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W. T. ILFREY ET AL
WELL PACKER

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2 Sheets-Sheet 1

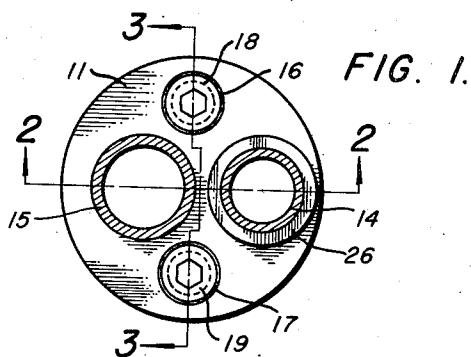


FIG. 2.

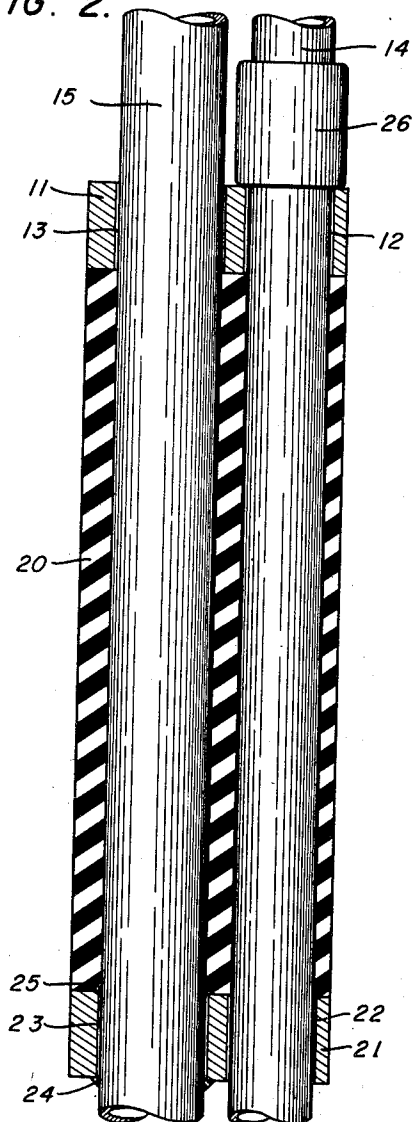
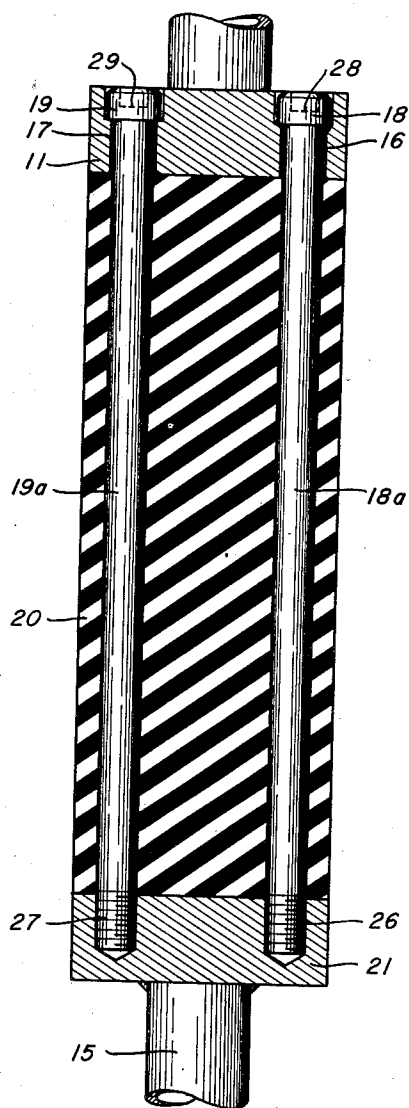


FIG. 3.



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FIG. 4.

