

July 2, 1957

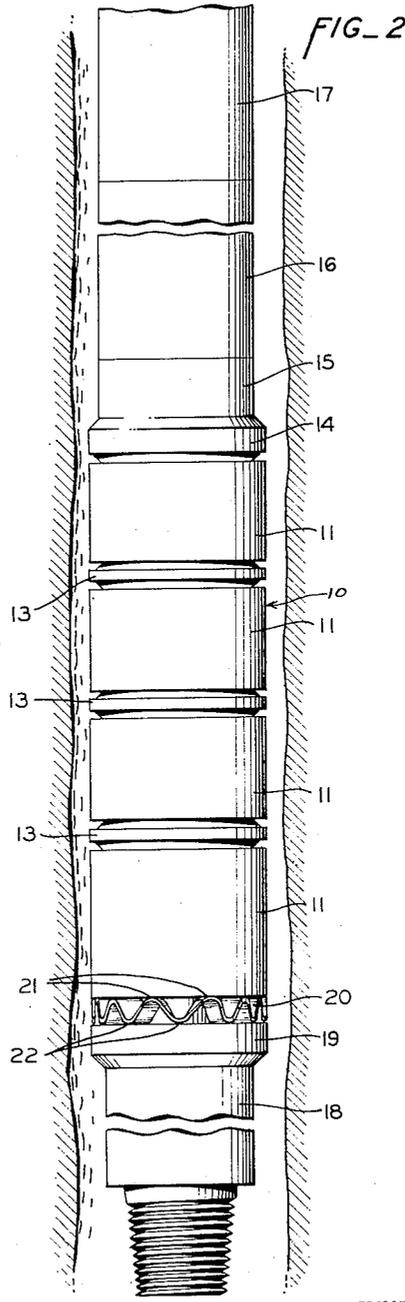
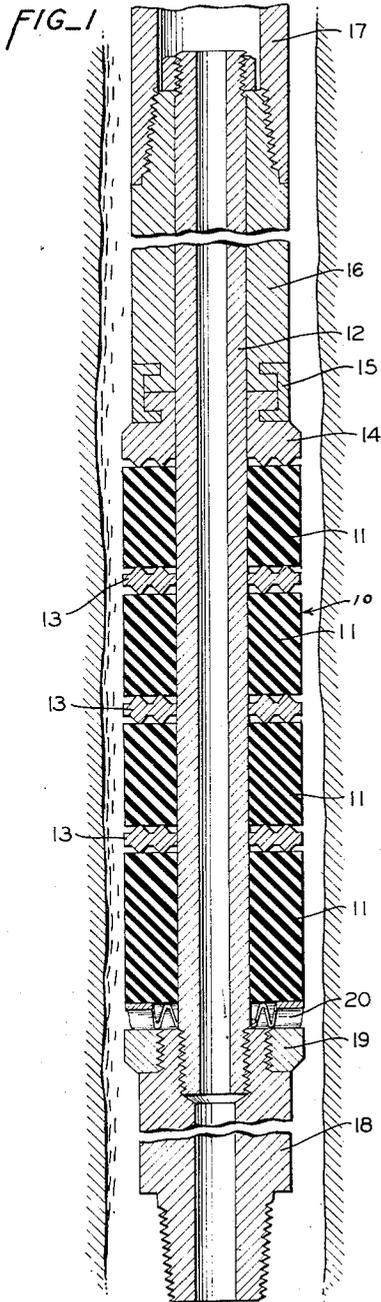
T. L. LONG ET AL

