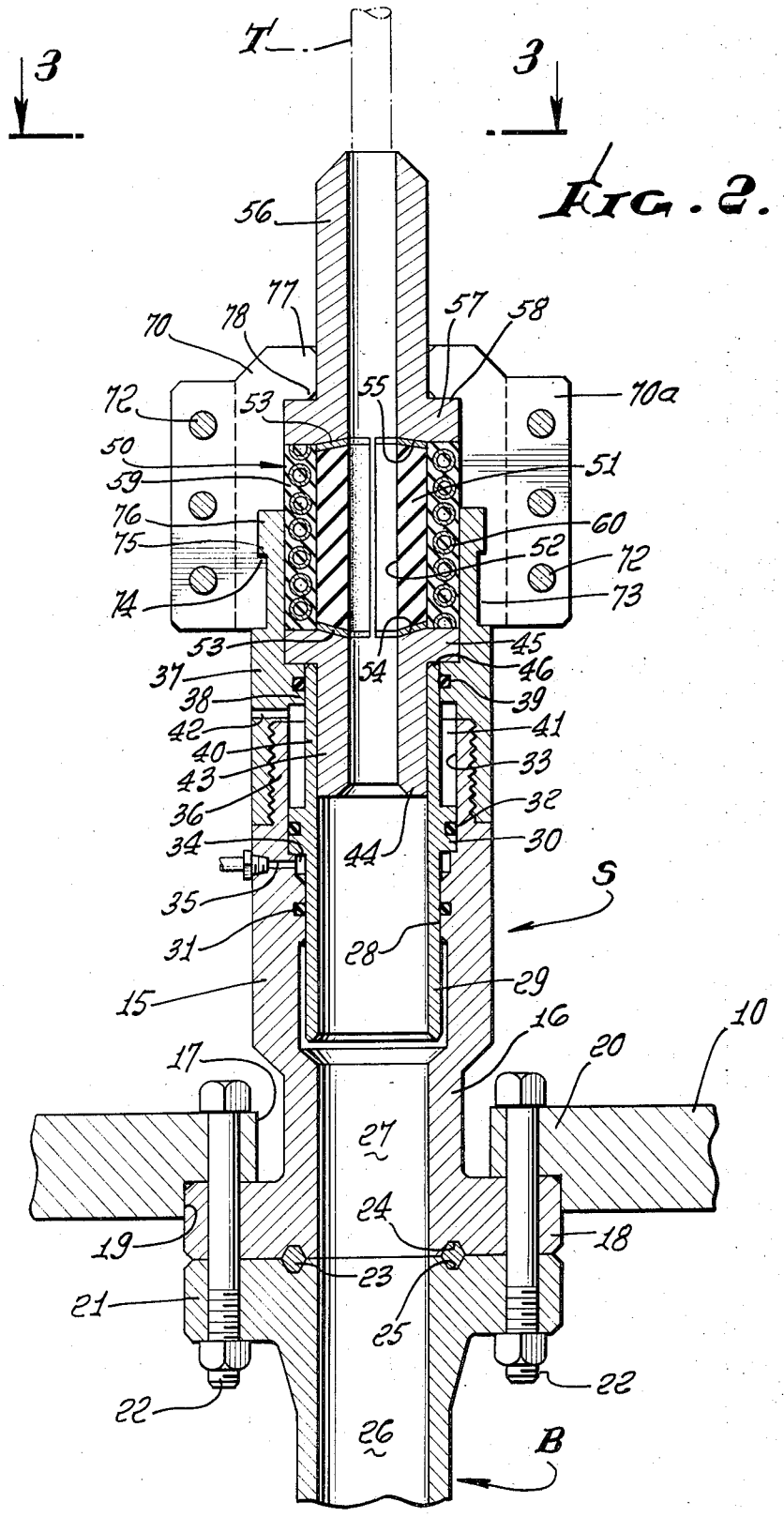

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FIG. 2.

TUBING INJECTOR AND STUFFING BOX CONSTRUCTION

BACKGROUND OF THE INVENTION

For various reasons, it may be desirable to inject and remove continuous lengths of conduit or tubing into and from a well through a blowout preventer. For example, it may be desirable to run or remove a length of tubing into or from a well bore for connection to or removal from subsurface apparatus operable by fluid pressure, such as a subsurface shutoff valve, subsurface well head equipment on offshore wells, or for other reasons.

An example of a tubing injector of the type here involved is illustrated on page 748 of the **1970–71** *COMPOSITE CATALOG OF OIL FIELD EQUIPMENT & SERVICES*. While the injector there shown is supported on legs, it is also known, for example, at offshore locations or platforms, the tubing injector unit may be supported on the tubing stuffing box, directly, instead of on legs, as shown in the catalog.

