May 12, 1942. C. WHITE ET AL 2,282,629

LINER PULLING DEVICE

Filed Dec. 15, 1939

Fig. 1.

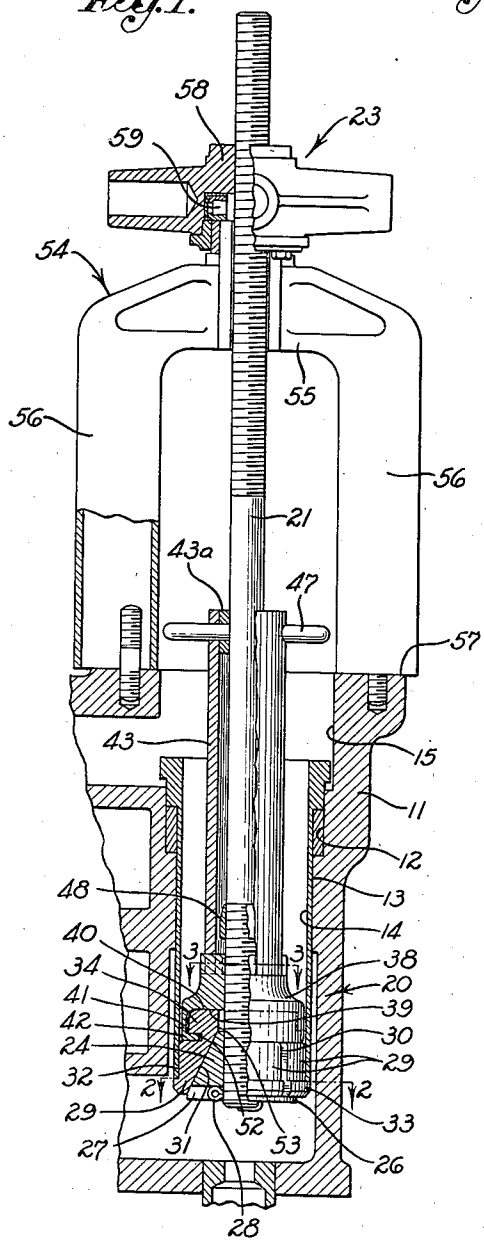


Fig. 4.

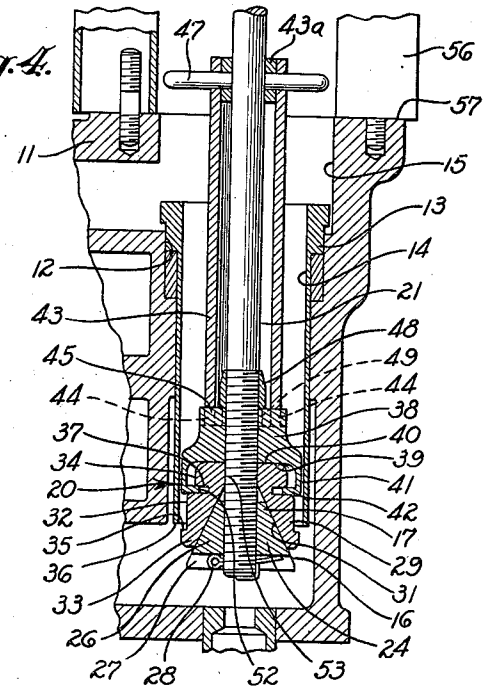


Fig. 3.

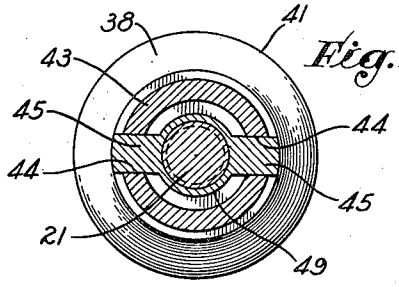
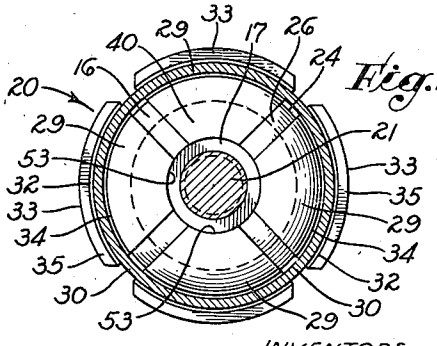


Fig. 2.



