March 9, 1954 H. B. YOUNG 2,671,413

SPLIT SWAB PISTON WITH FLANGE TYPE SEALS

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Fig. 1

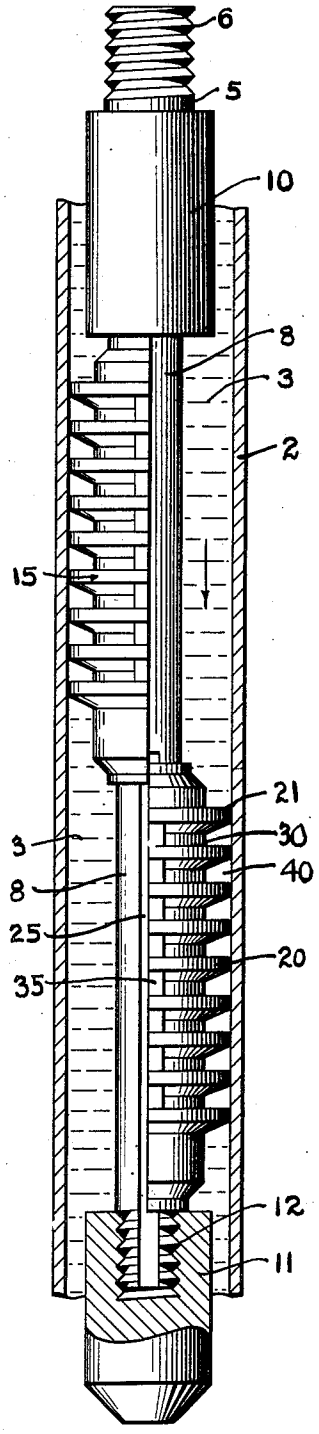
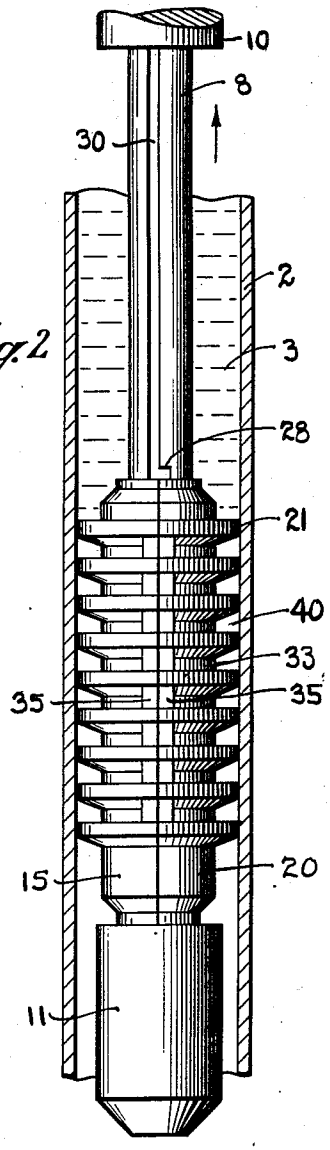


Fig. 2



Henry B. Young
INVENTOR.

BY Lester B. Clark

ATTORNEY

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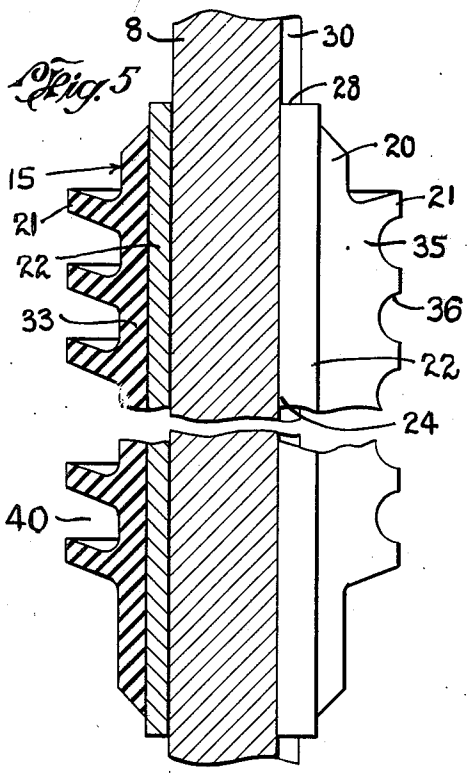


