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2,184,634

PACKING ELEMENT

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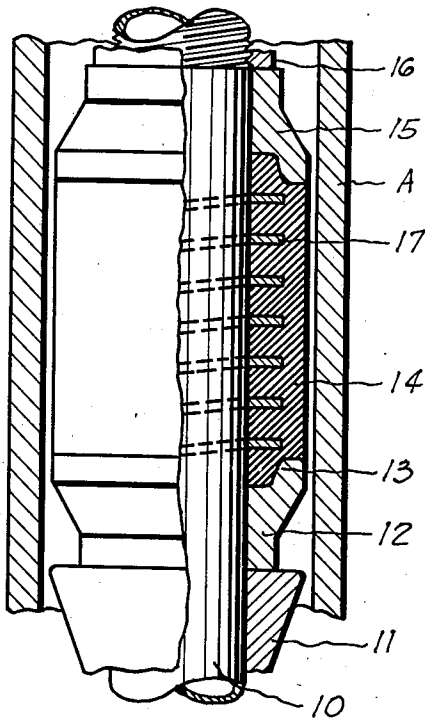


FIG. 1

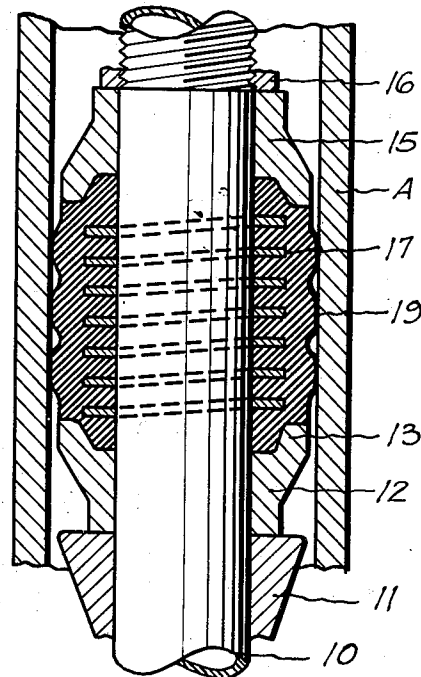


FIG. 2

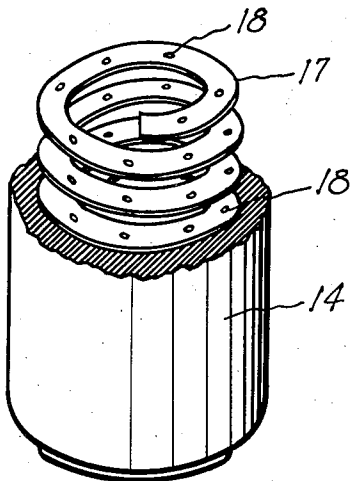


FIG. 3

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PACKING ELEMENT

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4 Claims. (Cl. 166-10)

This invention relates to new and useful improvements in packing elements.

This invention is an improvement of our co-pending application filed November 5, 1936, Serial No. 109,264, now Patent No. 2,132,723, granted October 11, 1938.

One object of the invention is to provide an improved packing element, adapted to be used on a well packer or other device, which will effectively seal off the annular space between the well casing and the well tubing.

Another object of the invention is to provide an improved packing element having a continuous helical reinforcing member molded, or otherwise secured, therein, whereby when the element is distorted, the member acts to displace the outer periphery of the element into a series of super-imposed bulges or protuberances, whereby the packing effect of a plurality of super-imposed individual packing members is obtained.

A further object of the invention is to provide an improved packing element which is provided with a continuous resilient member molded therein, which not only reinforces the element but also aids in returning the element to a normal undistorted position after the same has been moved to a packing position, whereby the inherent elasticity of the element is not solely depended upon to return said element to such normal position.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, in which an example of the invention is shown, and wherein:

Figure 1 is a view, partly in elevation and partly in section, of a packing element constructed in accordance with the invention.

Figure 2 is a transverse, sectional view of the element in its distorted position, and

Figure 3 is an isometric view of the helical reinforcing element.

In the drawing, the numeral 10 designates an elongate tubular mandrel which is adapted to be connected in a tubing string or other support (not shown), so as to be lowered therewith into a well casing A. The invention is applicable to any device, but for purposes of description it is shown as mounted on the mandrel of a well packer. The usual slip head 11 is slidable on the mandrel, and the usual gripping slips (not shown) are slidable on this head. When the slips are engaged with the wall of the casing, the head

11 is held stationary and the mandrel may slide therethrough. The slips have not been shown, as they form no part of the invention, and any suitable means may be employed for locking the head in a fixed position in the casing.

A supporting thimble 12 is slidably mounted on the mandrel 10 above the slip head 11, and rests on the upper end thereof. The thimble is recessed at its upper end to form a peripheral flange 13. An elastic packing element 14, formed of rubber, Duprene, or any other suitable elastic material, surrounds the mandrel above the thimble 12 and has its reduced lower end disposed within the recess in the thimble and confined between the flange 13 and the mandrel. A flanged confining cap or inverted thimble 15 engages the reduced upper end of the packing element, whereby the element is mounted on the mandrel between the cap 15 and the thimble 12. A retaining collar 16 is secured to the mandrel above the confining cap 15 in some suitable manner, as by screw threads, whereby said cap is held in constant engagement with the upper end of the packing element.