INVENTORS
CLARENCE WHITE
OLIVER B. GRAHAM

BY
HARRIS, KIECH, FOSTER & HARRIS

FOR THE FIRM
ATTORNEYS

Patented May 12, 1942 2,282,629

UNITED STATES PATENT OFFICE

2,282,629

LINER PULLING DEVICE

Clarence White, Walnut Park, and Oliver B. Graham, Los Angeles, Calif., assignors to Oil Well Manufacturing Corporation, Los Angeles, Calif., a corporation of California

Application December 15, 1939, Serial No. 309,374

4 Claims. (Cl. 29—88.2)

Our invention relates to devices for pulling an insert member from a bore. The device and the equivalent embodiments thereof are adapted for pulling various pieces of equipment from oil well pump tubing, such as valves and liners, and for pulling the liner from the bore of a slush pump. It is in connection with the latter use that we have illustrated the device in the drawing. It should be understood, however, that we do not intend the scope of the invention to be limited to use in connection with slush pumps or for use solely in pulling liners from pumps, this embodiment being chosen for the purposes of illustration and description.

It is one of the objects of our invention to provide a device operable from the exterior of a body such as a slush pump to engage an insert member in a bore within the body such as a cylinder, and particularly a cylinder liner having a relatively thin wall, the device being operable to exert forces sufficient to break the liner loose from the bore in which it is inserted and to withdraw the liner therefrom.

It is another object of our invention to provide a device of the character mentioned which includes a pulling mechanism comprising several separate members which will not become mutually disengaged in the operation of the device.

It is another object of our invention to provide a device of the character mentioned which includes a grasping mechanism of a relatively few strong parts which will positively engage both the bore and the inner end face of a liner or other insert, and particularly a liner or insert having a relatively thin wall, the grasping device having its parts assembled upon and interlocked with the pulling mechanism.

These and other objects and features of our invention will be apparent from a perusal of the following part of the specification in connection with the accompanying drawing and the appended claims.

In the drawing:

Fig. 1 is a longitudinal fragmentary section through a cylinder such as the cylinder of a slush pump, and illustrates the manner in which the device embodying the features of our invention is installed for the operation of pulling a relatively thin liner from a pump cylinder.

Fig. 2 is a cross section of the pulling device taken along the line 2—2 of Fig. 1.

Fig. 3 is a cross section of the pulling device taken along the line 3—3 of Fig. 1.

Fig. 4 is a longitudinal fragmentary section similar to Fig. 1, showing the grasping mechanism in collapsed position in which it is adapted for the step of inserting it within the cylinder.

In Fig. 1 of the drawing, the grasping mechanism is shown in position ready to pull a liner from a cylinder. The numeral 11 indicates the pump body having a bore 12 therein. An insert liner 13 in the form of a sleeve provides a pump cylinder bore 14. The pump body 11 is formed with an outer opening 15 coaxial with the bore 12 and cylinder bore 14. The liner is inserted in and removed from the bore through this opening 15.

Although we have illustrated our pulling device in an operable position in a vertical bore for illustrative purposes, the device is equally adapted for use with horizontal bores. The invention comprises generally a pulling mechanism 20 carried by a puller bolt or stem 21 and a means for imparting longitudinal movement to the bolt 21, which means is generally indicated on the drawing by the numeral 23.

A grip expanding nut 24 having a frustro-conical rim surface 16 is threaded upon the puller bolt 21 with its small end 17 facing toward the opening 15. The larger end 26 is disposed adjacent the inner end of the puller bolt 21 and is diametrally slotted at 27 to receive a cotter pin 28 which engages the bolt 21 and prevents the nut 24 from turning thereon.

A plurality of segmental expanding grips 29 are circumferentially spaced about the nut 24. Each of these grips constitutes the segment of a ring, and each two grips are separated by a radially disposed gap 30. The inner bore surface 31 of each grip 29 is conically shaped to fit the conical rim surface 16 of the nut 24. Each of the grips 29 is also machined to present a segment 32 of a cylindrical surface diametered to slidably fit within the bore 14 of the liner 13, a segment 33 of a cylindrical surface of larger diameter than that of the segment 32, and a segment 34 of a cylindrical surface of smaller diameter than that of the segment 32.

The cylindrical segment 33 at the inner end of the grip 29 provides an annular shoulder 35 adapted to engage the inner end of the liner 13. The cylindrical segment 33 is of the same or preferably of somewhat smaller diameter than the outside diameter of the liner 13, enabling the grips 29 when in expanded position to be withdrawn through the bore of the pump body and yet have a maximum contactual surface engagement with the inner end 36 of the liner 13.

