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McGinn

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[54] **WELL TUBING MANDREL WITH COMBINATION GUARD AND GUIDE**

[76] Inventor: **Ferdinand M. McGinn**, P.O. Box 51971, Lafayette, La.

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[52] **U.S. Cl.** **166/117.5**

[51] **Int. Cl.** **E21b 7/06**

[58] **Field of Search** 166/117.5

[56] **References Cited**

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Primary Examiner—Werner H. Schroeder

[57] **ABSTRACT**

A mandrel for use in a well tubing has a body with a bore extending therethrough for alignment with the well tubing, a valve pocket is offset from the mandrel bore for receiving a valve or other tool therein, and guard means of a particular configuration are formed at the upper end of said pocket to restrict access thereto.

1 Claim, 3 Drawing Figures

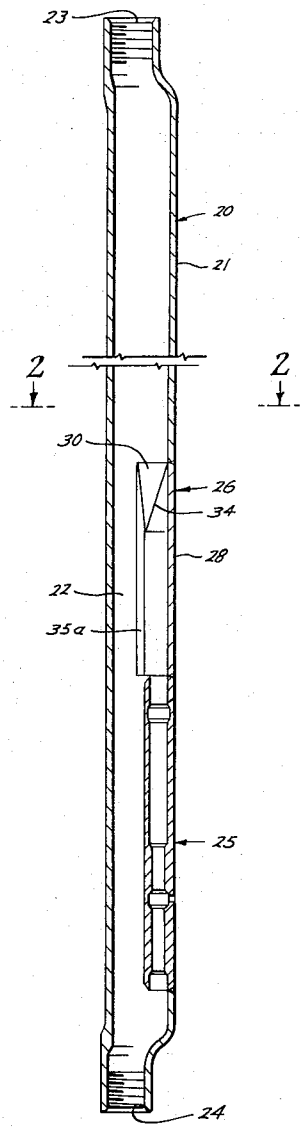


Fig. 1

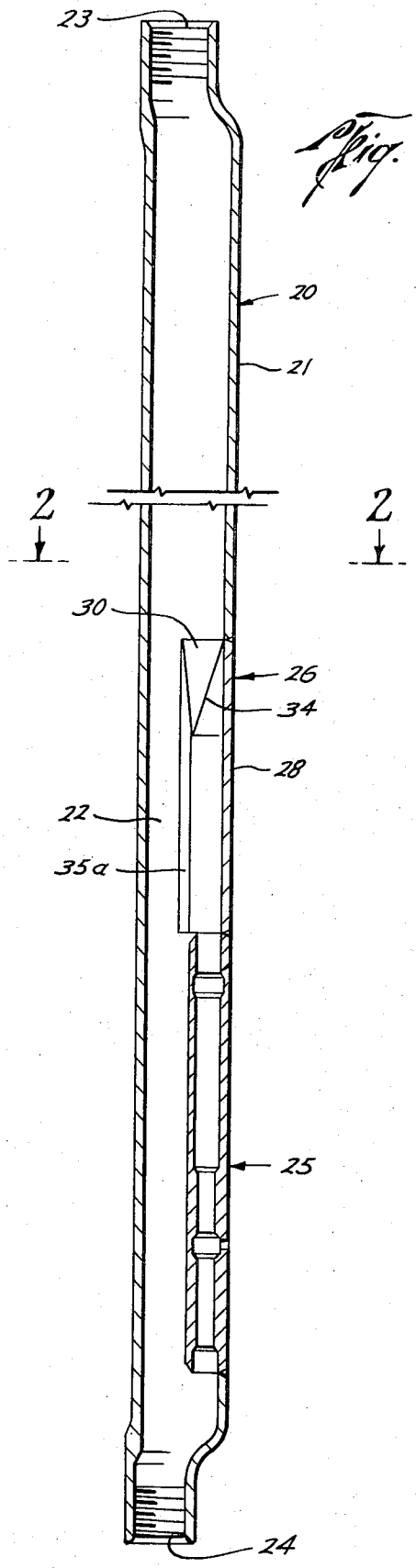


Fig. 2

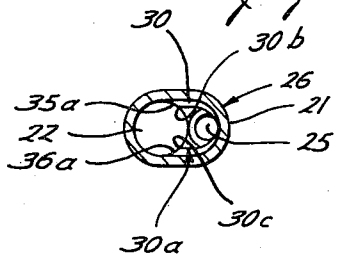
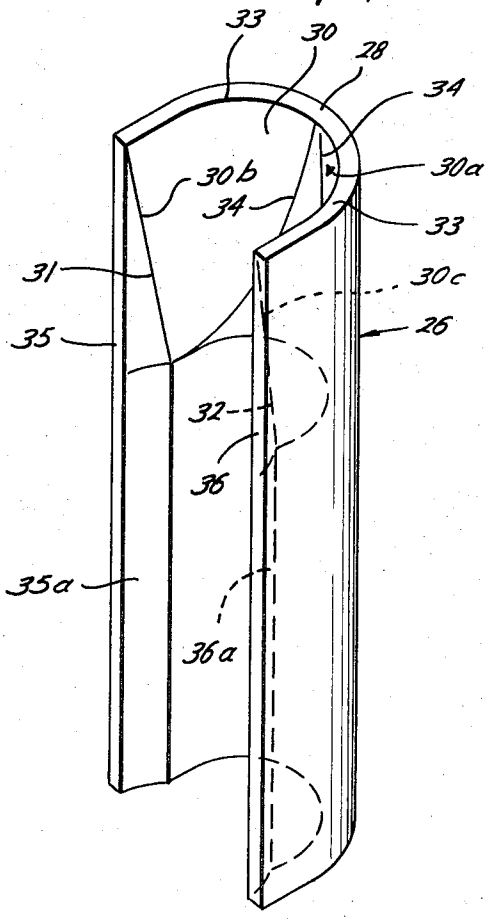


Fig. 3



WELL TUBING MANDREL WITH COMBINATION GUARD AND GUIDE

CROSS REFERENCE TO RELATED APPLICATION

The present invention discloses and claims a combination guard and guide for use in conjunction with my invention "WELL TUBING MANDREL WITH GUARD AND ORIENTING SLEEVE" in my copending application bearing Ser. No. 230,781 and filed Mar. 1, 1972, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to retrievable mandrels and particularly to retrievable mandrels for receiving valves therein, which mandrels are provided for use in well tubing at spaced intervals therealong. The mandrels have a full opening bore extending therethrough for alignment with the well tubing to permit wireline tools to be run therethrough, or to permit tubing tools to be pumped therethrough.

The mandrel also includes a pocket offset from the mandrel bore to receive a retrievable valve or other flow control element.

A combination guard and guide of relatively simple configuration is provided at the upper end of the pocket and is constructed and arranged to permit devices of a desired or predetermined diameter to enter the side pocket. Other equipment either pumped or run on a wireline in the tubing will be restricted from access to the pocket by such guard, and the guard is constructed and arranged so that safety valves, fishing tools, and other similar equipment will not enter or hang up on the valve pocket or on the guard, but will be guided back into the main bore of the mandrel for movement through the tubing.

Also, the guard is constructed in a manner so that while accomplishing its function, it inhibits the collection of debris such as wax, paraffin, or other substances that may tend to settle from fluids in a tubing flow string from interfering with the normal operation of the guard.

The present invention is directed to a guard adapted to be employed with a side pocket mandrel to selectively restrict access to the side pocket.