Such an installation of the tubing injector poses problems of stability or rigidity and, in addition, the tubing stuffing box is located beneath the tubing injector base or platform. When the tubing stripper rubbers are to be removed and replaced, the connection or assembly of the injector with the tubing stuffing box must be broken down. In such an assembly, moreover, sufficient height or space must usually be afforded to enable removal of the stripper rubber from the stuffing box assembly, which has, heretofore, involved unthreading a retainer nut from the injector assembly, thus requiring axial space for threading and unthreading the retainer nut and other stuffing box components.

SUMMARY OF THE INVENTION

The present invention has as an object the provision of a more rigid, simple and compact assembly of a tubing injector with a stuffing box.

More particularly, the stuffing box and tubing injector are interconnected at the base of the tubing injector. In a specific form, the base of the tubing injector and the stuffing box are rigidly supported on the upper end of the usual blowout preventer which is located beneath the tubing injector.

To further improve the arrangement and simplicity of the tubing injector and stuffing box combination, by conserving space and saving time when the stuffing box stripper rubber is to be replaced, the stuffing box top sub or body is longitudinally split so as to be applicable and removable laterally, thereby eliminating the need for axial freedom or space for threaded connection and removal of the top sub and other connectors, such as the retainer nut referred to above. The longitudinally split top sub or body parts have bolt receiving side portions enabling the body parts to be interconnected and disassembled.

This invention possesses many other advantages, and has other purposes which may be made more clearly apparent from a consideration of the form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. They will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed descriptions are not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevation of a tubing injector and stuffing box supported on a blowout preventer, in accordance with the invention;

FIG. **2** is an enlarged, fragmentary vertical section, as taken on the line **2—2** of FIG. **1**; and

FIG. **3** is a top view, as taken on the line **3—3** of FIG. **2.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

As seen in the drawing a tubing injector assembly I and a stuffing box assembly S are supported on a blowout preventer assembly B, the latter, as is well known, being suitably located on a well drilling or production rig and being connected to a well pipe, such as a well casing, not shown, to enable various operations to be performed through the blowout preventer which enables the well to be sealed off at the blowout preventer.

The details of the tubing injector I are not germane to the present invention, and an exemplary tubing injector is that identified above and shown in the *COMPOSITE CATALOG OF OIL FIELD EQUIPMENT & SERVICES*. This tubing injector comprises a base or platform **10** and an upwardly extended housing **11** for drive means (not shown), whereby a length of tubing T may be fed or injected into and removed from the well, the tubing being suitably stored on a supply reel, for example. In the illustrated case, the tubing T extends over an arched guide means **12** supported above the housing **11** on brace means **13.** The injector assembly also includes suitable support and jack means **14,** all as is well known, so as to require no detailed disclosure herein.

Referring to FIG. **2,** the stuffing box means or assembly S is shown as comprising a base or body member **15** of tubular form. The body **15** has a lower section **16** disposed within an opening **17** in the base or platform **10** of the tubing injector and having a radially outwardly extended flange **18.** This flange **18** seats in an annular cavity **19** of the platform **10** formed by a flange section **20.** The flange **18** and the flange section **20** are interconnected and connected to an upper, radially outwardly projecting flange **21** of the blowout preventer means B by a number of circumferentially spaced bolts **22** which extend through the flanges **18, 20** and **21.** A packing or seal ring **23** of annular form is disposed in opposed, annular seal cavities **24,** in the lower face of the flange **18,** and **25,** in the upper face of the flange **21.** This seal ring **23** provides a seal to prevent leakage between the flanges **18** and **21** from an axially extended bore **26** in the blowout preventer B and **27** in the stuffing box body **15.**

Within the stuffing box body **15** is a cylindrical section **28** which defines a cylinder head, through which a cylindrical skirt portion **29** of an annular piston **30** is reciprocable. Between the skirt **29** and the cylinder head **28** is a seal ring **31,** and the annular piston **30** has an external ring seal **32** slidably and sealingly engaging an upper cylinder wall **33,** in the body **15** above the cylinder head **28.** Between the lower sealing ring means **30** and the upper sealing ring means **32** is a chamber **34** to which pressure fluid is admissible via a radial port **35**

in the body 15 to act on the piston 30 for forcing it upwardly.

The body 15 has a threaded neck 36, on which is threaded a tubular cylinder adaptor 37. Within the adaptor 37 is a cylindrical section 38 having an internal seal ring 39 slidably and sealingly engaging the outer surface of a cylindrical, upward extension 40 of the piston 30. The space 41 between the piston 30 and the cylindrical section 38 is vented via a port 42 extending radially through the adaptor 37.

