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RECUPERABLE PACKER

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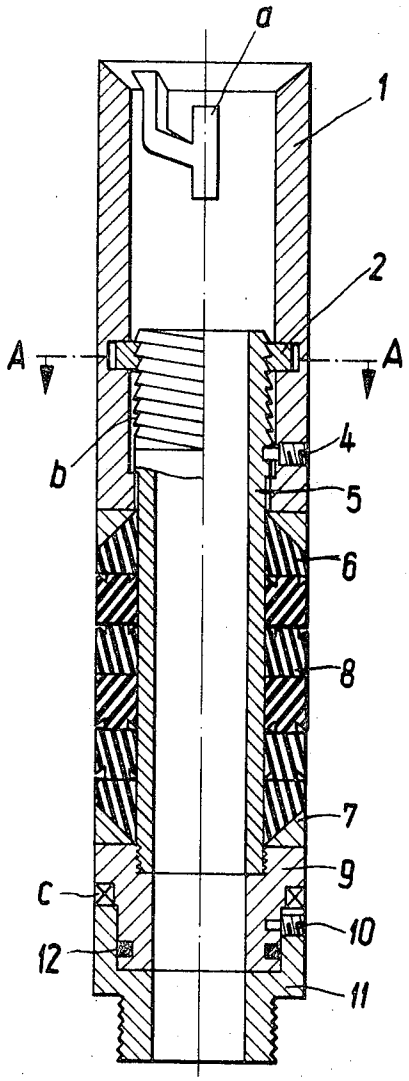


Fig. 1

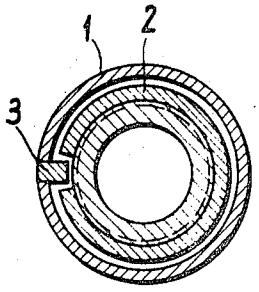


Fig. 2

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RECUPERABLE PACKER

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U.S. Cl. 166—182 5 Claims

ABSTRACT OF THE DISCLOSURE

A packer with a blocking system made up of a split sleeve having an interior thread, with such a profile, that when an axial force, necessary for the compression of the elastic tightening elements is applied to the packer this sleeve opens and moves downward. The sleeve engages successive teeth of a thread provided the interior surface of the upper end of the central tube of the packer, this packer thus remaining in a blocked state on the pipe string. For the recuperation of the packer from the wall, a bayonet-type system is used for coupling and uncoupling, which couples the packer, while by a clockwise rotation of about seven turns, the split sleeve is unscrewed from the central tube. The elastic tightening elements are distended and thus permit the disengagement of the packer from the pipe string, by a lifting of the extraction pipes.

The invention concerns a recuperable oil-well or gas-well packer without jaws; the activation of the packer being effected by compressive stress as realized by its setting on the bottom of the oil well or gas well, while the releasing (the unblocking) is obtained by a clockwise rotation of the extraction-pipe string.

There are known several types of packers in which the stressing necessary to effectuate sealing in the casing is realized by the application of an axial force alone or by the application of an axial force concurrently with a clockwise rotation of the extraction pipes while the releasing action (the unblocking) or destressing is obtained by a left-hand rotation of the pipe string.

These packers present the disadvantage that during the left-hand rotation of the extraction pipes for destressing of the packing there may arise technical disadvantages, often as serious as major accidents, as a consequence of the unscrewing of the pipe string.

The packer according to the invention avoids these disadvantages, by providing the packer with a blocking system made up of a split sleeve having an interior thread, of such profile, that when the axial force necessary for the compression stressing of the elastic tightening elements is applied to the packer, this sleeve opens and moves downwardly, engaging itself successively in the threads provided on the exterior surface of the upper end of the central tube of the packer. This packer thus remains in a blocked state on the pipe string. For the recuperation of the packer from the well, we make use of a bayonet-type system for coupling and uncoupling, which couples the packer, while by a clockwise rotation of about seven turns, the split sleeve (actuated by a longitudinal sill provided in the upper socket) is unscrewed out of the central tube; the elastic tightening elements are distensible and thus permit the disengagement of the packer from the pipe string by a lifting of the extraction pipes.

In order to achieve a selftightening between pipe string and the elastic rubber seals, especially if there exist great differences of pressure, the sealing rings are provided on one of their axially facing surfaces with two circular grooves of rectangular or trapezoidal profile, which grooves are deformed during the tightening of the pipe

string; the external rims or edges bear with a circular contour upon the opposing tightening surfaces, this action being intensified proportionally to the action upon these grooves of the pressure differential while for the recuperation of the packer, if the filter should be blocked in the sand, the packer is provided with a coupling system made up of a claw arrangement, for taking up the torsional stress or torques, the disengagement of the packer from the filter being realized by the shearing off of some pins, which maintain in a coupled state a socket rigidly fixed to the packer and a joint rigidly fixed to the filter.

The invention is described below with reference to the drawing in which:

FIG. 1 represents a longitudinal section through the packer; and

FIG. 2 is a cross-section taken along the line A–A of FIG. 1.

According to the invention the packer is made up of a mobile sleeve **1**, provided at its upper part with H-like slits *a* for the coupling and uncoupling of the extraction pipes, with the aid of an otherwise known bayonet-type system.

In the interior of sleeve **1** there is guided another split sleeve or ring **2**, provided with an inner thread; a longitudinal sill or key **3** rigidly fixed to sleeve **1** imparts to the sleeve **2** a movement of rotation. The upper sleeve **1** is connected at its bottom to a central tube **5** by some shear pins **4**, the upper end of the tube **5** being provided with an external left-hand thread *b*, with a toothing such that, when an axial force is applied to the packer, the split sleeve **2** can glide, by its thread, together with sleeve **1** on the inclined plane of the flanks only in one sense, i.e., downwardly. The profile of this thread permits the retirement or withdrawal of the split sleeve **2** only by its unscrewing.