Fig. 5

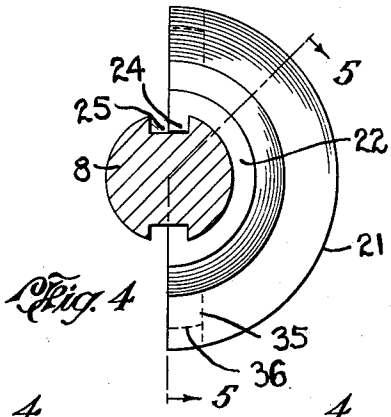


Fig. 4

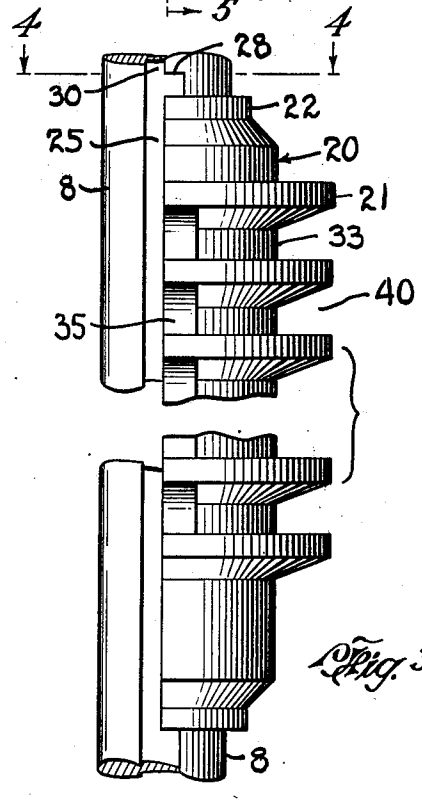


Fig. 3

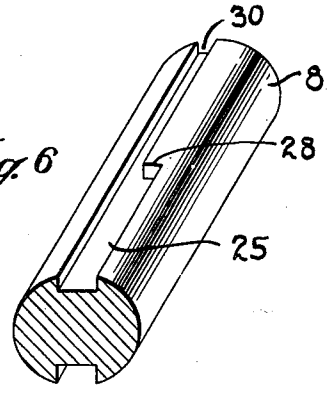


Fig. 6

Henry B. Young
INVENTOR.

BY Lester B. Clark.

ATTORNEY

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SPLIT SWAB PISTON WITH FLANGE TYPE SEALS

Henry B. Young, Houston, Tex., assignor to Mission Manufacturing Co., Houston, Tex., a corporation of Texas

Application December 18, 1950, Serial No. 201,376

1 Claim. (Cl. 103—225)

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The invention relates generally to a swab which is a form of piston construction which can be lowered into a pipe in a well bore containing liquid and upon the raising thereof to trap some of the liquid above the swab or piston and to thereupon elevate the liquid above the swab. The repeated lowering and raising of the swab in this manner elevates liquid in order to remove it from the well bore.

Swabs of the general type have been known heretofore and one such swab is disclosed in the application for patent of Jack C. Webber, Serial No. 51,173, filed September 25, 1948, now U. S. Patent No. 2,633,808, granted April 7, 1953, for "Well Swab."

The present invention further contemplates what is generally recognized as a split type of well swab such as shown generally in United States Letters Patent 2,201,451 issued May 21, 1940, to B. E. Parrish for a "Well Swab."

The Parrish swab has been exploited commercially to a considerable extent and has been in general use since the issuance of the patent.

The present invention contemplates a recognition of the advantage of the split type swab, such as Parrish, but further contemplates taking advantage of the spaced flange assembly of Webber, and in conclusion, contemplates the combination of the split type arrangement of Parrish embodying the sealing member construction of Webber.

It is believed that the above indicated combination required the exercise of the inventive faculties and a modification of the parts in order to adapt the Parrish and Webber structures into a single unitary device.

It is one of the objects of the present invention to provide a split type swab having radially extending sealing members in combination with vertical edge partitions between the split sections when they are in load lifting position by the provision of vertical sealing edges on the respective halves so that the pressure of the load being lifted tends to create a seal between the two split portions to prevent leakage and loss of the load of liquid being lifted.

Another object of the invention is to provide a split type swab having edge reinforcing portions between the spaced laterally extending sealing flanges.

