Oct. 25, 1938. G. A. HUMASON 2,134,044

TUBING HEAD

Filed June 22, 1937 2 Sheets-Sheet 1

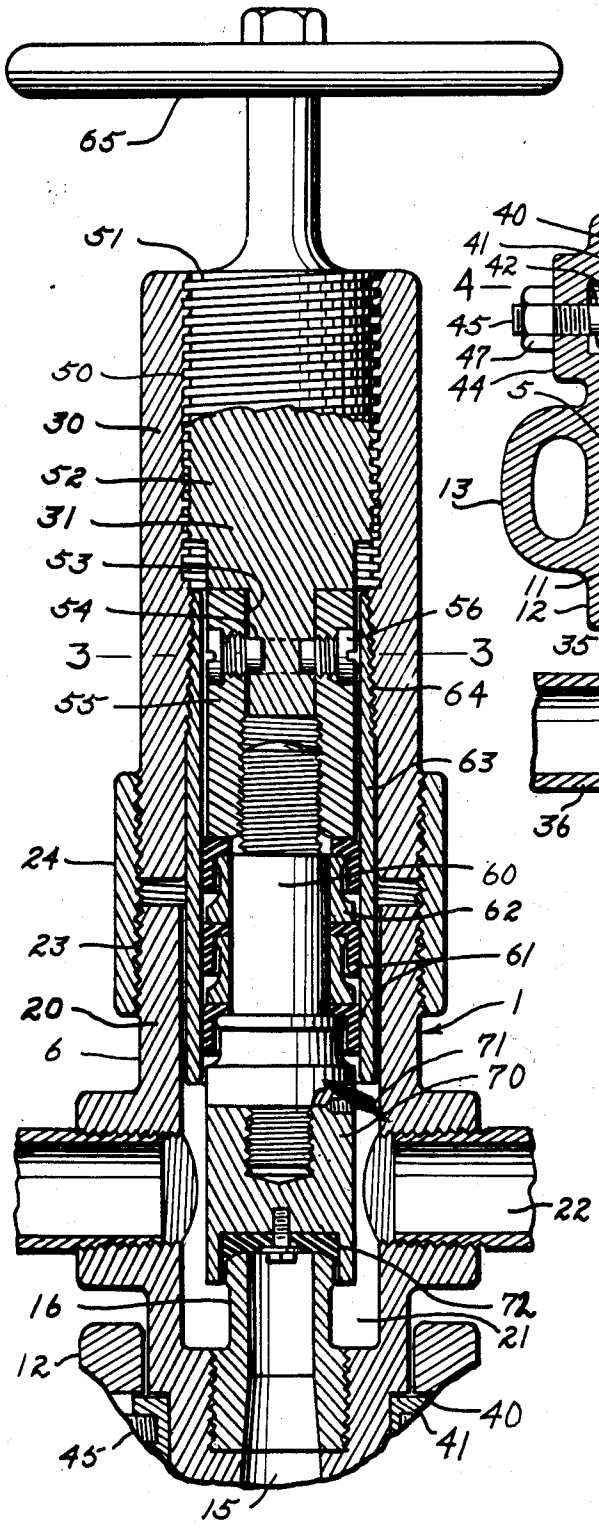


Fig. 1.