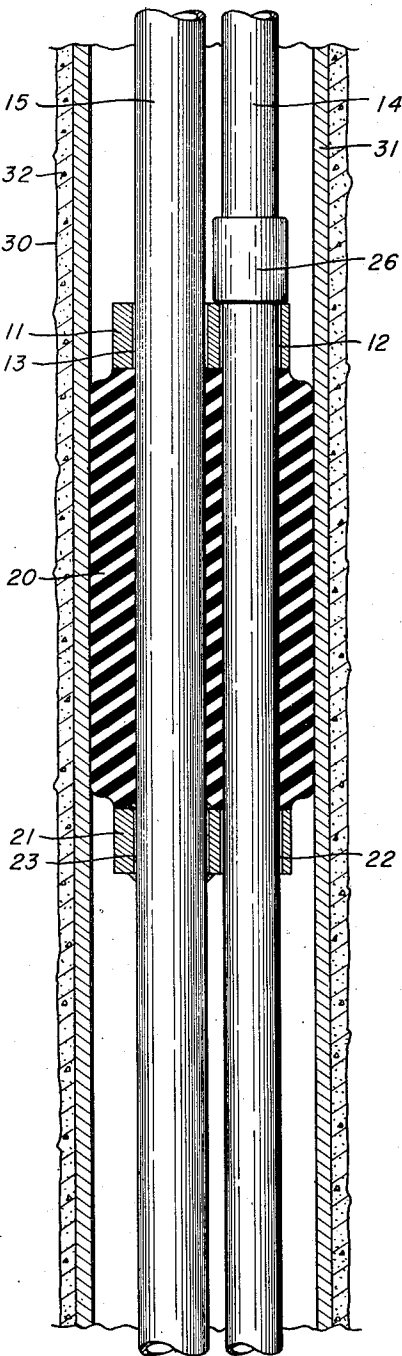
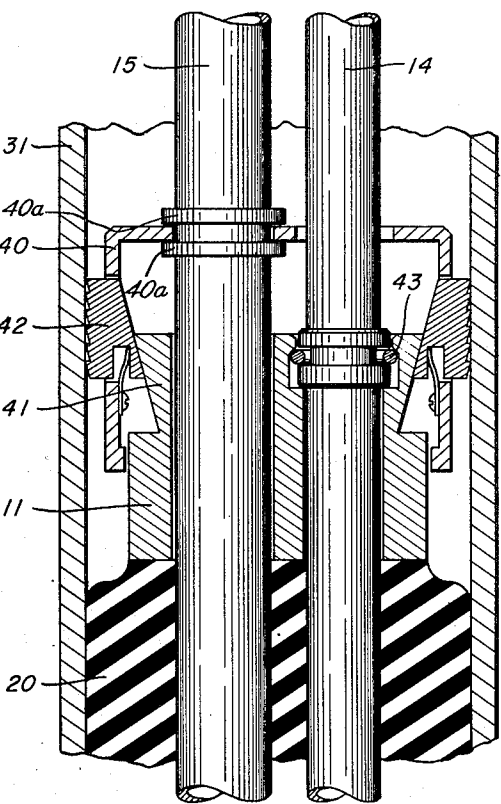


FIG. 5.



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WELL PACKER

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2 Claims. (Cl. 166—118)

The present invention is directed to a well packer. More particularly, the invention is concerned with a compression-type well packer. In its more specific aspects, the invention has to do with a well packer for use in sealing the annular space between a plurality of side-by-side tubing strings and a well bore.

The present invention may be briefly described as a well packer for use in sealing the annular space between a plurality of side-by-side tubing strings and a well bore and around one or a plurality of tubing strings which comprises a compressible packing element mounted on the tubing strings for vertical movement of the tubing strings with respect to the packing element. The packing element is confined between first and second plate members having passageways for said tubing strings. The plate members are interconnected by a flexible means which extends through the packing element. One of the plate members is fixedly connected to one of the tubing strings and the other of the plate members is urged into compression by the other of the tubing strings.

A problem exists in multiple completions where parallel strings of pipe are used in side-by-side relationship for production of oil and/or gas from a plurality of production zones. Packers have been used wherein compression is provided to the packer by setting down the tubing or by rotation of the element for setting the packer. These procedures are undesirable in multiple and/or dual completions. Also a drillable upper packer is undesirable since when it is drilled, the lower packer must also be drilled to clean junk from the well bore. The problem of providing a compression-type packer for use in dual or multiple completions has been solved in accordance with the present invention in which the tubing is employed to actuate the packer by maintaining a slight tension on one tubing and setting down with the other tubing to provide compression to the packer.

The present invention will be further illustrated by reference to the drawing in which:

Fig. 1 is a view looking downwardly on the device of the present invention;

Fig. 2 is a partial sectional view taken along the lines 2—2 of Fig. 1;

Fig. 3 is a view taken along the lines 3—3 of Fig. 1;

Fig. 4 shows an arrangement of the device in a well bore in operative position; and

Fig. 5 shows a modification of a plate member of the device provided with slips to engage the wall of the well bore.