The present invention also is directed to a guard construction which does not employ surfaces that might tend to collect debris such as wax, paraffin, or other substances entrained in liquid flow in a tubing, which collection of substances might otherwise interfere with the normal operation of the guard.

Still another object of the present invention is to provide a guard at the upper end of a side pocket in a side pocket mandrel which does not present any sharp surfaces or ledges in the flow path in the tubing, but which includes guide surfaces to guide tubing tools which might otherwise tend to enter the valve pocket back into the main of the mandrel for movement through the tubing and thus selectively restrict access to the valve pocket.

Still another object of the present invention is to provide a plurality of side pockets in a well tubing stream having a combination guard and guide thereon of a predetermined diameter, with the guard in each valve pocket being substantially the same size.

Other objects and advantages of the present invention will become apparent from a consideration of the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view of a mandrel showing the main bore, offset valve pocket, and combination guard and guide at the upper end of the valve pocket;

FIG. **2** is a sectional view on the line **2—2** of FIG. **1**; and

FIG. **3** is a perspective view of the combination guard and guide.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Attention is first directed to FIG. **1** of the drawings wherein a mandrel represented generally at **20** is shown as including a body **21** having a bore **22** extending therethrough with threads **23** and **24** formed at each end of the body for connecting the mandrel into a tubing string. When the body **21** is connected in the tubing string (not shown), the bore **22** is aligned with the bore of the tubing string for receiving various tubing equipment therethrough such as safety valves, fishing tools, and the like, as well as gas lift valves and control valves to be seated within the mandrel **20.**

The mandrel **20** includes a side pocket referred to generally at **25** which forms a receptacle for receiving a flow control valve or gas lift valve therein.

The tubing bore equipment inserted in the tubing string may be in some instances pumped down, or lowered on a wireline, and it is desirable that such equipment not enter the side pocket **25.** It can be appreciated that where deviated holes are encountered, or due to other circumstances, such tubing equipment may move to the lateral offset portion of the mandrel away from the main bore **22** therethrough and tend to enter the valve pocket **25.**

To overcome this, a combination guard and guide **26** is arranged at the upper end of the valve pocket **25** as shown in FIG. **1** to restrict access thereto so that only tools of a predetermined diameter will pass into the guard **26** and then be guided into the valve pocket **25** for seating therein. Where a plurality of mandrels are at spaced intervals in the tubing string, it is generally desirable that the guard **26** with each mandrel be of substantially the same diameter throughout the tubing string.

