Oct. 29, 1963 O. W. BROOKS 3,108,639

MULTIPLE STRING CENTRALIZER

Filed May 20, 1960 2 Sheets-Sheet 1

Fig. 1

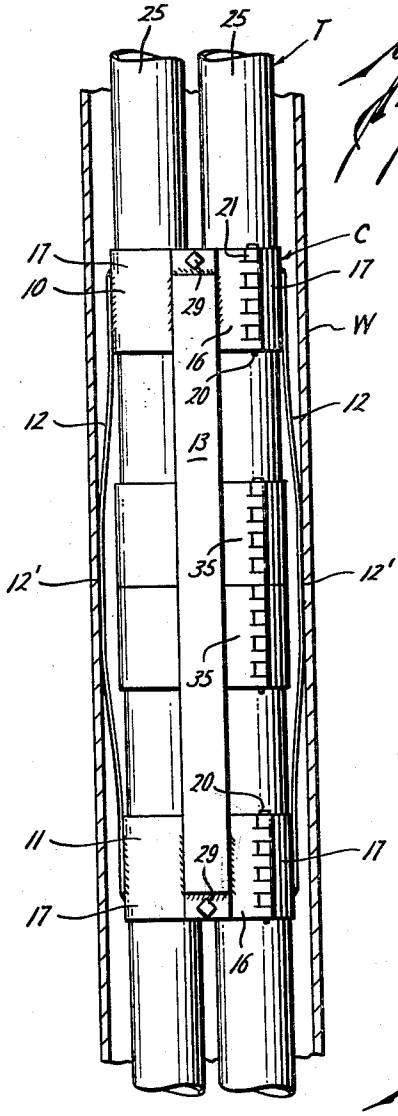


Fig. 2

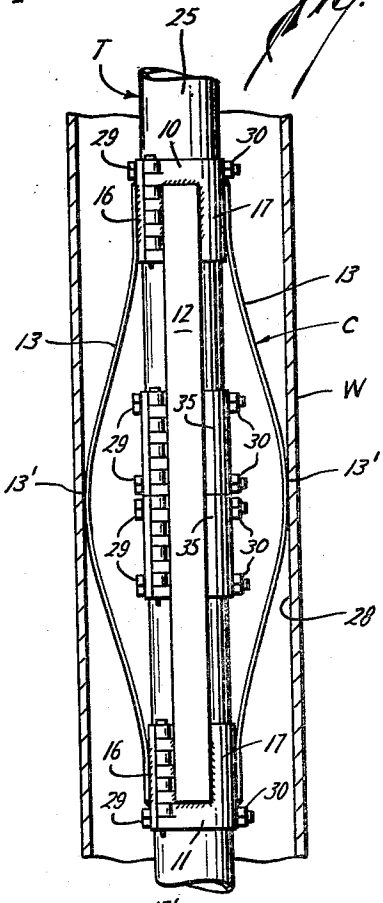


Fig. 3

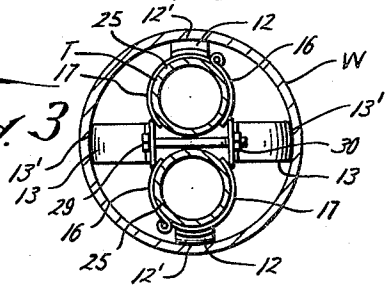
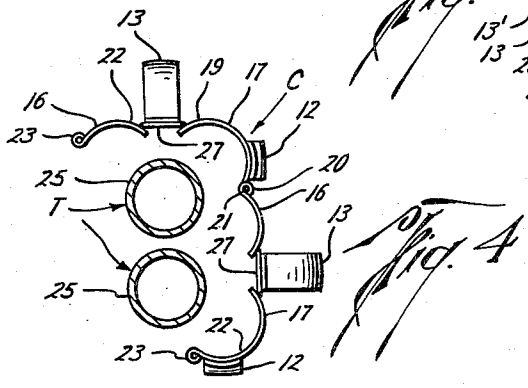


Fig. 4



Oran W. Brooks
INVENTOR.

