July 15, 1941. L. D. MEDDICK 2,249,155

PACKING MEANS FOR BRIDGING PLUGS

Filed Dec. 11, 1939

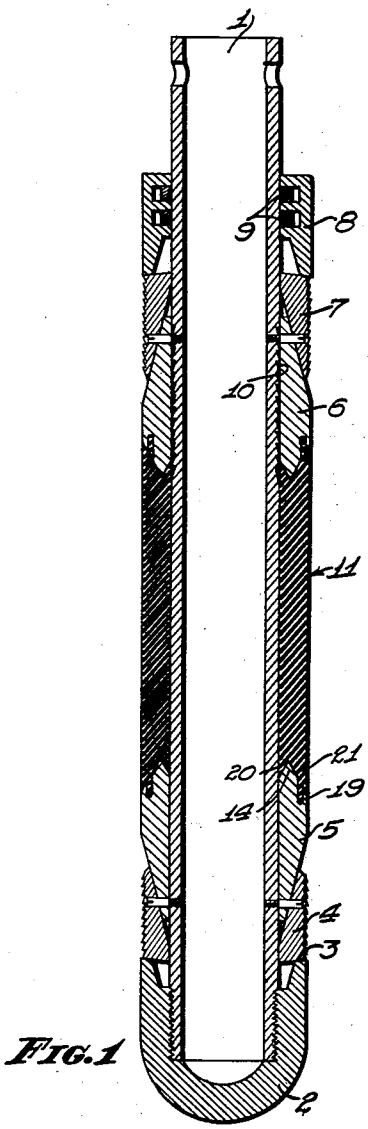


FIG. 1

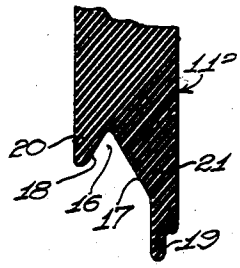


FIG. 3

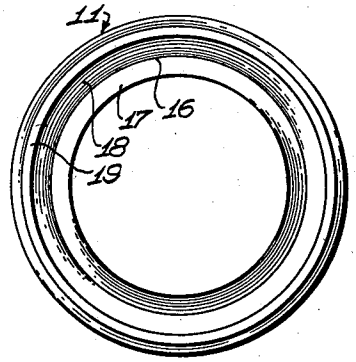


FIG. 4

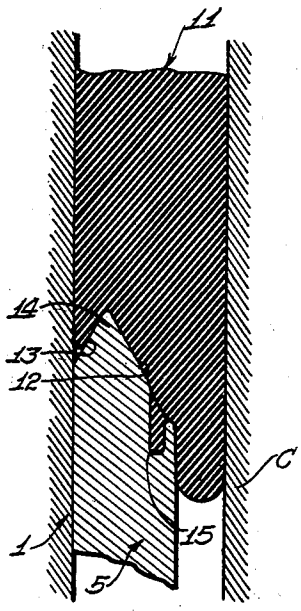


FIG. 2

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Patented July 15, 1941

2,249,155

UNITED STATES PATENT OFFICE

2,249,155

PACKING MEANS FOR BRIDGING PLUGS

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Application December 11, 1939, Serial No. 308,601

3 Claims. (Cl. 166—13)

My invention relates to bridging plugs, particularly to packing means for bridging plugs adapted to form a water-tight seal between the mandrel of a bridging plug and a surrounding well casing. Among the objects of my invention are:

First, to provide a packing means for bridging plugs which may, by application of a relatively small amount of force, be expanded against the surrounding casing and when so positioned has a shape inherently adapted to seal against the transfer of fluid, either along the walls of the casing or around the mandrel of the bridging plug;

Second, to provide a bridging plug and sealing means therefor, which is particularly designed for use in conjunction with wire line or cable-operated setting tools;

Third, to provide a bridging plug of this character wherein material clearance may be provided between the bridging plug and surrounding casing to insure adequate circulation area and facilitate rapid movement of the bridging plug through the well bore; and

Fourth, to provide a bridging plug of this character which incorporates a novel packing element restraining means associated with the packing element so as to maintain pressure-responsive areas at the ends of the packing element adapted to bear against the bridging plug mandrel and casing.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of a bridging plug incorporating my invention;

Figure 2 is an enlarged fragmentary, detailed view showing the packing sleeve when in its packing position;

Figure 3 is a fragmentary sectional view of the packing sleeve illustrating one end thereof; and

Figure 4 is an end elevational view of the packing sleeve.