2,797,759

ANTI-EXTRUSION DEVICE FOR PACKERS

Filed Nov. 21, 1955

2 Sheets-Sheet 1



INVENTORS  
THOMAS L. LONG  
WILLIAM K. ANSITE

BY  
*Mellin and Hanscom*  
ATTORNEYS

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FIG-3

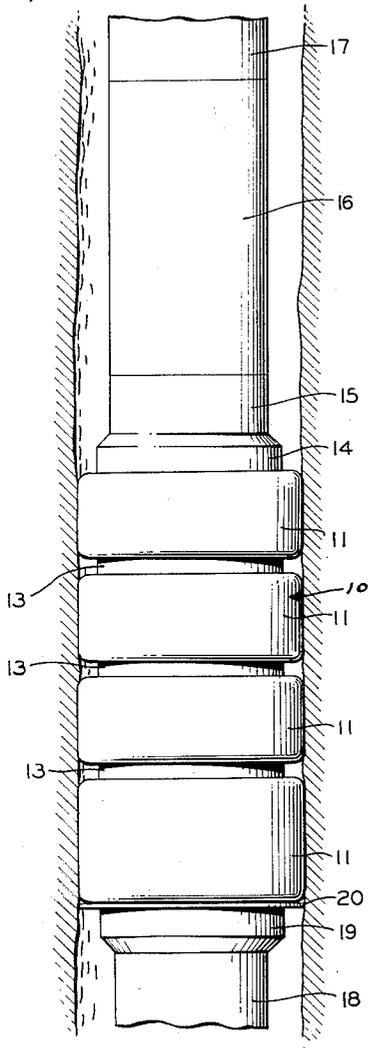


FIG-4

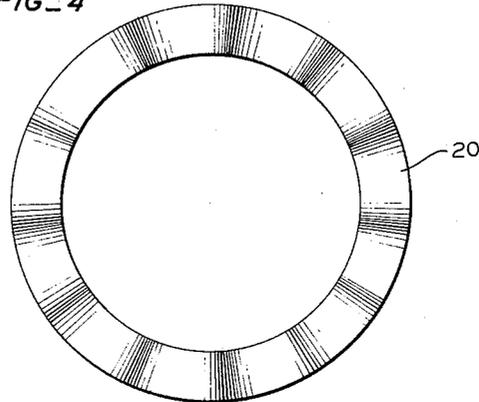


FIG-5

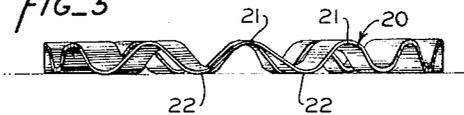
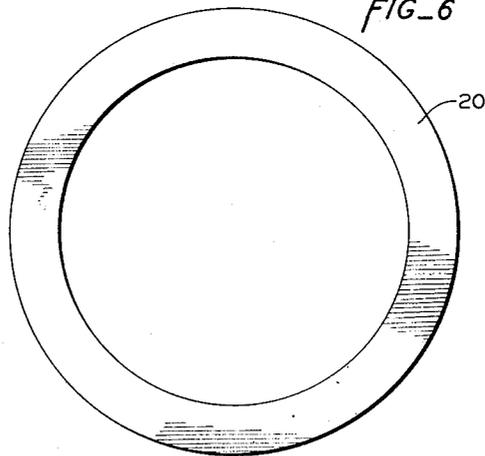


FIG-6



INVENTORS  
THOMAS L. LONG  
WILLIAM K. ANSITE

BY

*McClain and Hancock*  
ATTORNEYS

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2,797,759

## ANTI-EXTRUSION DEVICE FOR PACKERS

Thomas L. Long, Houston, Tex., and William K. Ansite, Glendale, Calif., assignors, by mesne assignments, to Johnston Testers, Inc., Houston, Tex., a corporation of Texas

Application November 21, 1955, Serial No. 548,062

4 Claims. (Cl. 166—204)

This invention relates generally to the art of packers for use in deep wells, and particularly pertains to an anti-extrusion device for preventing the plastic flow of the packing material when the packer is subjected to high differential pressures.

The specific anti-extrusion device disclosed herein is shown in connection with a packer such as that illustrated in the copending application of Mordica O. Johnston and Richard H. Stanier entitled "Doughnut-Type Packer," filed October 17, 1955, bearing Serial No. 540,712 and assigned to the same assignee.

It is the principal object of this invention to provide a novel form of anti-extrusion device for use with well packers.

A further object is to provide an anti-extrusion device in the form of a flat metal ring which has been fluted so that its overall diameter is reduced to the external size of the packing elements in their relaxed position, whereby when said ring is flattened, the overall diameter of the ring will be increased so that the ring will form an annular shelf completely filling the space between the bore wall or casing and the external wall of the packer body below the packing elements.

A preferred form of the invention is described in the following detailed specification, and illustrated by way of example in the accompanying drawings, wherein:

Fig. 1 is a sectional view of a packer embodying the principles of our invention.

