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INTERCHANGEABLE TUBING HEAD SEAL AND CASING HOLD-DOWN AND TOOL GUIDE

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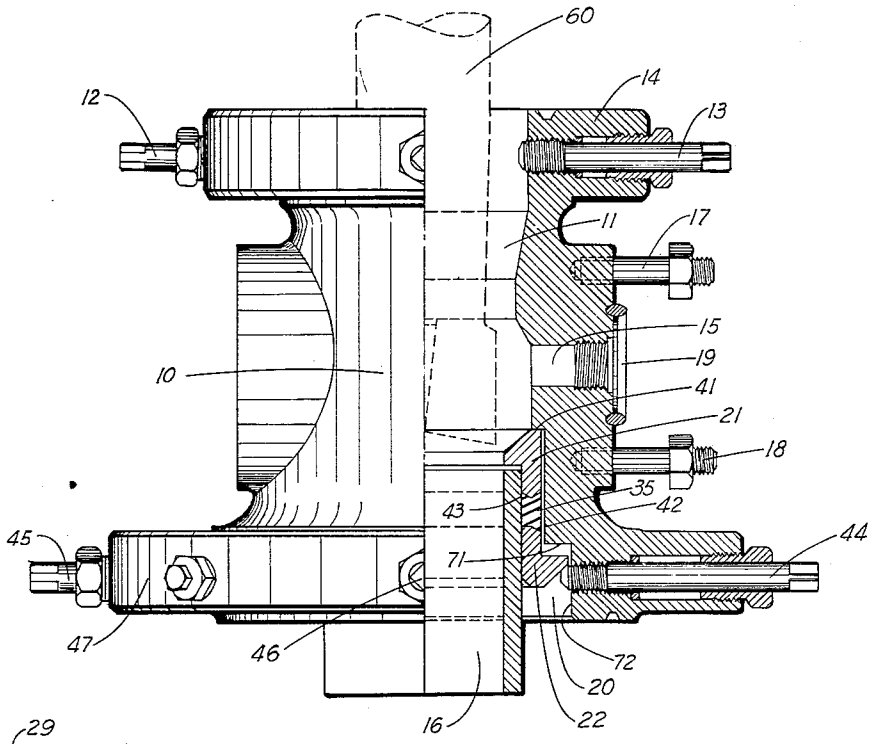



Fig. 1

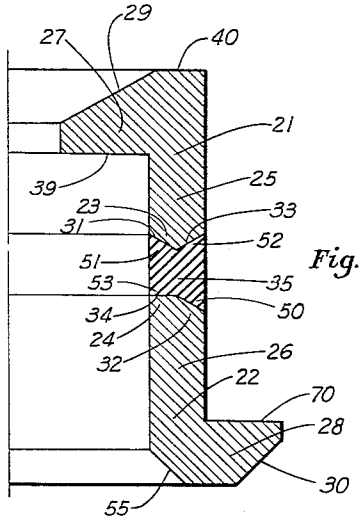



Fig. 2

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# INTERCHANGEABLE TUBING HEAD SEAL AND CASING HOLD-DOWN AND TOOL GUIDE

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4 Claims. (Cl. 285—22)

This invention pertains to an apparatus for use in well completion equipment to seal between the head and casing and hold down the casing and guide tools through the head into the casing and more particularly to such apparatuses interchangeable with one another to adapt a given size tubing head to different sizes of casing.

An object of the invention is to provide such an apparatus that will serve as a tubing head seal and casing hold-down and tool guide.

A further object of the invention is to provide such an apparatus that can be changed in size to fit different sizes of casing with the same size tubing head so that a single size tubing head together with a set of such interchangeable apparatuses for different casing sizes will suffice to equip any one of a number of different wells having different casing and tubing sizes, thereby reducing the number of sizes of tubing heads that need be stocked.

