Jan. 6, 1953

C. H. SWEET

2,624,603

WELL PACKER RUBBER

Filed Sept. 13, 1949

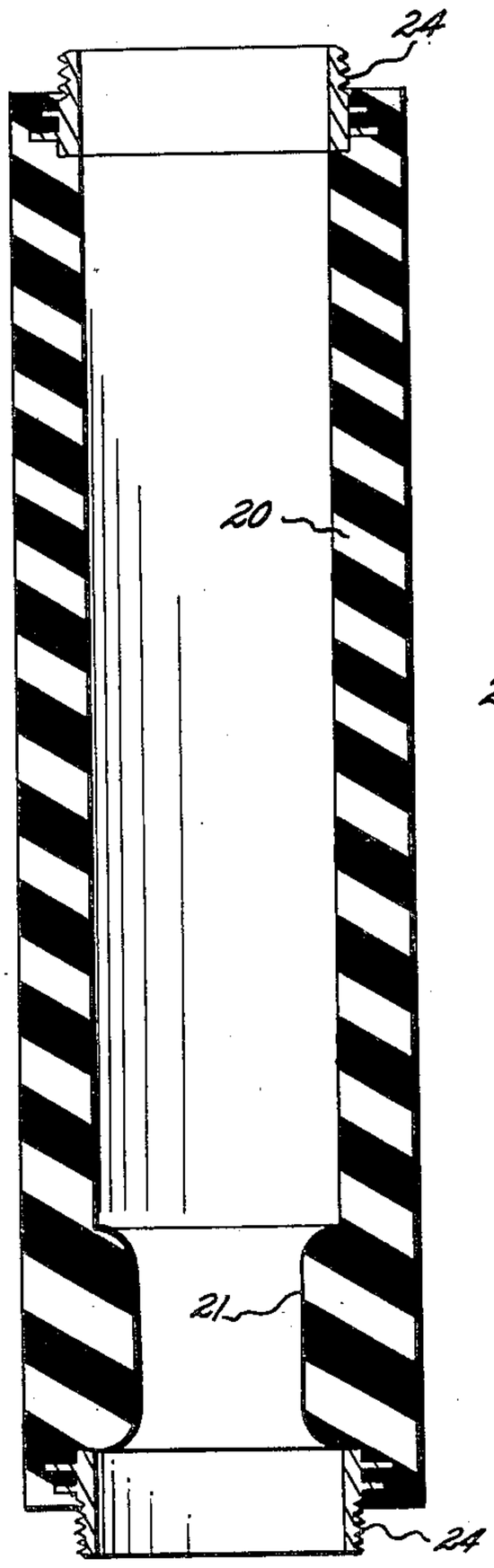

FIG. I

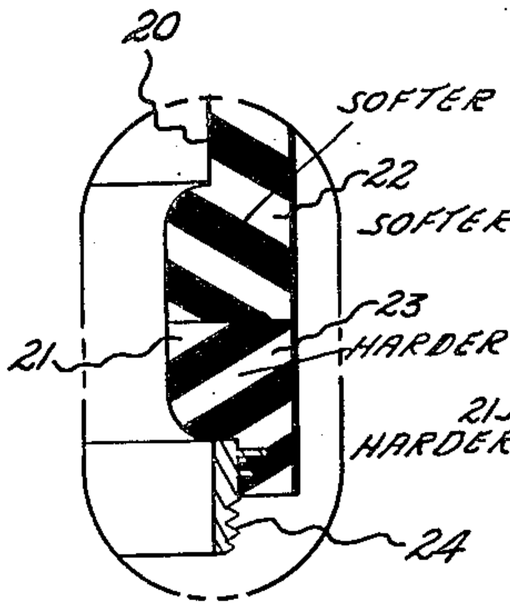

FIG. IV

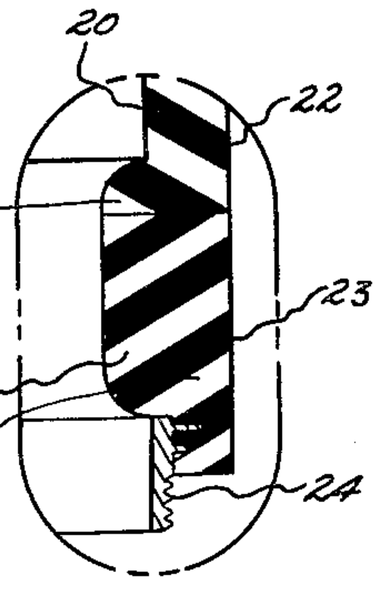

FIG. V

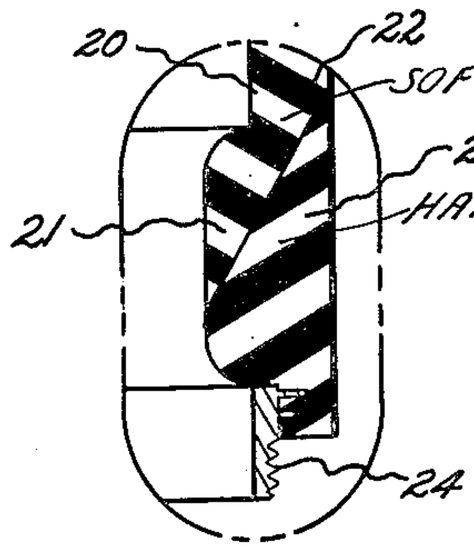

FIG. III

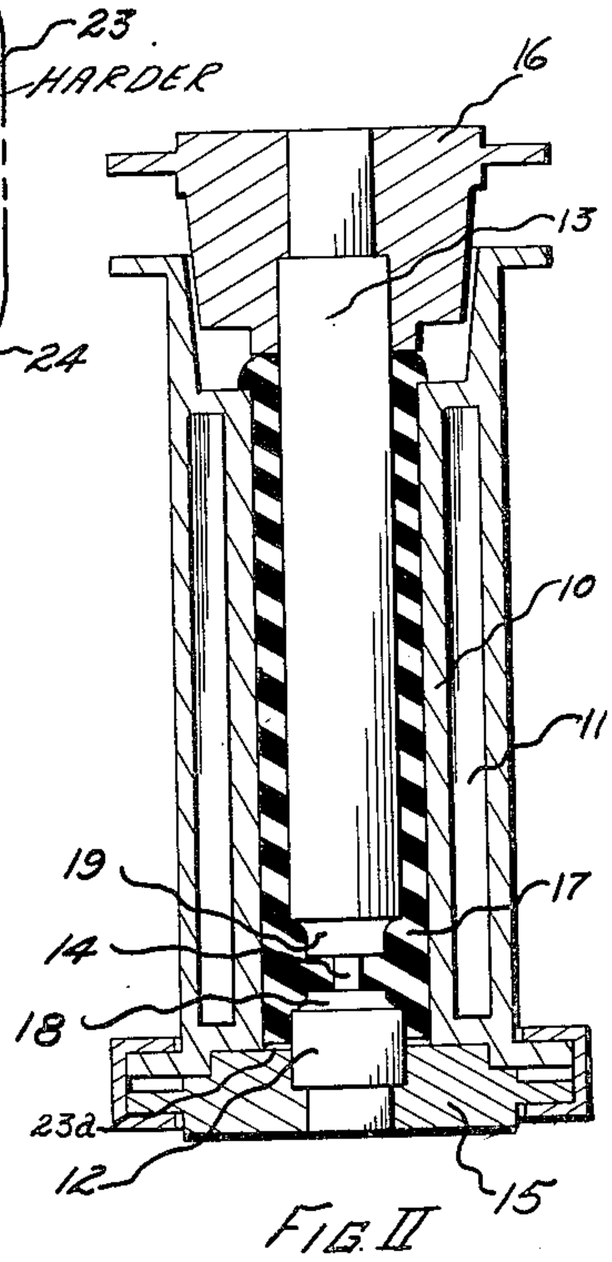

FIG. II

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2,624,603

WELL PACKER RUBBER

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Application September 13, 1949, Serial No. 115,351

11 Claims. (Cl. 288—2)

1

This invention relates to oil well packers and particularly to the resilient, deformable element thereof usually made of natural or synthetic rubber.

The usual manner of effecting a seal or pack between packer mandrels and the well bore or casing is to compress the packing element between seats which may be properly manipulated through a string of tubing or drill pipe by which the packer assembly is lowered into the well.

It is well known that with packing elements heretofore used in the art when the packing element was compressed from the seat provided on the tubing string the first distortion and engagement with the well bore or casing occurs at or near the upper end of the element and upon applying further load by lowering of the tubing string that part of the packing element first engaging the well bore must be slid along its contact therewith which generally tears or ruptures the packing element, frequently causing the pack to be lost or the element itself to become lodged and bound irretrievably in the well.

I have provided a novel packing element which readily overcomes the foregoing defects and enables me to effect the expansion and initial setting of a predetermined position of the packer.

My present invention primarily deals with the packing element per se while in my co-pending application Serial No. 115,352, filed September 13, 1949, I have shown novel structure for effecting the setting and retrieving of my novel packing element.