BY Hayden + Gravel

ATTORNEYS

Oct. 29, 1963 O. W. BROOKS 3,108,639

MULTIPLE STRING CENTRALIZER

Filed May 20, 1960 2 Sheets-Sheet 2

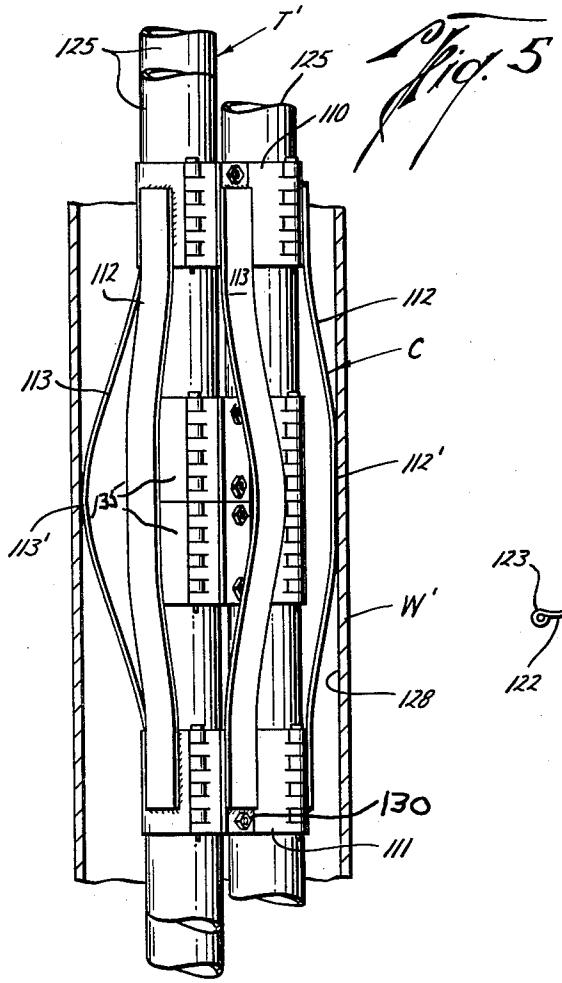


Fig. 5

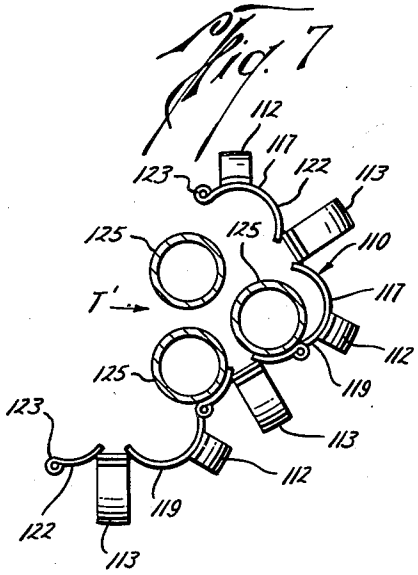


Fig. 7



Fig. 8

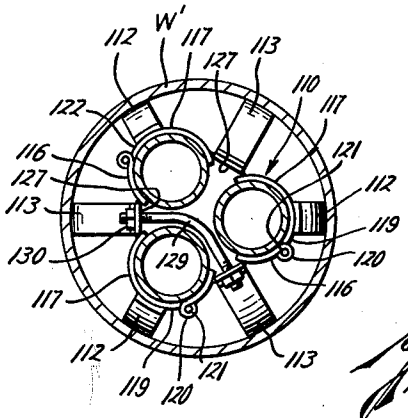


Fig. 6

Oran W. Brooks
INVENTOR.

BY Hayden & Gravel

ATTORNEYS

United States Patent Office 3,108,639 Patented Oct. 29, 1963

3,108,639

MULTIPLE STRING CENTRALIZER

Oran W. Brooks, Harris County, Tex.