A continuous, metallic, reinforcing member 17 is molded, or otherwise suitably mounted within the packing element, and is placed so that it encircles the mandrel and has its inner periphery engaging the mandrel while its outer periphery terminates short of the outer periphery of the packing element. The member may be made of flat, ribbon-like metal in the form of a helical spring and may have a plurality of perforations 18 extending entirely therethrough. It is obvious that the material of which the packing element is constructed passes through these openings, whereby the member is rigidly affixed within the element. These perforations may or may not be used. Since the member encircles the mandrel 10 it will be seen that it tends to hold the packing element in engagement with the mandrel. Although the inner edge or periphery of the member is shown engaging the mandrel it may, if desired, be spaced slightly therefrom, whereby the entire member would be completely and wholly embedded in the packing element.

When the device has been lowered into position within the well casing, with the packing element in its normal or undistorted position, as shown in Figure 1, the slips (not shown) are moved into gripping engagement with the wall of the casing, thereby holding the slip head 11 stationary. Since the thimble 12 is supported on the slip head, it will also remain stationary, while the mandrel 10, which is slidable through both the

thimble 12 and the slip head 11, may move vertically. As the mandrel is moved downwardly, the retaining collar 16 being fixed to the mandrel moves downwardly therewith and also moves the
 5 confining cap 15 downwardly.

The downward movement of the cap 15 toward the stationary thimble 12 distorts the packing element 14 therebetween, and since the coils of the metallic element 17, molded within the element,
 10 are compressed therewith into closer proximity to each other, the element is distorted between each coil into annular protuberances or bulges 19 (Figure 2). That portion of the element immediately adjacent the periphery of the
 15 reinforcing element will be held in substantially its normal undistorted position by the element because it is firmly affixed or molded to the ring. The distortion of the packing member causes the same to move into engagement with the wall of
 20 the well casing, whereby a seal is formed between said casing and the mandrel.

It is noted that the protuberances formed by distortion of the element have substantially the
 25 same sealing effect as a series of super-imposed individual packing rings, yet the element is formed in a single piece and retains the strength and durability of a one-piece packing element. It is further noted that, since the packing element is firmly affixed to the metallic reinforcing
 30 member 17, and extends through the openings 18 therein, said member acts to hold the element in engagement with the mandrel, whereby said element is prevented from being stripped off the mandrel. It is also noted that the provision of
 35 the spaced coils of the member 17 within the element serve to reinforce the same throughout the length thereof, whereby the element is strengthened and made more rigid. Also, distortion of the element beyond the elastic limit
 40 of its material is substantially eliminated by the member, which retains those portions of the element secured thereto in a fixed position with relation to the mandrel.

It is pointed out that the reinforcing member
 45 17 may be made of any suitable material since the member would act to displace the outer periphery of the packing element into a series of super-imposed bulges or protuberances. However, it is noted that the reinforced member may
 50 be constructed of spring steel, in which case it would not only act to displace the outer periphery of the packing element into a series of protuberances, but also when the packer was released said spring steel member would aid in returning the

packing element to a normal undistorted position. Under certain well conditions the outer surface of the packing element tends to adhere or stick to the inner wall of the casing. Under such conditions the spring reinforcing element would be
 5 a material aid in loosening the packer and in returning the element to an undistorted position. Thus the inherent elasticity of the element is not relied on alone to accomplish this returning of the packing element to a normal position, but
 10 said elasticity is supplemented and aided by the tendency of the spring member to expand when the packer is released.

What we claim and desire to secure by Letters
 Patent is:

1. A packing element including, an annular elastic body, and a helical reinforcing member embedded within said body, said member having a plurality of perforations extending there-
 20 through whereby said member is more firmly attached to the annular body.

2. A packing element including, an annular elastic body, and a helical reinforcing member embedded within said body, said member being
 25 formed of spring steel and having a plurality of perforations extending therethrough whereby said member is more firmly attached to the annular body.

3. A packing element including, a cylindrical elastic body having a bore extending there-
 30 through, and a helical resilient reinforcing member embedded within the body and having flat convolutions with the inner edge of each convolution being exposed within the bore, whereby
 35 when the body is engaged around an element said edges contact said element.

4. A packing element including, a cylindrical elastic body having a bore extending there-
 40 through, and a helical resilient reinforcing member embedded within the body and having flat convolutions with the inner edge of each convolution being exposed within the bore, whereby
 45 when the body is engaged around an element said edges contact said element, the outer edges of the convolutions being spaced inwardly a sufficient distance to provide a substantial body of elastic material between said outer edges and the outer surface of the elastic body, whereby an
 50 outer layer of elastic material of substantial thickness surrounds said reinforcing member and may yield inwardly independently of said member.

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