A still further object of the invention is to provide a split type swab wherein the swab may move downwardly at an accelerated rate by virtue of the provision of the split swab whereas it will in turn trap a load of liquid above the swab

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parts when they move into the complementary position shown in Fig. 2.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation of the swab negotiating a downward movement in a well pipe containing liquid which will cause the loose portion or section of the swab to move upwardly and allow a flow of liquid from the lower left hand side of the figure to the upper right hand side as the swab moves downwardly.

Fig. 2 is a view similar to Fig. 1 except that the swab is negotiating an upward movement whereupon the two halves of the swab will move into the complementary position shown so as to trap a load of liquid above the swab for elevation in the well.

Fig. 3 is a broken sectional view illustrating an enlarged view of one of the half sections and illustrating the detail construction thereof.

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3 and looking downwardly.

Fig. 5 is a section taken on the line 5—5 of Fig. 4 and showing the arrangement of the body and resilient portions in sections with the reinforcing edge rib in side elevation.

Fig. 6 is a perspective view of the slotted arrangement in the mandrel to limit the sliding movement of one of the swab halves.

In Fig. 1 the well tubing or well conductor 2 is a length of pipe in the well which contains the well liquid 3 therein which it is desired to elevate from the well.

The swab is shown in side elevation and constitutes a mandrel 5 which is a solid cylindrical member having the threaded connection 6 on the upper end thereof for connection to a string of sucker rods or a wire line socket as may be desired so that the swab and the mandrel thereof will be raised and lowered in the well.

The mandrel body proper at 8 is a cylindrical member which is provided at its upper end with an enlarged collar 10 and with a bottom plug 11 threaded at 12 on the lower end of the mandrel.

Arranged for sliding movement on the mandrel body portion 8 between the collars 10 and 11 are the swab sections or halves 15 and 20. These sections when in operating position to carry a load of oil will be complementary with each other side by side as seen in Fig. 2, so as to form a complete closure of the well pipe 2 in order to retain a body of the liquid 3 thereabove as best seen in Fig. 2.

The load of oil is carried on the laterally extending flanges or sealing elements 21 which are outwardly and upwardly inclined or beveled as shown in the drawings. When a load of oil is disposed thereon and the swab is pulled upwardly, the load of oil will tend to flex or bend these flanges downwardly so that they will move outwardly to a sufficient extent to maintain a seal with the inside wall of the pipe 2 and prevent the load of liquid from leaking or seeping past the swab as it moves upwardly. As to the detail construction of these swab sections 15 or 20, attention is directed to Figs. 3, 4, and 5. In Fig. 3 the side elevation indicates that the central semi-circular body member 22 is fitted about the mandrel body portion 8, whereas Fig. 4 shows that this body 22 has an inwardly directed flange or rib 24 at each edge thereof. The mandrel 8 is provided with opposite elongated slots 25 in which the flanges 24 are arranged to slide. The body 22 is slipped over the end of the mandrel before the collars 10 or 11 are affixed. As seen in Fig. 2, both sections ride upon the lower plug 11 when the swab moves upwardly.

The section 15 has free sliding movement from the position of Fig. 1 to the position of Fig. 2, and the position of the section 15 depends on whether the swab is being lowered in Fig. 1 or whether the swab is being raised as in Fig. 2. The ribs 24 of the section 15 are the same as the ribs 24 of the section 20 as seen in Fig. 4, and flanges 24 of the two sections fit side by side into the opposite grooves 25 in the mandrel so as to form an operative combination.

The groove 25 as seen in Fig. 4 has a width to receive both of the flanges but this width of the groove is limited by the shoulder 28 as seen in Fig. 2, which is disposed a short distance above the upper end of the section 20 when the parts are in the position of Fig. 2. The lower collar 11 serves as a support for both sections of the swab when the swab is moved upwardly to lift the liquid.

When, however, the swab is moved downwardly, if the parts remained in the position of Fig. 2, the lowering operation would be slow and tedious because it would be practically impossible for the liquid to flex the rubber flanges upwardly sufficient to permit any substantial amount of the liquid to pass as the swab moves downwardly.

The left hand section 15 as seen in Fig. 1 is thus arranged to slide upwardly through an extension 30 of the slot 25 so that the flanges 24 of the section 15 will move away from the flanges of the section 20 from the Fig. 2 position. The shoulder 28 will prevent the section 20 from moving upwardly but the extended slot 30 will permit the section 15 to move upwardly and assume the position shown in Fig. 1.