Filed May 20, 1960, Ser. No. 30,572
4 Claims. (Cl. 166—241)

The present invention relates to a new and improved centralizer for multiple tubular members and more particularly to a dual string tubing centralizer.

In the completion of an oil well it is often desired or necessary to run a dual string or a multiple string of tubing in the well hole. The two strings or multiple strings of tubing must be properly spaced or centralized in the hole and in relation to each other. In endeavoring to centralize and space multiple tubing strings in prior art operations a large number of single tubing centralizers have been spaced along each of the individual strings of tubing in the hole. In effect an attempt is made to centralize each string of tubing individually. It can easily be seen that for a dual string of tubing, twice as many centralizers are required and for a triple string three times as many centralizers and ad infinitum. This is not only expensive but soon becomes impractical as the centralizer on one string must be staggered in relation to those on another string. Further, even after positioning such a great number of the single tubing centralizers, such centralizers are not fixed in relation to the tubing strings themselves.

The device of the present invention overcomes the above problems in that a single centralizer is used to position or centralize all the strings of tubing at any one depth both in relation to the well hole and in relation to each other.

It is therefore an important object of the present invention to provide a new and improved centralizer for multiple tubular members which positions or centralizes a plurality of strings of tubular members in relation to a well hole and further positions or centralizes each string of tubular members in relation to each other string of tubular members.

Another object of the present invention is to provide a new and improved centralizer for multiple strings of tubing which can be quickly and easily installed on all strings of tubing at the well head prior to positioning the tubing strings in the well hole.

Still another object of the present invention is to provide a new and improved centralizer for multiple strings of tubing which can be installed at any desired position along the tubing strings.

A further object of the present invention is to provide a new and improved centralizer for multiple strings of tubing which can be manufactured and sold at a relatively small amount more than the cost of a single tubing centralizer.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

FIG. 1 is a side elevation illustrating one embodiment of the invention in position on a dual string of tubing in a well hole;

FIG. 2 is a view similar to FIG. 1, but rotated ninety degrees;

FIG. 3 is a plan view of the device of the present invention illustrated in locked position on a dual string of tubing in a well hole;

FIG. 4 is a plan view of the device of the present

invention and illustrates the device in open position just prior to positioning the device on a dual tubing string;

FIG. 5 is a view similar to that of FIG. 1 but illustrates an alternate embodiment of the present invention;

FIG. 6 is a plan view of the alternate embodiment of FIG. 5 of the present invention, illustrating the device in a locked position;

FIG. 7 is a plan view similar to that of FIG. 6, but illustrating the alternate embodiment of the present invention in an open position; and

FIG. 8 is a detailed view of the locking means used on the alternate embodiment of the present invention.

Referring now to the drawings and more particularly to FIGS. 1–4, the device of the present invention C is illustrated as being adapted for use on a dual string of tubing T positioned in a well casing W. The device C includes principally an upper body 10 and a lower body 11 which are joined together by a plurality of flexible longitudinal bow springs 12 and 13, or the like. The upper body 10 and the lower body 11 are substantially alike and are each comprised of a plurality of arcuate segments 16 and 17 which are connected together and adapted to be positioned on the tubular string T, all of which will be described in detail hereinafter.

The curvature of each of the segments 16 and 17 is such that the segments 16 and 17 may be positioned on the tubing T as more clearly seen in FIG. 3. In the dual string embodiment C of FIGS. 1–4, one pair 19 of the members 16 and 17 is hingedly connected together at 20 by any suitable means such as a pin hinge 21. The other pair 22 of the arcuate segments 16 and 17 is releasably hinged together by a pin hinge 23 similar to that of the pin hinge 21. Each pair of arcuate segments 19 and 22 are substantially alike and in fact the members 16 and 17 of each of such pairs 19 and 22 can be cast from the same respective molds. The length of each of the segments 16 and 17 is less than one-half of the circumference of the tubing members 25 in the tubing string T which permits the segments 16 and 17 to be quickly and easily positioned around the tubular members 25 and in substantial continuous contact therewith. The members 16 are preferably shorter than the members 17 thereby allowing the members 13 to be positioned directly opposite each other for the most effective centralizing.