The bridging plug with which my packing sleeve is incorporated comprises a mandrel 1 of substantially uniform diameter and hollow, which is screwthreaded at its lower end for connection to a nose piece 2. The upper side of the nose piece forms a shoulder 3 which engages a plurality of slips 4 adapted to be spread by a cone 5 slidably mounted around the mandrel 1. The cone 5 converges downwardly and a second cone 6 is mounted on the mandrel, the latter cone converging upwardly and coacting with slips 7 similar to the slips 4.

A locking ring collar 8 is fitted around the mandrel above the slips 7. The collar 8 is provided with channels which confront the mandrel 1 and which receive split locking rings 9 adapted to coact with wicker teeth 10 provided on the mandrel when the parts of the bridging plug are in their sealing position. The upper end of the mandrel 1 is suitably constructed for attachment to a setting tool, not shown.

The above described elements are, in so far as my present invention is concerned, conventional, my invention having particular reference to a packing sleeve mounted between the cones 5 and 6, and the coacting ends of said cones.

The cones 5 and 6 receive therebetween a packing sleeve 11 formed of rubber or similar composition material, such as a material known commercially as "Neoprene," which material may or may not contain reinforcing. The confronting ends of the cones 5 and 6 are beveled inwardly for approximately two-thirds of their wall thickness and are beveled outwardly from their inner peripheries for approximately one-third of their wall thickness, as indicated by 12 and 13, respectively, so as to form axially directed, undercut, pointed, annular ridges 14.

The beveled face 12 of each cone may have, near its outer periphery, an axially directed, annular channel 15.

The packing sleeve 11 is provided at each end with an axially directed V-shaped annular channel 16, the side walls 17 and 18 of which conform to the beveled faces 12 and 13, respectively, of the cones. In addition, the ends of the packing sleeve are provided with annular ribs 19 which fit the channels 15 of the two cones.

The channels 16 at the ends of the sleeve 11 form pressure lips 20 which fit in the undercut portion 13 of the cone, and pressure lips 21 which wedge between the beveled portion 12 of the cones and the surrounding casing, as shown in Figure 2.

Operation of the packing sleeve is as follows: When the bridging plug is set the cones 5 and 6 move toward each other, axially compressing the packing sleeve 11. This is accomplished by the use of a suitable setting tool (not shown) in association with the bridging plug. Axial compression of the sleeve causes radial expansion or distortion until it engages the walls of the surrounding casing designated C in Figure 2.

Rubber or other relatively soft, yieldable material tends to flow very much like water when

subjected to pressure. Consequently, the parts of the sleeve tend to reshape themselves materially. However, the beveled portions 12 and the undercut portions 13 coacting, respectively, with the walls of the casing and the mandrel form wedge-shaped spaces into which the sleeve is crowded. Once the sleeve is in position, fluid which may tend to move between the cones 5 and 6, or the packing sleeve, encounters the pressure lips 20 and 21, forcing them against the casing and mandrel, respectively, and preventing the passage of fluid along the packing element.

The ribs 19 and channels 15 coact to restrain the ends of the packing element while lowering the bridging plug into position. When the bridging plug is in position and is set, the ribs 19 tend to shear or tear from the packer. It is immaterial, however, whether they do this or pull out of the channels 15, for they have no function after the packer is set.

Various changes and alternate arrangements may be made within the scope of the appended claims, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. In a bridging plug: a packing sleeve having at its ends radially outer and radially inner, axially directed pressure lips; and a packing element expander engageable with each end of said sleeve, each having an axially directed channel adapted to receive one of said pressure lips, and a beveled face adapted to engage the other of said pressure lips.

2. In a bridging plug: a mandrel; a packing sleeve fitting said mandrel adapted to be axially expanded into engagement with a surrounding casing; and expander rings engageable with the ends of the packing sleeve, said expander rings having beveled ends forming, with the surrounding casing, substantially V-shaped channels and defining with said mandrel other substantially V-shaped channels, and said packing element provided with pressure lips at its ends adapted to be forced into conformity with said channels.

3. In a bridging plug: a mandrel; expander rings slidably mounted thereon and having confronting ends, and beveled on their radially inner peripheries; and a packing sleeve having a V-shaped channel in each end conforming to said expander rings, the walls of said channels forming inner and outer pressure lips adapted to conform to said expander rings.

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