Fig. 2 is an elevation view of the packer shown in Fig. 1, and shows the packer in its relaxed, or running-in condition.

Fig. 3 is a view similar to that shown in Fig. 2 and shows the packer set within a well bore.

Fig. 4 is a plan view of the anti-extrusion device per se, with the ring shown in its relaxed or fluted condition.

Fig. 5 is an end view of the ring shown in Fig. 4.

Fig. 6 is a plan view similar to that shown in Fig. 4, but showing the ring in its flattened and expanded relation.

Referring now to the drawings, wherein similar reference numerals are used to designate the same elements throughout the various views shown, 10 generally indicates a packer structure comprising a plurality of packing elements 11 mounted on a central mandrel 12. A plurality of separator rings 13 are interposed between the several packing elements 11. A collar 14 is slidably mounted on the mandrel 12 above the uppermost packing element 11 and is connected by a split ring connector 15 to a sleeve 16 which in turn is connected to the well string 17, all in the manner described in the above cited copending application of Mordica O. Johnston et al.

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The lower end of the mandrel 12 is connected to a lower sub 18 adapted to be connected to a tail pipe extending to the bottom of the well or to a suitable anchor device in a manner well known in the art. A retaining nut 19 is connected to the upper end of the sub 18 and opposes the lower face of the lowermost packing element 11.

A ring 20 made of spring steel, or other suitable resilient material, is interposed between the lower surface of the lowermost packing element 11 and the retaining nut 19. The ring 20, when in its relaxed condition, is formed with a plurality of upwardly and downwardly extending generally sinusoidal undulations of flutes 21 and 22, respectively, in the manner shown in Figs. 2 and 5. By deforming the ring in this manner, the external diameter of the ring is reduced until it approximately equals the normal relaxed external diameter of the packing elements 11. When the packer is set in the manner illustrated in Fig. 3, the generally sinusoidal undulations 21 and 22 of the ring 20 are flattened out, causing the ring to expand laterally and block the annular space between the retaining nut 19 and the bore wall or casing.

While the description refers to only one ring 20, it is obvious that several superimposed rings may be used if it is deemed necessary.

While we have shown and described a preferred form of the invention, it is obvious that various changes may be made in its construction by those skilled in the art, without departing from the spirit of the invention as defined in the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a packer construction having a packing element adapted to be compressed longitudinally against an abutment and thereby expanded laterally into contact with the casing or wall of a well bore, an anti-extrusion device comprising a continuous annular ring inserted between said packing element and said abutment, said ring being formed with a plurality of axially extending undulations, whereby pressure of said packing element against said ring will cause said undulations to flatten and thereby expand said ring into contact with the bore wall or casing.

2. In a packer construction having a packing element adapted to be compressed longitudinally against an abutment and thereby expanded laterally into contact with the casing or wall of a well bore, an anti-extrusion device comprising a continuous annular ring of resilient sheet material inserted between said packing element and said abutment, said ring being formed with a plurality of undulations contoured to flatten out upon the application of pressure axially of said ring to expand into contact with the bore wall or casing when said packing element is compressed.

3. In a packer construction having a packing element adapted to be compressed longitudinally against an abutment and thereby expanded laterally into contact with the casing or wall of a well bore, an anti-extrusion device comprising a continuous annular ring of resilient sheet material inserted between said packing element and said abutment, said ring being formed with a plurality of axially extending undulations, the overall diameter of said undulated ring being approximately equal to the external diameter of said packing element, whereby pressure of said packing element against said ring will cause said undulations to flatten and thereby expand said ring into contact with the bore wall or casing.

4. In a packer construction having a packing element adapted to be compressed longitudinally against an abutment and thereby expanded laterally into contact with the casing or wall of a well bore, an anti-extrusion device comprising at least one continuous annular ring of resilient sheet material inserted between said packing element and said abutment, said ring being formed with a plurality of radially extending sinusoids, the outside diameter of said sinusoidal ring being approximately equal to the external diameter of said packing element when uncompressed, whereby pressure of said packing element against said ring will cause said sinusoids to flatten and

thereby expand said ring into contact with the bore wall or casing.

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