The members 16 and 17 in each of the bodies 10 and 11 are rigidly connected together by a short flat rectangular member 27 by welding or any other suitable means. The connection members 27 are of such length that when the segments 16 and 17 are positioned on the tubular members 25 of the tubing string T that the members 27 are diametrically opposed to each other. The longitudinal members 13 are welded or otherwise suitably attached to the members 27 of the upper body 10 and the corresponding lower body 11. The members 12 and 13 are shaped so that their outer portions 12′ and 13′ will contact the inner surface 28 of the casing W and simultaneously hold the tubing string T in the desired position. The members 12 and 13 are preferably arranged on the bodies 10 and 11 so as to be 90° from each of the other members 12 and 13, and with the members 12 being opposed to each other and with the members 13 opposed to each other. This arrangement provides the maximum stability with a minimum of members. It should be understood however, that variations in the arrangement and members of such longitudinal members 12 and 13 can be made without departing from the scope of the invention. Suitable openings (not seen) are provided in the member 27 for receiving a bolt 29 or the like on which a nut 30 may be placed thereon. The use of the bolt 29 and the nut 30 in each of the bodies 10

and 11 inhibits longitudinal movement of the device C on the tubing string T.

The device of the present invention provides a centralizer C which can be quickly and easily positioned in place on a multiple tubing string and firmly positions the tubing string T within the casing W and also positions each of the tubular members 25 in relationship to each other. As the size of the casing usually determines the total amount of space within the casing available for tubing, such space is somewhat limited as a rule, for economical and other reasons. Normally there is not sufficient space within the casing W to position the tubular members 25 of the tubing strings T so that their joints are adjacent each other. Therefore such tubular members 25 must be placed sufficiently close to each other so that the joints must by necessity be staggered within the casing. This is normally done by using different lengths of tubular members 25 or by merely inserting a pup joint in one of the tubing strings comprising the dual string of tubing T. As a result the bodies 10 and 11 must therefore be postioned on the tubing string on a smooth area (i.e., one on which there are no joints).

Even utilizing the bolt 29 and nut 30 on each of the bodies 10 and 11, the centralizer C may tend to move longitudinally on the tubing strings T and to eliminate this undesirable happening, stop collars 35 similar to the upper bodies 10 and the lower bodies 11 except that an additional bolt 29 and nut 30 is provided for more positive locking of such stop collars 35 on the tubing string T, may be used. Two such stop collars 35 are illustrated in the drawings in position on the tubular members 25, and it is recommended that two such stop collars 35 be used to more positively assure that no longitudinal movement of the centralizer C will occur. It should be noted, however that one or no stop collars can be used if desired.

The centralizer C is normally installed on the dual string T at the well head where it may be quickly and easily positioned on such tubing string. FIG. 4 best illustrates the device C in an opened position just prior to positioning on the tubing string T. One pair 19 of arcuate members 16 and 17 is positioned on one tubular member 25 of the tubular string T and the other pair 22 of the members 16 and 17 is positioned on the other tubular member 25 of the tubing string T so that the hinges 23 of each of the members 16 and 17 are brought together. A pin 20 is then inserted in each of the hinges 23 thereby closing the bodies 10 and 11 respectively on the tubular members 25. Bolts 29 are then inserted through the openings in the members 27 and the nuts 30 are then tightened on the bolts 29 in the usual manner thereby locking the centralizer C on the tubing string T. This procedure is followed normally on the upper body 10 first and then on the lower body 11. Either body 10 or 11 may be positioned first as desired. As previously stated above, stop collars are positioned as desired and can be placed on the tubing string either before or after the tubing centralizer C has been positioned on the tubing string T, but it is generally preferred that they be placed on the tubing string T prior to positioning the device C.