Other objects and advantages of the invention will become apparent from the following description of a preferred embodiment thereof, reference being had to the accompanying drawing in which:

Figure 1 is a vertical quarter section through a tubing head and casing showing an apparatus according to the invention disposed therebetween; and

Figure 2 is an enlarged fragmentary sectional view of said apparatus.

Referring to the drawing, there is shown a flanged tubing head **10** having a tapered bowl to receive a hanger (not shown) in which a string of tubing can be suspended. Lock screws such as **12** and **13** are disposed around the upper flange **14** of the tubing head to hold down the hanger. Passages such as **15** extend through the side of the tubing head to provide communication with the annulus, i. e., the space between the tubing and the casing **16** therearound. Passage **15** is threaded to receive a valve removal plug, and in addition there are studs such as **17, 18** around the passage and a steel ring gasket **19** which can be used if it is desired to make a flanged connection to passage **15**. Between the casing **16** and the tubing head **10** there is an apparatus **20**.

Referring now to Figure 2, apparatus **20** comprises a pair of coaxial upper and lower metal (steel) rings **21, 22**. These rings each comprise a straight cylindrical body having a radial flange at one end. The bodies of the rings have the same internal and external diameters. The rings are disposed with the unflanged end portions **23, 24** adjacent and the portions **25, 26** aligned and with the radial flanges **27, 28** extending respectively inwardly and outwardly. Flanges **27** and **28** are beveled on the faces thereof farthest removed from the unflanged ends as shown at **29, 30**, both bevels flaring, that is, getting progressively larger in diameter, in the upward direction, which is the direction going axially from the outwardly extending portion **28** to the inwardly extending portion **27**. The portions **23, 24** each has a beveled face **31, 32** flaring downwardly, which is the opposite direction from the flare of faces **28, 29**. Beveled face **31** lies on the



same side of ring **21** as inwardly extending portion **27** and beveled face **32** lies on the same side of ring **27** as outwardly extending portion **28**. Portion **23** also has a beveled face **33** flaring oppositely to face **31** and portion **24** also has a face **34** lying in a plane perpendicular to the axis of the rings.

Between faces **31—34** of the rings is disposed a gasket or seal ring **35** having upper and lower ends shaped complementary to faces **31—34**. Ring **35** is made of neoprene or some other rubberlike oil-resistant material which is resilient and has a low elastic modulus so that it can be deformed under pressure.

The inwardly extending portion or flange **27** on ring **21** has a face **39** that is perpendicular to the ring axis, and the upper end of the ring also has a face **40** that is perpendicular to the ring axis. When the apparatus **20** is in position between the tubing head and casing as shown in Figure 1, the end face **40** will seat on the internal downwardly facing internal shoulder **41** in the tubing head, and face **39** on the flange forms an abutment which overlies the upper end of casing **16** and defines the limit of upward travel of the casing in the tubing head.

As shown in Figure 1, the gasket **35** is confined between the lower end of the seat ring **21** and the upper end of the compression ring **22** and between the cylindrical inner bore **42** of the tubing head and the outer cylindrical surface **43** of the casing. A plurality of pressure screws such as **44, 45, 46** extending through lower flange **47** of the tubing head have conical ends bearing against the lower beveled upwardly flaring end surface **30** of ring **22**. As the pressure screws are screwed inwardly they force ring **22** upwardly, distorting ring **35** and forcing its lower beveled lip **50** (see also Figure 2) outwardly against the tubing head and forcing its upper beveled lip **51** inwardly against the casing, thus quickly forming a pressure seal between the tubing head and casing. At the same time lips **52** and **53** are also forced into engagement with the tubing head and casing. Summarizing, the engaged ends of the rings **21, 22** and **35** are of V section so that as rings **21** and **22** are brought together the lips **50—53** of ring **35** are spread apart outwardly. Lip **53** is squared off to facilitate retaining the seal ring in place when the tubing head is being placed over the casing during completion of the well. The lower end of ring **22** is internally bevelled at **55** to help guide the casing into the apparatus **20** during assembly.