Between the cylindrical segments 32 and 34 of each grip 29 is a circumferential groove 37

with parallel side walls. A grip adjusting nut 38 has threaded engagement with the bolt 21 and is provided with an inner end face 39 for engagement with outer end faces 40 of the grips 29. The adjusting nut 38 is formed with an integral annular web 41 projecting inwardly from the body of the nut 38 and disposed between the cylindrical segmental faces 34 and the bore 14 of the liner 13. The web 41 at its inner end is integrally connected with an annular flange 42 which extends radially inwardly from the web 41 and projects into and has annular sliding engagement with the side walls of the grooves 37. The length of the web 41 is such that the position of the flange 42 within the side walls of the groove 37 permits endwise contact between the faces 39 and 40.

A cylindrical socket wrench 43 is concentrically mounted about the bolt 21 and is provided at its inner end with slots 44 which engage radially disposed ribs 45 formed integrally with and projecting longitudinally outwardly from the body of the nut 38, and is provided at its outer end with handles 47 which are rigidly secured to the wrench 43 and the sleeve 43a which is rotatably mounted upon the bolt 21.

A collar 48 is rigidly secured in fixed position upon the bolt 21 at such a position therealong that it is spaced a short distance from a hub portion 49 of reduced diameter of the nut 38. This collar 48 affords a shoulder for positively stopping movement of the nut 38 along the bolt 21. Otherwise as the nut 38 is rotated with respect to the bolt 21 in a manner to cause it to move upward to the end of the threaded portion of the bolt 21 the threads of the nut might become jammed on the unthreaded portion of the bolt 21 and be difficult to dislodge for a subsequent movement downward on the bolt 21.

The radial distance between the bore faces 53 of the outer or upper end portions of the segmental grips 29 and the bolt 21 is less than the depth of that portion of the flange 42 which is radially inside the rim faces 34 of the segmental grips 29 when the latter are in operative position of engagement with the liner 13. The radial distance between the bore faces 53 and the bolt 21 is somewhat greater than the thickness of the liner to be pulled. It follows from these relationships that when the nut 38 is withdrawn longitudinally of the bolt 21 a sufficient distance from the nut 24 to enable the bore faces 53 of the segments 29 to be moved radially into contact with the bolt 21 the entire pulling structure 20 can be inserted within the bore 14 but that the several segments will be held in assembled relationship with respect to the bolt 21 and nuts 24 and 38 by reason of the engagement of the flange 42 with the slots 37 of the segments. To disassemble the segments 29 the cotter pin 28 is removed, the nut 24 is unscrewed from the bolt 21 and the nut 38 is moved downward of the bolt 21 at least to a point at which its face 39 is flush with the lower end of the bolt 21. The segments 29 can then be moved radially inwardly to clear the inner edge 52 of the flange 42.

Our invention includes in combination with the pulling mechanism 20 the means 23 for moving the bolt 21 longitudinally of the cylinder bore 14 for operation of the pulling mechanism 20 to pull the liner 13 from the bore 12. The means 23 is arranged and constructed in substantially the same manner as that shown and described in our Patent No. 2,039,371.

Since the invention which is the subject of this application is not concerned with the details of construction of the means 23, reference is herein made for a detailed description of this means to our Patent No. 2,039,371. It is sufficient for the purposes of this application to describe the means 23 for imparting longitudinal movement of the bolt 21 as comprising a bridge member 54 having a transverse body portion 55 provided at each end thereof with a pressure foot 56 adapted to engage an outer surface 57 of the pump body 11 so that the body portion 55 is extended across the bore 12 substantially in the manner shown in Fig. 1, a nut 58 having threaded engagement with the bolt 21, and a roller thrust bearing 59 interposed between the nut 58 and the transverse body portion 55 of the bridge member 54.

In the operation of the device, the position of the nut 24 on the bolt 21 is regulated by means of the cotter pin 28 so that when the nut 38 is at its extreme outer position along the bolt 21 in which it is in contact with the collar 48, the segmental grips 29 are free to move inwardly toward each other sufficiently that their shoulders 35 are inside the liner bore 14. The grips are held in assembled relationship with each other and the other parts of the device by the flange 42, stem 21, and nut 24 for all positions of the nut 38 and of the socket wrench 43 by which the nut is operated.