FIGS. 5–8 of the drawings illustrate an alternate embodiment or another form of the invention C' which is adapted to be positioned on a triple string of tubing T'. The device C' is similar to the device C except that it is adapted to be postioned on a triple string of tubing T and therefore requires two additional arcuate segments 116 and 117 and two additional longitudinal members or bow springs 112 and 113. The device C' includes principally an upper body 110 and a lower body 111 with such upper body 110 positioned directly above the lower body 111 and the bodies 110 and 111 being joined together by a plurality of longitudinal members 112 and 113. Each of the longitudinal members or bow springs 112 and 113 are positioned on the bodies 110 and 111 in such manner that a member 112 is diametrically opposed to a member 113 and such members 112 and 113 are in equal numbers. The members 112 and 113 are flexed outwardly so that their outer portions 112' and 113' will engage the interior surface 128 of the casing W'. The members 112 and 113 may be secured to the bodies 110 and 111 by welding or any other suitable means. The members 112 and 113 are pre-shaped on the basis of the size of the tubing members 125 in the tubing string T' and the relative position within the casing W' in which it is desired to position such triple string of tubing T'.

Each of the bodies 110 and 111 are substantially alike and include a plurality of pairs of arcuate segments 119 and 122. The arcuate segments 116 and 117 comprising the pairs 119 are hingedly connected together at 120 by means of a pin 121. The segments 116 and 117 comprising the pair 122 is releasably hinged together at 123. Such hinge 123 is similar to the hinge 120 and utilizes a pin (not shown) similar to pin 121.

Each of the pairs of arcuate segments 119 and 122 are rigidly connected to the next successive pair of arcuate members either 119 or 122 by means of a relatively short rectangular member 127. Each of the members 127 is of a size determined by the desired relationship of the individual tubing members 125 to each of the other tubular members 125 in the triple string of tubing T'. Each of the members 127 has an opening (not seen) therein adapted to receive a curved bolt 129 or the like which is threaded on each end and adapted to receive a nut 130 on each end thereof. The position of the bolt 129 in locked position on the tubing T' is best illustrated in FIG. 6. As such bolt 129 only extends through two of the members 127, it is recommended that the bolt 129 be inserted through one different member 127 in each upper body 110 and each lower body 111 thereby assuring a more positive holding or locking of the centralizer C' on the tubing string T'.

Stop collars 135 constructed similarly to the bodies 110 and 111 except that each stop collar 135 is adapted to receive at least two bolts 129 for a more positive locking action are used to inhibit longitudinal movement of the device C' on the tubing string T'. As in the case of the stop collars 35 it is also recommended that two stop collars 135 be used with each centralizer C'; however, one or none can be used if desired.

The installation and use of the device C' is similar to that of the device C, and it is believed that no further description of such is necessary.

The device C' provides a multiple string tubing centralizer which not only positions the tubing string T' within the casing W' in relation to such casing W' but also each of the members 125 comprising the tubular string T' are positioned in relation to each other. It should also be noted that the outer portions 112' and 113' of the members 112 and 113 are positioned on the bodies 110 and 111 so that the full surface area of such outer portion 112' and 113' is in contact with the inner surface 128 of the casing W'. This assures a more positive centralizing action and as each of the members 112 has a member 113 diametrically opposed to it the centralizer C' is firmly positioned within the casing W'.

As additional strings of tubing are added to a multiple tubing string, additional pairs of arcuate segments similar to 16, 17 or 116, 117 may be added to bodies similar to 10, 11 and 110, 111 whereby the tubing centralizer may be adapted to fit on any number of tubing members as desired. It should also be noted that more or less longitudinal members similar to 12, 13, 112 and 113 may be secured to upper and lower bodies such as 10, 11 and 110, 111 as desired depending upon the size of the tubular members and the number used, or as desired.

It can therefore be appreciated that the device of the present invention provides a multiple string centralizer which may be quickly and easily positioned on a multiple string of tubular members, which may be firmly locked in position so as to eliminate longitudinal movement

and which not only positions the tubing string within the well hole or casing, but also firmly positions the individual tubing members in relationship to each other.