In the Fig. 1 position, it will be noted that there is a large open area between the top of the section 20 and the bottom of the section 15, which area allows the liquid to move from the lower left hand position to the upper right hand position as the swab moves downwardly. In this manner, the swab may be lowered at a very substantial rate so as to facilitate the swabbing operation.

One of the important features of the invention is the particular arrangement of the rubber covering for the body 22 of the swab section. This covering is properly vulcanized upon the metal body 22 and has a substantial thickness 33 for the support of the flanges 21, which extend laterally and inclined upwardly therefrom.

If the flanges 21 of the two respective sections were at the same elevation as seen in Fig. 2, it is entirely possible that the unsupported edges might move out of alignment with each other and either permit the liquid to leak past the flanges or the flanges might become distorted. In order, therefore, to support the flanges and to create a seal between the respective swab sections which will automatically prevent leakage, a reinforcing web or retainer rib 35 has been arranged on the ends or edges of the flange sections 21 as best seen in Figs. 3 and 5. This web 35 is formed as integral with the flanges and extends outwardly between adjacent flanges beyond the periphery of the thickness or covering 33 as shown in the right hand side of Fig. 5, whereas the left hand side of Fig. 5 in section shows the arrangement of the thickness of the covering and the flanges.

Fig. 2 shows the swab sections in alignment with the webs 35 of the two sections arranged side by side so as to be forced into sealing position by any load of liquid which is being lifted by the swab. This is true because the liquid will move into the space 40 between adjacent flanges 21 and will bear against the covering 33 around the periphery and against the webs 35 to force them circumferentially against each other as seen in Fig. 2. This web is recessed or undercut at 36 as seen in Fig. 5, so as to not interfere with the flexing of the flanges at the edges or ends thereof to any substantial extent.

It is believed that the operation, the construction and the arrangement of the swab may be readily understood from the foregoing description.

Broadly, the invention contemplates a split type swab provided with spaced laterally and upwardly extending flanges to move out of alignment when the swab is lowered and to move into complementary aligned position to provide a load carrying swab when the device is moved upwardly in the well.

What is claimed is:

A well swab for elevating liquids in a well conductor comprising, a mandrel, a pair of half section complementary swab units mounted on said mandrel to form an annular circular swab when said swab units are aligned in the same transverse plane, key means slidably connecting one of said half section swab units to said mandrel to permit same to move longitudinally on said mandrel from an aligned position in the same transverse plane with the other swab unit to a misaligned position above said other swab unit whereby said swab is readily lowered into the well liquid when said swab units are misaligned and is adapted to lift a load of liquid when said swab units are in the aligned position during the raising of the swab, each of said swab units comprising a semi-circular body, a plurality of semi-circular sealing elements mounted on said body in longitudinally spaced relationship, each sealing element being constructed of elastic material and being upwardly and outwardly inclined when the element is in a normal undistorted position, each sealing element on each of said swab units being alignable in the same transverse plane with a corresponding sealing element on the other of said swab units when said swab units are in said aligned position to form a plurality of annular sealing rings, said sealing rings being capable of flexing in a downward direction under a predetermined load of liquid to effect a sealing engagement of

the peripheral edge of each element with the wall of the well conductor whereby said elements may be utilized to lift a predetermined load of liquid, increase of the liquid load beyond the predetermined load causing further flexing of said element in a downward direction to move the peripheral edge thereof out of sealing engagement with the wall of the conductor to permit escape of liquid downwardly past the element to reduce the liquid load thereabove to the predetermined load, retainer ribs mounted between said sealing elements and at the ends of each of such sealing elements to support the ends of the sealing elements which are in abutment when the swab units are in said aligned position whereby distortion of the ends of the sealing elements is avoided to prevent any leakage of liquid between the abutting ends of the elements, said ribs being each radially inset within the peripheral edge of the

sealing elements to permit the downward flexing of said elements while providing the support for the ends thereof.

HENRY B. YOUNG.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,449,674	Heggem	Mar. 27, 1923
2,153,843	Parrish	Apr. 11, 1939
2,176,231	Swortwood	Oct. 17, 1939
2,201,451	Parrish	May 21, 1940
2,290,351	Parmeson	July 21, 1942
2,326,902	Thomason	Aug. 17, 1943
2,360,577	Parrish	Oct. 17, 1944
2,417,349	Colbaugh	Mar. 11, 1947

OTHER REFERENCES

Oil Weekly (page 2), March 9, 1936.