Proceeding now with the description together with the accompanying drawing:

Fig. I is an elevation of one form of my packing element.

Fig. II is a mold in section with my packer rubber in place as formed.

Figs. III, IV, and V show modified forms of a stction of my packer rubber.

In the several views like references indicate similar parts, wherein **10** is an outer section of a cylindrical mold which may be provided with suitable steam jacket **11** for effecting curing of the packer by the introduction of steam thereinto by conventional piping through openings not shown. **12** and **13** are telescoping inner mandrel sections which are guided to mating relation as section **13** passes over stinger **14** of section **12**, while heads **15** and **16** close the ends of outer mold **10** and compress the rubber load **17** about mandrel sections **12** and **13** and inside mold **10** to form the packer into final shape under pressure as desired while the same is cured. Now it

2

will be noted that mandrel sections **12** and **13** have at their mating ends reduced body portions **18** and **19** so that when completely closed, the mold will form a packing rubber element with graduated inside diameters such as shown at **20** and **21** of Figs. I, III, IV, and V. By a suitable arrangement of inside mandrel parts these graduations of inside diameters may be positioned as desired. In Fig. II the rubber element is shown having sections at each end of the same diameter with an intermediate section of other and varying diameters adjacent one end.

In Fig. I, I have shown my rubber packer of uniform hardness throughout, however, I have found it desirable to provide sections of my packer with hardnesses varying at different points along its body such as hard at one or both ends or hard at the restricted or minor portion of its axial bore as shown at **22—23** in Figs. III, IV, and V, the portion **23** being harder than the portion **22**. The advantage of providing the lower harder portion **23** is that, when the packer is set, the harder rubber **23** will flex outwardly enough to contact the well casing, but will be too hard to flow longitudinally downwardly between the well casing and the lower packer seat. The prohibiting of such flow is highly desirable since, if allowed to occur, the rubber is so far distorted that it tears and is ruined as far as reuse is concerned and in addition usually becomes irretrievably wedged so that the whole packer unit can only be removed by destroying said unit. **24** is a metal insert to which the rubber may be vulcanized and is for convenience in manipulating the packer rubber in setting the same in and retrieving it from a well.

From the foregoing, other modifications of my invention will readily occur to those skilled in the art and all such are meant to be included as falling within the scope of the following claims.

What I claim is:

1. A well packer comprising an elongated cylindrical member of resilient material having a major bore section therethrough; and a relatively shorter internally restricted section forming a minor bore therein, said restricted section graduating from the major diameter and back again thereto and being located nearer one end of the packer than the other end.

2. A well packer comprising an elongated cylindrical member of resilient material having a major bore section therethrough; and a relatively shorter internally restricted section forming a minor bore therein, said restricted section graduating from the major diameter and being located

nearer one end of the packer than the other end.

3. In a well packer as set forth in claim 2, a second even shorter internally restricted section forming a secondary minor bore in said minor bore and spaced from the ends thereof.

4. In a packer as set forth in claim 2, said resilient material being rubber, the longer portion of the packer being softer rubber and the shorter portion from the minor bore to the end of the packer adjacent thereto being harder rubber.

5. In a packer as set forth in claim 2, said resilient material being rubber including adjacent relatively softer and harder portions bonded together along an axial frustroconical intersection extending from within the minor bore to the outer surface of the member opposite the major bore, the portion adjacent the major bore being the softer.

6. In a packer as set forth in claim 2, said resilient material being rubber including adjacent relatively softer and harder portions bonded together along a plane normal to the axis of the bores and passing through the minor bore, the major bore portion being the softer rubber.

7. A well packer comprising an elongated cylindrical member of resilient material having a major bore section therethrough; a relatively shorter internally restricted section forming a minor bore therein, said restricted section graduating from the major diameter and being located nearer one end of the packer than the other end; and an annular metal ferrule partially embedded in each end of the packer.

8. In a well packer as set forth in claim 7, a second even shorter internally restricted section forming a secondary minor bore in said minor bore and spaced from the ends thereof.

9. In a packer as set forth in claim 7, said resilient material being rubber, the longer portion of the packer being softer rubber and the shorter portion from the minor bore to the end of the packer adjacent thereto being harder rubber.

10. In a packer as set forth in claim 7, said resilient material being rubber including adjacent relatively softer and harder portions bonded together along an axial frustroconical intersection extending from within the minor bore to the outer surface of the member opposite the major bore, the portion adjacent the major bore being the softer.

11. In a packer as set forth in claim 7, said resilient material being rubber including adjacent relatively softer and harder portions bonded together along a plane normal to the axis of the bores and passing through the minor bore, the major bore portion being the softer rubber.

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