It should also be noted that the particular arrangement of the longitudinal members such as the members **12, 13, 112** and **113** while being preferred as illustrated in the drawings and described hereinabove may be varied on the bodies **10, 11, 110** and **111** as desired without departing from the scope of the invention. Such arrangement assures a maximum stability with a minimum of longitudinal members. For similar reasons it is also recommended that the number of longitudinal members such as **12** and **13** or **112** and **113** correspond to the number of arcuate segments **16** and **17** or **116** and **117**, and that two arcuate segments such as **16, 17, 116** and **117** be utilized in each upper and lower body **10, 11, 110** or **111** for each tubular member **25** and **125** within the tubing string.

The foregoing disclosure and description of the invention is 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 within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. A well centralizer for positioning multiple strings of tubular members in a well bore comprising an upper body and a lower body, a plurality of flexible longitudinal members attached to said upper and said lower bodies whereby said upper and said lower bodies are connected to each other with said upper body being positioned directly above said lower body, said longitudinal members forming bow springs for engaging the well bore wall and thereby positioning said upper and said lower bodies in a predetermined position in a well bore, each of said upper and lower bodies including a plurality of pairs of arcuate portions for positioning on strings of tubular members, said pairs of arcuate portions having an arcuate length less than the circumference of the tubular member on which they are positioned, means hingedly connecting said pairs forming said upper body together, and means hingedly connecting said pairs forming said lower body together.

2. A well centralizer for positioning multiple strings of tubular members in a well bore comprising an upper body and a lower body, a plurality of flexible longitudinal members attached to said upper and said lower bodies whereby said upper and said lower bodies are connected to each other with said upper body being positioned directly above said lower body, said longitudinal members forming bow springs for engaging the well bore wall and thereby positioning said upper and said lower bodies in a predetermined position in a well bore, each of said upper and lower bodies including a plurality of pairs of arcuate portions for positioning on strings of tubular members, means hingedly connecting said pairs forming said upper body together, and means hingedly connecting said pairs forming said lower body together, said arcuate portions in each of said pairs of arcuate portions being of an arcuate length which is less than one-half of the circumference of one of the tubular members on which said well centralizer is to be positioned.

3. A well centralizer for positioning multiple strings of tubular members in a well bore comprising an upper body and a lower body, a plurality of flexible longitudinal members attached to said upper and said lower bodies whereby said upper and said lower bodies are connected to each other with said upper body being positioned directly above said lower body, said longitudinal members forming bow springs for engaging the well bore wall and thereby positioning said upper and said lower bodies in a predetermined position in a well bore, each of said upper and lower bodies including a plurality of pairs of arcuate portions for positioning on strings of tubular members, means hingedly connecting said pairs forming said upper body together, and means hingedly connecting said pairs forming said lower body together, said arcuate portions in each of said pairs of arcuate portions being of an arcuate length which is less than one-half of the circumference of one of the tubular members on which said well centralizer is to be positioned, one of said arcuate portions in each of said pairs of arcuate portions being shorter in circumferential extent than the other of said arcuate portions in said same pair of arcuate portions.

4. A well centralizer for positioning multiple strings of tubular members in a well bore comprising an upper body and a lower body, a plurality of flexible longitudinal members attached to said upper and said lower bodies whereby said upper and said lower bodies are connected to each other with said upper body being positioned directly above said lower body, said longitudinal members forming bow springs for engaging the well bore wall and thereby positioning said upper and said lower bodies in a predetermined position in a well bore, each of said upper and lower bodies including a plurality of pairs of arcuate portions for positioning on strings of tubular members, means hingedly connecting said pairs forming said upper body together, and means hingedly connecting said pairs forming said lower body together, one of said arcuate portions in each of said pairs of arcuate portions being shorter in circumferential extent than the other of said arcuate portions in said same pair of arcuate portions.

References Cited in the file of this patent

UNITED STATES PATENTS

2,297,146	Guirl	Sept. 29, 1942
2,640,544	Baker	June 2, 1953