On this central tube there are also mounted some elastic elements including two rubber end rings **6**, each of them covered partially by a funnel-like ring **7** of lead and several intermediate rubber rings **8**.

The funnel-like or frustoconical wedge-section construction of the leaden rings **7** permits them to be readily stressed and applied towards the wall of the pipe string, realizing on its surface the tightening and the blocking of the packer.

The intermediate rings **8** are each provided on one of their frontal faces with circular grooves, whose flanks are inclined frustoconically upwardly and downwardly towards the interior, thus forming some steps, which when placed on the plane frontal surface of the adjoining ring, form annular spaces with rectangular or trapezoidal longitudinal profile—depending on the right or oblique cut of the grooves. We are thus able to realize a good self-tightening of the assembly because the edges of the grooves expand easier under the influence of pressure escape, adhering on the tightening surface, this section being proportional to the difference of pressures.

The packer is thus mounted such that the grooves of the intermediate rings **8** are oriented in both senses (i.e., the top two are turned upwardly and the bottom two are turned downwardly), so that the packer has the possibility of working when subjected on both sides to differential pressures.

At its bottom end the packer is provided with a unit made up of a sleeve **9** having at its upper end an inner thread and at its bottom end some coupling claws *c* with which it is fixed to a bottom connection **11**, provided with corresponding coupling claws and with an outer thread for the connection with the filter (shown in the drawing).

Four or more shear pins **10** are utilized for fixing sleeve **9** to connection **11**, an elastic seal **12** being provided for the tightening of the joint.

Sleeve **9** is also utilized by threaded attachment to the tube **5** as the seat for the elastic tightening elements about the inner tube **5**.

The shearing pins **10** yield to the traction when the filter is blocked in the sand whereas the coupling claws protect these pins when the assembly is subjected to rotational movements.

The packer is introduced into the oil well or gas well, utilizing to this end a bayonet-type device, with a filter mounted on its bottom end.

When the filter is supported by the bottom of the oil or gas well, there is applied to the packer an axial force, exerted by a part of the weight of the extraction pipes, such that the blocking pins **4** are sheared off.

The shearing of the pins **4** is followed by a downward displacement of the extraction pipes, with the upper sleeve **1**; in the same time the split sleeve **2** opens and glides downwards, compressing the elastic tightening elements **6**, **7** and **8**; at the end of the compression action the split sleeve engages the corresponding thread *b* of the central tube **5**, maintaining in a compressed position the whole unit of the elastic tightening elements **6**, **7** and **8**.

For the extraction of the packer from the oil well or gas well the string of extraction pipes is turned clockwise with about seven turns and then it is pulled out till the packer is disengaged.

The clockwise rotation unscrews the split sleeve **2** from the thread *b* of the central tube **5**, which causes the distention of the elastic tightening elements **6** and **8** thus permitting by traction their disengagement from the pipe string.

If the filter is blocked with sand and can't be extracted, then applying to the pipe string a greater force of extraction the pins **10** will be sheared and thus the sleeve can be disengaged from the connection **11** and the packer can be extracted, only the filter still remaining in the oil or gas well.

We claim:

1. A retractable packer for the sealing of a well casing, comprising a pair of axially spaced annular seal seats axially shiftable relatively to one another; a stack of elastic sealing rings received between said seats and axially compressible therebetween upon movement of said sheets relatively toward one another to force said rings outwardly into sealing engagement with a surrounding wall, an upper one of said seats being formed internally with an internally threaded split sleeve anchored to said upper seat for axial and angular movement therewith while being radially deflectable relatively thereto; a central tube passing through said stack and extending into the lower one of said seats, said tube having an upper end received in said upper sleeve and externally threaded for engagement by said sleeve, the threads of said sleeve and said upper end of said tube being complementary whereby relative rotation of said sleeve and said tube withdraws said sleeve from said tube to decompress said rings, said threads having a saw-tooth profile oriented to permit unidirectional ratchet movement of said sleeve along said tube upon axial application of force to said upper sleeve to compress said rings, said teeth preventing inverse axial movement of said sleeve with respect to said tube in the absence of the previously mentioned relative rotation.

2. The retractable packer defined in claim **1** wherein said upper and lower seats are respectively formed with a bayonet coupling for attaching the packer to a pipe string and with connecting means for fastening a filter to said packer, said sleeve being formed with a slot, said upper seat having a key received in said slot for angular entrainment of said sleeve, said upper seat being further provided with at least one shear pin radially interconnecting said upper seat and said tube.

3. The retractable packer defined in claim **2** wherein at least some of said rings are provided each with a pair of circular grooves of generally frustoconical configuration along surfaces confronting others of said rings whereby axial compression of said rings between said seats results in deformation of the rings to bring edges of said grooves into sealing engagement with the respective confronting surfaces.

4. The retractable packer defined in claim **3** wherein said stack is flanked by a pair of frustoconical lead rings bearing upon the elastic rings for wedging said elastic rings outwardly.

5. The retractable packer defined in claim **3** wherein said connecting means comprises a further sleeve axially aligned and rotatable with said lower seat, said further sleeve and said lower seat being formed with complementary interengaged claw means enabling axial separation thereof but rotatably interconnecting them, said lower seat and said further sleeve being provided with radial shear-pin means axially interconnecting them and destructible for withdrawal of the packer from a well upon blockage of a filter affixed to said further sleeve.

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