After the apparatus has been installed, the beveled end face **29** of the upper or seat ring **21** serves to guide tools, such as the tool indicated at **60**, downwardly through the tubing head into the casing.

The external flange portion **28** of the lower or compression ring provides sufficient metal for the pressure screws **44** to bear against, so that the distance between cylindrical surfaces **42** and **43** of the tubing head and casing can be kept to a minimum. There is adequate clearance between the top surface **70** of the flange **28** and the shoulder **71** in the tubing head formed by the counterbore **72** to prevent flange **28** from contacting the tubing head prior to ring **35** making a seal.

By changing the internal diameters of apparatus **20**, the same tubing head can be used with a number of different sizes of casing.

While a preferred embodiment of the invention has been shown and described, many modifications thereof can obviously be made by one skilled in the art without departing from the spirit of the invention, and it is intended to protect by Letter Patent all forms of the invention falling within the scope of the following claims.

What is claimed is:

1. In a tubing head having a vertical passage therethrough, an annular downwardly facing horizontal shoulder therein, a portion of said passage below said shoulder

being cylindrical, three rings coaxial with each other and said passage, said rings being disposed one on top of the other and slidably received in said cylindrical portion, each of said rings having substantially the same outside diameter as the inside diameter of said cylindrical portion and having substantially the same inside diameter adapted to pass over and fit close around a casing extending up into said cylindrical portion, the upper and lower of said rings being made of metal and the middle ring being made of rubber-like material, the upper ring having an inturned flange, the lower surface of said flange having a horizontal portion adapted to extend over the upper end of said casing to limit upward travel thereof, the upper surfaces of said flange having a horizontal portion engaging said horizontal shoulder and having an upwardly flaring bevel on its inner periphery extending radially inwardly beyond said shoulder to guide tools into said casing, said lower ring having an upwardly flaring face at its lower end, radial screws passing through threaded apertures in said tubing head adapted to engage said upwardly flaring face on said lower ring to compress said middle ring between said upper and lower rings into sealing engagement with said casing and said cylindrical portion of the tubing head, said three rings being disposed entirely within said tubing head above the lower end thereof between said tubing head and said casing and supported vertically solely by said radial screws from said tubing head.

2. The combination of claim 1 in which the ends of said upper and lower rings adjacent said middle ring each have a bevel on their outer periphery to force the adjacent portions of said middle ring radially outwardly to engage said cylindrical portion of said tubing head passage, said middle ring having correlative end surfaces to engage said bends.

3. The combination of claim 2 in which the lower end of the upper ring has a bevel on its inner periphery to force the adjacent portion of said middle ring radially inwardly and the inner periphery of the upper end of said lower ring is horizontal, said middle ring having correlative end surfaces to engage the adjacent ends of said upper and lower rings at all points.



4. An apparatus comprising two coaxial metal rings, each ring having a straight cylindrical body, said bodies having the same internal and external diameters, said rings each having a radial flange at one end of its body, the other ends of said bodies being flangeless, said rings being disposed with the flangeless ends of said bodies nearest each other and the cylindrical bodies aligned and the radial flanges extending respectively inwardly and outwardly, said flanges being beveled on the faces thereof farthest from said flangeless ends and flaring from the axis of the rings going along said axis in the direction from the ring having the outwardly extending flange toward the ring having the inwardly extending flange, the flangeless ends of said bodies each terminating in a convex surface of V section with the apex of the V in between and spaced from the inner and outer side walls of the bodies of the rings, a sealing ring of resilient low elastic modulus material disposed between said flangeless ends of said metal rings and in contact therewith and having ends shaped complementary to said V section ends of said metal rings, said sealing ring being coaxial with said metal rings and when unstressed having substantially the same inner and outer diameters as said bodies of said metal rings, the flangeless ends of said rings terminating at the ends of said sealing ring in contact therewith leaving both the side walls of said sealing ring exposed.

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