It will be noted that the valve pocket **25** is illustrated as being welded into the mandrel **22,** but the mandrel **20** may be formed in any suitable manner well known in the art. The guide pocket **26** is also illustrated as being welded adjacent the upper end of the valve pocket **25,** and in FIG. **3,** the configuration of the guard **26** is more clearly illustrated.

It can be seen that the body of the guard is of a generally semicircular shape, the portion **28** of which forms a wall of the mandrel **20** as illustrated in FIG. **1.** The upper end of the guard is provided with a particular interior surface configuration including a pair of surfaces, one of which is referred to at **30,** and the other at **30*a*.** The surfaces **30** and **30*a*** are formed by sloping the sides of the semicircular body member from the upper end of the body member as illustrated at **31** and **32,** such sloping configuration extending downwardly and inwardly towards the center of wall portion **28** as represented by the lines **33** and **34.** The sides of the

semicircular body extend toward the opening body bore as shown in the drawings to define the front of the combination guard and guide. It will be noted that the outer edges **35** and **36** of the semicircular member **28** extend at right angles to the longitudinal axis of the body for a portion of the wall thickness of member **28** and then slope inwardly from their respective inner edges the remainder of the wall thickness of member **28** as illustrated at **35***a* and **36***a* in FIG. **3** of the drawings. The sloping surfaces **35***a* and **36***a* intersect the sloping surfaces **30** and **30***a*, respectively, at the upper or forward end of the body and then extend continuously throughout the body as shown. The intersection of the surface **35***a* and **30** is represented by the line **30***b* and the intersection of surfaces **30***a* and **36***a* is represented by the line **30***c*. Since surfaces **35***a* and **30** both are sloping, the line **30***b* is at an angle relative to the longitudinal axis of the body, as is line **30***c*.

In FIG. **2**, the sloping surfaces **30** and **30***a* are again illustrated in end view, as are surfaces **35***a* and **36***a*. The intersection of surfaces **35***a* and **30** is again represented at **30***b*, and the intersection of surfaces **36***a* and **30***a* at **30***c*.

FIG. **2** shows that surfaces **30** and **30***a* extend inwardly toward and blend into wall **28** adjacent the center of wall portion **28** at the forward or upper end of guide **26.**

It can be appreciated that the arrangement and configuration of the surfaces **30, 30***a*, **35***a*, and **36***a* is such that no sharp ledges or edges are provided in the guard which form a suitable collecting surface for paraffin, wax, or other debris flowing through the tubing and the bore **22** of the mandrel. On the other hand, the arrangement of the surfaces **30** and **30***a* is such that a device of only a predetermined diameter will be permitted to enter the valve pocket **25** immediately beneath the guard **26.**

Thus, when tubing equipment is either pumped or lowered into the tubing string on a wireline, it will be deflected from entering the valve pocket **25** should it move laterally of the bore **22** extending through the mandrel **20.** However, the diameter of the guard **26** is such that when it is desired to insert a tool in the pocket **25,** such may be accomplished without any problem since the guard **26** will permit such predetermined, sized device to be received within the pocket **25.**

From the foregoing description, it can be appreciated that an arrangement is provided which restricts access to the pocket **25** on the one hand, but which does not provide any surfaces that might tend to collect debris so as to interfere with the proper functioning of such guard surface.

The surfaces **30** and **30***a* will deflect tools and equipment of undesired size from the valve pocket **25** and urge them onto surfaces **35***a* and **36***a* to enable such tools to move back towards bore **22** and into the tubing string. However, when a valve or other device of predetermined diameter for insertion in valve pocket **25** engages the combination guide and guard **26,** it will guide such device into the pocket **25.**

The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape, and materials as well as in the details of the illustrated construction may be made without departing from the spirit of the invention.

What is claimed is:

1. In a mandrel for use in a well tubing including:

a. a body having an open bore extending therethrough for alignment with the well tubing;

b. a valve receptacle formed in said mandrel body and offset from the open bore of said body;

c. combination guard and guide means formed at the upper end of said valve receptacle and offset from the open bore of said body, said combination guard and guide including:

1. a body of generally semicircular shape having a portion which forms part of the mandrel body that is offset from the open bore of said mandrel body and is adajcent and above said valve receptacle;

2. said semi-circular body including sides extending toward the open body bore to define the front of said combination guard and guide;

3. said sides having upper ends, and each of said sides at their upper ends having an interior surface that is formed by sloping each side downwardly from its upper end and towards the center of the one portion which forms part of the mandrel body;

4. said sides having outer edges with each edge including a portion that slopes inwardly toward the center of the one portion that forms part of the mandrel body; and

5. said sloping interior side surfaces intersecting the sloping portions of said outer edges to define an opening in said guard and guide of a desired configuration to restrict access to said valve receptacle immediately therebelow.

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