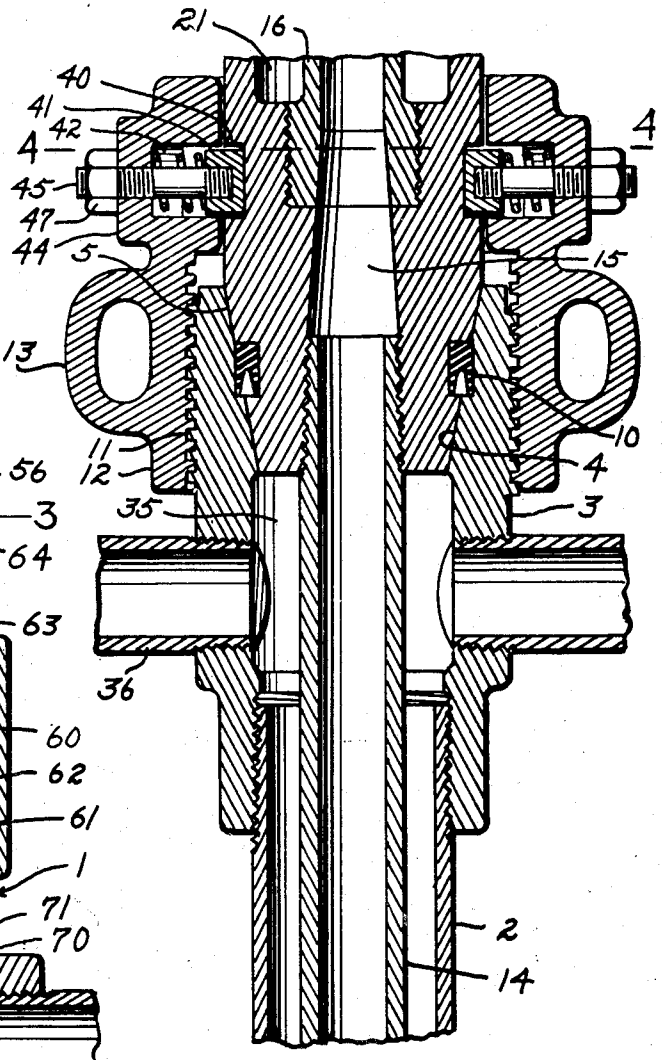


Fig. 2.

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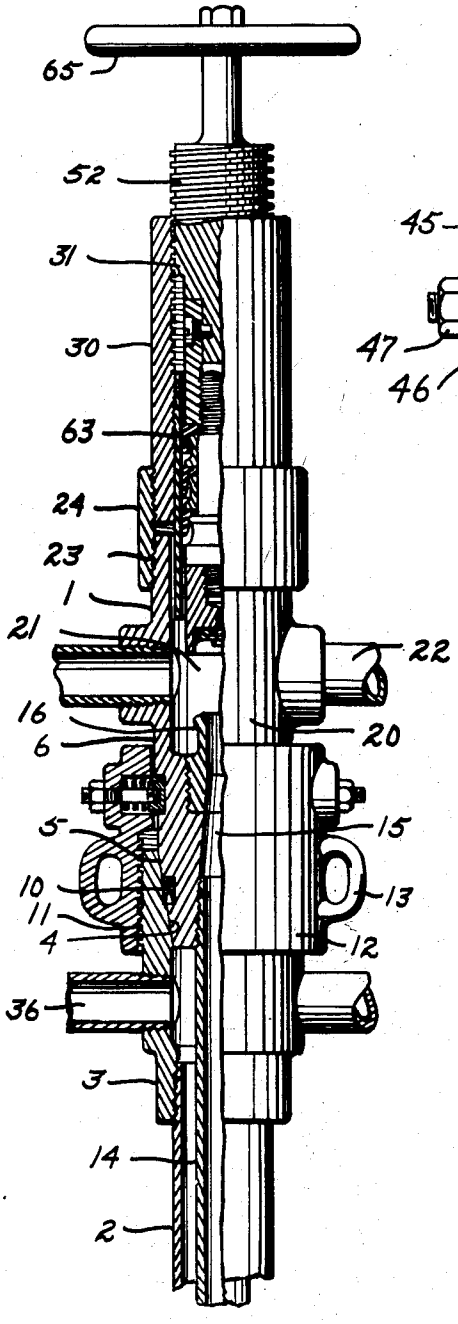


Fig. 5.

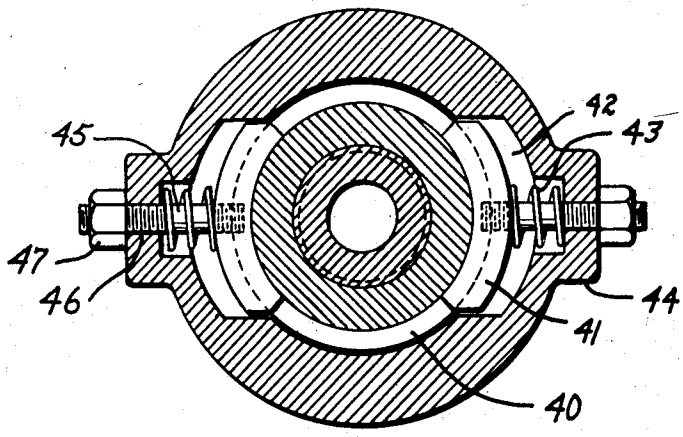


Fig. 4.

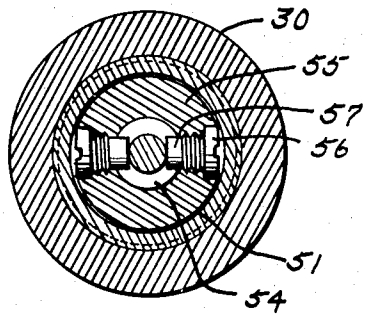


Fig. 3.

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2,134,044

TUBING HEAD

Granville A. Humason, Houston, Tex.

Application June 22, 1937, Serial No. 149,587

6 Claims. (Cl. 166—15)

The invention relates to a tubing head and flow control assembly.