With the nut 38 in its outermost position against the stop 48 and with the segmental grips 29 consequently at their radially innermost position, the entire pulling mechanism 20 is inserted within the bore 14 of the liner 13 until the shoulders 35 of the segmental grips 29 have moved beyond and inside the inner end of the liner 13. The socket wrench 43 is then turned in a direction to move the nut 38 and the segmental grips 29 inwardly along the bolt 21. The grips 29 by reason of the engagement of their conical bore surfaces with the nut 24 are expanded radially outwardly as they are moved longitudinally inwardly of the bolt 21. When the rim surfaces 32 of the grips 29 contact the inner bore surface 14 of the liner 13, the bolt 21 and pulling assembly 20 are moved longitudinally outwardly until the shoulders 35 engage the inner end surface of the liner 13. The bridge member 54 and nut 58 are then placed in position, and the nut 58 rotated, with the result that the bolt 21, pulling means 20, and liner 13 are withdrawn by a force sufficient to overcome the forced fit of the liner 13 within the cylinder bore.

We have described herein one embodiment of our invention, but it is capable of many other embodiments which come within the terms of the appended claims.

We claim as our invention:

1. In a device for pulling an insert sleeve from a bore, the combination of: a stem adapted to be extended inwardly of said bore; means associated with said stem for moving it longitudinally outwardly of said bore; a plurality of annularly disposed segmental grip members each provided with a shoulder at one end for engagement with the inner end face of the insert sleeve, and each having a conical bore face directed inwardly of said bore, a portion of reduced diameter extending from the end face opposite said shoulder end, and an outwardly facing annular groove between said portion of reduced diameter and the remainder of said grip; a grip expander threaded upon said stem having a conical rim face mating with said conical bore faces; an adjusting nut

threaded on said stem having an endwise engagement with said grip members for expanding said grip members on said mating conical faces; an integral web carried by said adjusting nut encompassing said reduced portion; an integral, inwardly extending, annular flange carried by said web, projecting into said groove and adapted to hold said adjusting nut and grips in assembled relationship longitudinally and radially when said nut and grips are in assembled position on said stem; and a stop limiting threaded movement of said grip expander away from said adjusting nut.

2. In a device for pulling an insert sleeve from a bore, the combination of: a stem adapted to be extended inwardly of said bore; means associated with said stem for moving it longitudinally outwardly of said bore; a plurality of annularly disposed segmental grip members each provided with a shoulder at one end for engagement with the inner end face of the insert sleeve, and each having a cylindrical peripheral face for engagement with the bore face of the insert sleeve and each having a conical bore face directed outwardly of said bore; a grip expander threaded upon said stem and having a conical peripheral face mating with said conical bore faces; an adjusting nut threaded on said stem and having endwise engagement with said grip members for expanding said grip members on said mating conical faces to move said cylindrical peripheral faces into engagement with the bore face of the sleeve, said grip members and adjusting nut being formed with annular, slidably engaging, axially parallel faces limiting the expanding movement of said grip members, and with annular, slidably engaging, axially transverse faces longitudinally interlocking said grip members and adjusting nut for radial positions of said grip members between said limit of expanding movement and a position of contact with said stem, and releasing said grip members and adjusting nut for relatively longitudinal movement at a radial position of said grip members centrally inside of said stem contacting position; and a removable stop limiting movement of said grip expander away from said adjusting nut.

3. In a device for pulling an insert sleeve from a bore, the combination of: a stem adapted to be extended inwardly of the bore; means associated with said stem for moving it longitudinally outwardly of the bore; a plurality of annularly disposed segmental grip members, each provided with a shoulder for engagement with the inner end face of the insert sleeve, with a cylindrical rim face shaped for solid, axially extended engagement with the bore face of the insert sleeve, and with a conical bore face set at an angle to the axis of said rim face and tapering away from said axis in a direction outwardly of said bore; a grip expander secured upon said stem having a conical rim face forming an angle with the axis of the bore of the same degree as said first-mentioned angle, whereby said grip member may simultaneously solidly engage both the insert sleeve bore face and said expander rim face for a substantial distance axially of said grip member; and an adjusting member axially adjustable along said stem and engaging said grip members for moving said grip members axially of said expander to wedge said grip members between the insert sleeve bore face and said expander rim face.

4. The combination defined in claim 3, in which said adjusting member is a nut threaded on said stem and the adjusting member and grip members are formed with interengaging surfaces maintaining said grip members in axial parallelism with said stem while permitting radial movement of the grip members with respect to said stem.

CLARENCE WHITE.
OLIVER B. GRAHAM.