Referring now to the drawing in which identical numerals will be employed to designate identical parts, numeral 11 designates an upper plate of the packing element of the present invention which is provided with ports 12 and 13 through which tubings 14 and 15 extend. Tubing 14 extends to an upper productive zone and tubing 15 extends to a lower productive zone. The plate 11 has passageways 16 and 17 in which are arranged the upper ends 18 and 19 of flexible connecting means 18a and 19a which will be described in further detail hereinafter.

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Referring now particularly to Fig. 2, it will be seen that the upper plate 11 confines a compressible packing element 20 and the lower plate 21 confines the packing element 20 on the lower end thereof. The lower plate 21 has passageways 22 and 23 for the tubings 14 and 15. The lower plate 21 is rigidly attached to the tubing 15, for example by welding at the points 24 and 25.

The tubing 14 has a coupling member or shoulder 26 which is adapted to rest on the plate member 11.

Referring now to Fig. 3, it will be seen that the flexible connecting means 18a and 19a, which suitably may be wire cables, metallic rods, and the like, are threadedly connected by mating threads 26 and 27 into plate 21 while the upper ends 18 and 19 are arranged loosely in the passageways 16 and 17. Suitably the upper ends 18 and 19 may be hex nuts which may be threadedly connected into flexible connecting means 18a and 19a and the upper ends 18 and 19 may be provided with recesses 28 and 29 for insertion of a tool such as a wrench to tighten up on the connections.

Referring now to Fig. 4, the operation of the device may be described. Arranged in a well bore, such as 30, is a casing 31 which is cemented in place with cement 32. Parallel strings of tubing 14 and 15 are arranged in the casing 31 with the compressible packing element 20 being confined between the plates 11 and 12. The tubings 14 and 15 may be run in and set in the casing 31 separately or together. When it is desired to expand the packer to seal around the tubings 14 and 15 and between the tubings 14 and 15 and casing 31, tension will be exerted on tubing 15 and tubing 14 will be set down on the plate 11. By providing a coupling or shoulder 26 to rest on the plate 11, the packing element 20 is urged into compression by the tension on tubing 15 and the setting down of tubing 14. Since the plate 11 may be compressed by tubing 14 and since the tubing 14 is movable in the passageway 12, and since the tubing 15 is not restricted by the plate 11 in passageway 13, it may be seen that the packing element 20 may be compressed and urged into sealing engagement with the interior wall of the casing 31.

It may be desirable to provide the apparatus of the present invention with pipe engaging means or pipe latching means, such as pipe slips and the like; to this end the upper or the lower plate of the device of Figs. 1 to 4 may be provided with pipe slips. For purposes of illustration only, the upper plate 11 in Fig. 5 is provided with a spring slip cage 40 and slip wedges 41 on which pipe slips 42 are arranged for wedging into contact with the interior wall of the casing 31. Slip cage 40 is connected by collars 40a to tubing string 15. When the tubing 14 is set down on plate 11, a downward movement of the slip wedge 41 causes the slip 42 to be urged outwardly into contact with the interior wall of the casing which will hold the packer element 20 in fixed position with respect to the tubings 14 and 15. The snap ring 43 serves to urge the plate 11 upwardly and allow actuation of the slips 42 by wedges 41.

The device of the present invention is of considerable importance in multiple completion operations in oil and gas wells and is not subject to failure because of its particular and unique construction.

The nature and objects of the present invention having been completely described and illustrated, what we wish to claim as new and useful and to secure by Letters Patent is:

1. A well packer for use in sealing the annular space between and around a plurality of side-by-side tubing strings and a well casing which comprises, a compressible packing element fixedly mounted on a first of said tubing strings for vertical movement with respect to a second of said tubing strings, a first plate member having passageways for said tubing strings confining the upper end

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of said packing element, a second plate member having passageways for said tubing strings confining the lower end of said packing element, flexible means extending through said packing element and interconnecting said plate members, the second of said plate members being fixedly connected to the first of said tubing strings, said packing member being urged into compression by applying the weight of the second of said tubing strings on said packing member and by exerting tension of the first of said tubing strings, and pipe slips on said packer actuatable by downward movement of the second of said tubing strings and the first of said plate members relative to the pipe slips, said downward movement setting said pipe slips and compressing said packing member simultaneously into engagement with the interior wall of said casing.

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2. A well packer in accordance with claim 1 in which the first plate member is formed to provide wedge surfaces in operative relationship with corresponding surfaces on said pipe slips and in which said pipe slips are maintained on said first plate member by a slip cage connected to the first of said pipe strings.

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