It is an object of the invention to provide a device of the character described including means for releasably supporting tubing in a well bore.

Another object is to provide a device of the character described for releasably supporting tubing in the well bore with a fluid tight joint between the tubing and the surrounding casing.

A further object is to provide a means for supporting a tubing within a well bore including a novel mechanism for controlling the flow of oil from the tubing.

A more specific object is to provide a novel casing head and tubing hanger assembly in which the hanger may be easily and effectively brought into or released from sealing engagement with the casing head bowl.

Further objects, together with the foregoing, will be apparent from the following description taken in connection with the drawings in which:

Fig. 1 is a vertical sectional view of the upper portion of the device comprising the invention.

Fig. 2 is a similar view showing a lower portion of the device of the invention and constitutes a continuation of the view of Fig. 1.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is an assembly view, partly in section, showing the general construction of the present invention.

Referring first to Fig. 5, it will be noted that the present invention comprises a casinghead unit generally designated as 1, attached to casing 2 at the mouth of the well bore. The casinghead unit 1 includes casinghead bowl 3 having a tapered seat 4 to receive a complemental tapered surface 5 on tubing hanger 6, an annular resilient sealing member 10 serving to seal the joint between tapered surfaces 4 and 5. The outer surface of bowl 3 is provided with coarse threads 11 such as square or acme threads to threadably engage a hold-down ring 12, having ears 13, whereby the ring may be engaged for turning movement thereof to force the hanger 6 downwardly into sealing position and to retain the hanger in that position against pressure tending to lift the hanger and tubing string 14 connected thereto.

The tubing 14 is connected to the lower end of hanger 6 which has a central bore to threadably receive the tubing and extends upwardly therefrom at 15 and terminates in an upwardly facing valve seat 16. An upward extension 20 of the tubing hanger 6 has an internal chamber 21 connecting with flow lines 22 which may be individually provided with suitable control valves (not shown). The upper end of the extension 20 is threaded at 23 for connection with a collar 24, which is in turn threaded and is connected with upwardly extending valve housing 30 surrounding valve actuating mechanism, generally designated as 31, and to be further described.

Referring to Fig. 2, it will be noted that bowl 3 is provided with an enlarged bore 35 above the end of casing 2, flow lines 36 being connected with this enlarged bore. By means of this construction the flow from and the pressure within the annular space between the tubing 14 and casing 2 may be controlled by suitable valves not shown.

A circumferential groove 40, having parallel side walls, is provided in hanger 6 above tapered surface 5 of the hanger. This groove 40 is adapted to receive dogs 41 which are retractively positioned within arcuate recesses 42 in the hold-down ring 12, which is provided with threads for complemental engagement with the coarse threads 11 on the bowl 3. The ears 13 on the hold-down ring permit engagement of the ring whereby it may be effectively rotated to force hanger 6 upon its seat in bowl 3 or to receive the hanger therefrom.

An important feature of the present invention is the construction whereby dogs 41 are releasably engaged within groove 40 of the hanger 6. This feature is best illustrated in Fig. 4 in which the arcuate dogs 41 are shown as slidable internally from the recesses 42 in the hold-down ring 12 under the influence of compression springs 43, which engage the dogs and the inner surface of boss 44 on the hold-down ring 12. Each of the dogs 41 has an outwardly extending stud 45 fixed thereto and passing through an opening 46 in the boss 44. A nut 47 on the outer end of the stud 45 may be rotated to withdraw the dogs 41 from within the groove 40 whereby the hanger is released from the hold-down ring and may be lifted from the bowl 3, together with its attached tubing string 14. On the other hand, the dogs may be moved to an inwardly advanced position and the hanger inserted in the bowl and the hold-down ring assembly. The downward movement of the hanger will cause dogs 41 to ride upon the tapered surfaces 5 of the hanger whereby the dogs will be forced to retracted position against compression springs 43.

Continued downward movement of the hanger will bring the groove 40 in the plane of the dogs

41, whereupon the dogs will snap inwardly under the pressure exerted by the springs. The hold-down ring 12 may then be screwed downwardly to complete the connection between the hanger 6 and the bowl 3. This feature is particularly desirable in facilitating speed in obtaining a sealed connection between the bowl 3 and the hanger 6. At the same time, the construction is such that the hold-down ring 12 may be screwed upwardly to lift the hanger 6 and to break the sealed connection between the hanger and the bowl preliminary to releasing the hanger from the hold-down ring 12 and withdrawal of the hanger and its attached tubing from within the bowl.