Reciprocable within the cylinder adaptor 37 is a wear bushing 43 having a skirt portion 44 extending downwardly into the upward extension 40 of the piston 30 and an upper, radially outwardly projecting flange 45 engageable by the upper end 46 of the extension 40 so as to be moved upwardly by the latter, under the influence of fluid pressure admitted to the piston chamber 34.

Disposed above the wear bushing 43 are stripper means 50, comprising a stripper rubber in the form of a tubular body 51 of elastomeric material adapted to be axially and circumferentially deformed into engagement with the tubing which extends through the central opening 52 therethrough. Various forms of such stripper rubbers are known, but the rubber illustrated is longitudinally split and has metal end ring sections 53 forming frusto-conical washers engaged with an upwardly facing companion surface 54 on the wear bushing 43 and an opposed downwardly facing surface 55 at the lower end of an upper wear bushing 56. This wear bushing 56 has a bottom flange 57 projecting radially outwardly and providing an upper shoulder 58. Interposed between the flanges 45 and 57 of the wear bushings 43 and 56 and surrounding the stripper rubber 51, in the illustrated assembly, is a so-called energizer, of a known form, comprising an elastomeric body 59 having a coiled spring 60 embedded therein, and adapted to assist in forcing the stripper rubber 51 into engagement with the tubing.

For purposes of retaining the stripper rubber 51, the energizer 59 and the wear bushing 56 in assembly on cylinder adaptor 37 and enabling axial loading of the stripper rubber and the energizer between the flanges 45 and 57 of the wear bushings 43 and 56, while facilitating disassembly and replacement of stripper rubbers, a top sub or body 70 is provided, comprising complemental body half-parts 70 and 71 (see FIG. 3) joined together at a longitudinally extended parting line by fasteners 72 which extend through radially outwardly projecting flanges 70*a* and 71*a* on the body half-parts.

The body half-parts 70 and 71 are formed with an internal radially inwardly extending flange 73 which provides an upwardly facing shoulder 74 engageable beneath a downwardly facing shoulder 75 on an outwardly projecting flange 76 at the upper end of the cylinder adaptor 37. In addition, the body half-parts 70 and 71 have an upper, inwardly projecting flange 77 providing a downwardly facing shoulder 78 confronting the upwardly facing shoulder 58 of the wear bushing 56.

Thus, when the stripper means are assembled, as seen in FIG. 2, pressure fluid applied to the piston chamber 34 acts upwardly on the piston 30. As the piston 30 is moved upwardly, its upward extension 40 moves the flange 45 of the wear bushing 43 towards the flange 57 of the wear bushing 56, thereby axially deforming the energizer 59 and stripper rubber 51 and causing radial expansion of the stripper rubber towards the tubing for sliding engagement with the latter.

As will now be apparent, replacement of the stripper rubber 51 may be easily accomplished by lateral disassembly of the body parts 70 and 71. In addition, the interconnection of the base flange 18 of the stuffing box body 15 and the platform 10 of the tubing injection, provides a rigid assembly with the blowout preventer B.

We claim:

1. In combination, tubing injector means for running and retrieving a length of tubing into and from a well, and stuffing box means for stripping the tubing, said tubing injector means having a platform and said stuffing box means having a body connected to said platform, blowout preventer means below said tubing injector means, said blowout preventer means having a top flange, said body of said stuffing box means having a bottom flange, and fastener means connecting said platform of said tubing injector means with said top flange of said blowout preventer means and said bottom flange of said body of said stuffing box means.

2. In the combination of claim 1, said stuffing box means including resiliently deformable stripper means, and means for axially and radially deforming said stripper means into engagement with a tubing extending through said stuffing box means and said tubing injector means.

3. In combination, tubing injector means for running and retrieving a length of tubing into and from a well, and stuffing box means for stripping the tubing, said tubing injector means having a platform and said stuffing box means having a body connected to said platform, said stuffing box means including resiliently deformable stripper means, and means for axially and radially deforming said stripper means into engagement with a tubing extending through said stuffing box means and said tubing injector means, said stuffing box means including laterally separable means confining said stripper means between said tubing injector means and said stuffing box means.

4. In combination, tubing injector means for running and retrieving a length of tubing into and from a well, and stuffing box means for stripping the tubing, said tubing injector means having a platform and said stuffing box means having a body connected to said platform, said stuffing box means including an upper wear bushing having a lower end flange and a lower wear bushing having an upper end flange, resiliently deformable stripper means between said end flanges, and means for forcing one of said wear bushings towards the other of said wear bushings to deform said stripper means between said end flanges.

5. In the combination of claim 4, said stuffing box means including laterally separable means confining said stripper means between said tubing injector means and said stuffing box means.

6. In the combination of claim 4, said stuffing box means also including longitudinally split body sections having means coengageable with said wear bushings to limit axial separation, and means separably interconnecting said longitudinally split body sections.

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