The tubular valve housing 30 is coaxial with the extension 20 on the hanger 6 and is threadably secured thereto by means of collar 24 and is provided with internal threads 50 for engagement with complementary threads 51 on the shank 52 of the valve, generally designated as 31. The lower end of shank 52 has a reduced section 53, provided with a circumferential groove 54, as best seen in Fig. 3. A collar 55 slidably fits upon the reduced end 53 and has screws 56 fixed radially therein, the inner ends 57 of the screws projecting into the groove 54 whereby the collar 55 is threadably secured to the shank 52.

The lower end of collar 55 is threaded internally for connection with valve stem 60 whereby cups 61 and rings 62 on the valve stem may be clamped to form a plunger assembly. This plunger assembly sealably engages the inner walls of a sleeve 63, which is fixed to the inner wall of valve housing 30 as by threads 64 extending below the threads 50 in the valve housing.

This construction provides a valve that may be moved longitudinally of the extension 20 and the housing 30 by turning of the hand-wheel 65. The swivel connection between shank 52 and the plunger assembly permits the plunger to move longitudinally of the sleeve 63 without turning movement therein. This feature obviates rotational movement of the valve upon its seat when the valve is advancing to or receding from its fully closed position.

To facilitate replacement of parts subject to wear a valve cap member 70 is threadably attached to the lower end of valve stem 60 and is locked in assembled relation thereto by a set screw 71. The lower end of the cap member 70 is in the form of an inverted cup to receive the valve washer 72 having a concave inner surface to closely fit over the convex seating surface on the valve seat 16. With this type of valve washer and seat the cutting action of abrasive substances in the well fluid is minimized.

From the preferred embodiment of the invention just described it will be apparent that the invention comprehends a tubing head and flow control assembly in which the tubing hanger and valve mechanism for control of the flow of fluid through the tubing supported by the hanger may be quickly and effectively brought into assembled or detached relation. This is made possible by the novel construction of the hold-down assembly as best shown in Figs. 2 and 4. Likewise, the device of the invention includes a novel valve construction whereby there is an effective seal against the leakage of fluid past the valve stem and at the same time the construction is such that there is no sliding contact between the valve and its seat, either during opening or closing of the passage from the flow tubing. The particular arrangement of parts has many advantages that will be obvious to those skilled in the art.

What is claimed is:

1. A flow control unit for wells comprising a tubular bowl connected to the end of a pipe in a well bore, said bowl having an inner tapered seat therein, a tubing hanger on said seat, a tubing string supported by said hanger, a peripheral groove in said hanger above said tubular bowl, a hold-down ring threadably connected to the tubular bowl, and radially movable latch means in said hold-down ring above the bowl for releasable engagement with said peripheral groove whereby the ring and hanger may be interengaged and the bowl and hanger brought into seating engagement.

2. A casing head and flow control unit including a tubular bowl connected to the end of a pipe in a well bore, said bowl having an inner seat, a tubing hanger on said seat, tubing supported in the casing by said hanger, a peripheral groove in said hanger, a hold-down ring surrounding said bowl and hanger, and dogs within said ring for engagement in said groove whereby the bowl and hanger are brought into intimate seating engagement.

3. In a flow control unit including a concentric casing and tubing in a well, a casinghead bowl on said casing, said bowl having a tapered seat therein, a tubing hanger adapted for seating engagement in said tapered seat, a peripheral groove in the tubing hanger, a hold-down ring surrounding said bowl and hanger and threadably connected to the bowl, and radially releasable latch means in said hold-down ring for engaging said groove, whereby the casinghead bowl and ring may be drawn into sealing engagement by said ring, said hanger being releasable by withdrawing said latch means.

4. A well head comprising a bowl having a tapered seat therein, a tubing hanger supported on said seat, a peripheral groove in said hanger above said bowl, a hold-down ring surrounding said hanger and bowl and having threadable engagement with the latter, and interlock members carried by said ring and resiliently urged inwardly thereof to enter said groove.

5. A well head comprising a bowl having a tapered seat therein, a tubing hanger supported on said seat, a peripheral groove in said hanger above said bowl, a hold-down ring surrounding said hanger and bowl and having threadable engagement with the latter, interlock members carried by said ring and resiliently urged inwardly thereof to enter said groove, and means for withdrawing said interlock members from within said groove.

6. A well head comprising a bowl having a tapered seat therein, a tubing hanger supported on said seat, tubing supported by said hanger, said hanger having an internal chamber and a passage leading from the tubing to said chamber, a valve seat in said passage, a valve in said chamber adapted to fit upon said seat when the valve is closed and manually operable means for advancing the valve to closed position upon the seat, said means including a shank threadably engaging said hanger, and a plunger swivelly connected to said shank and having cups thereon to seal the chamber above the valve.

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