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2,546,582

CASING CENTRALIZER

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FIG. 1.

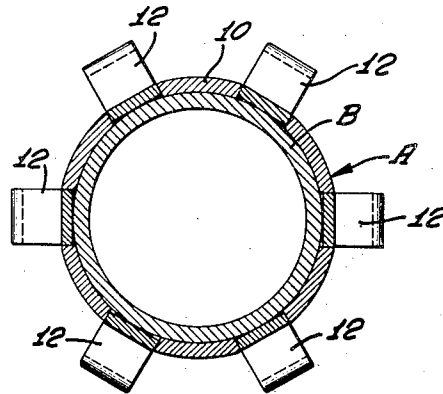
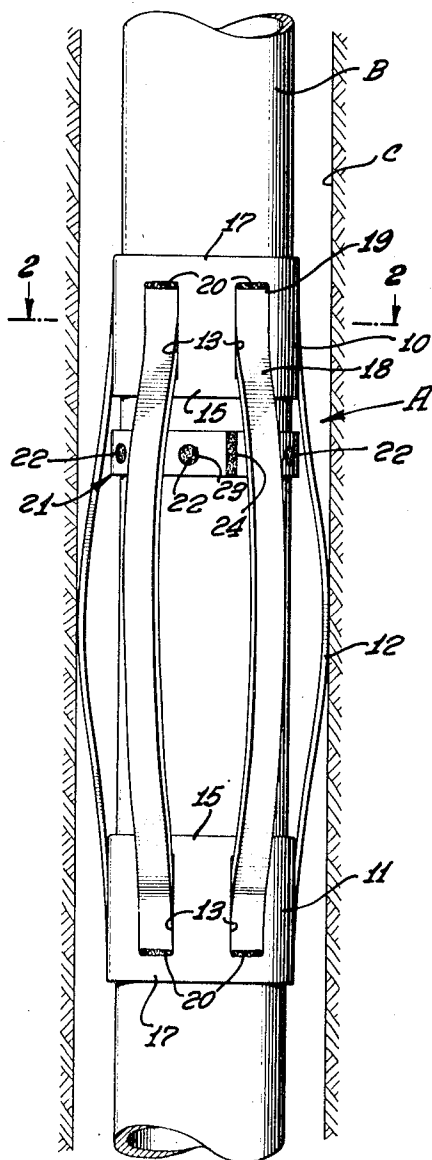


FIG. 2.

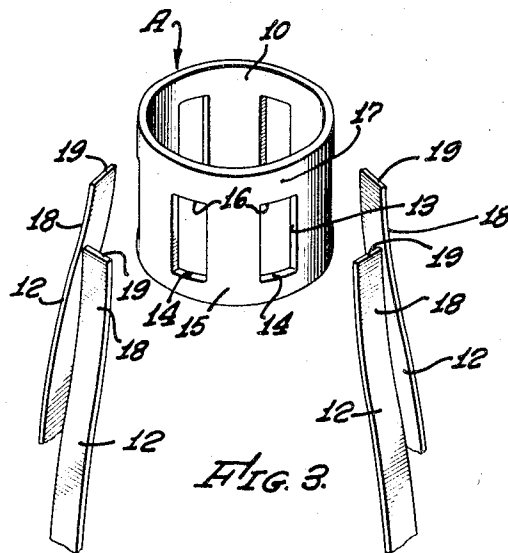


FIG. 3.

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CASING CENTRALIZER

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3 Claims. (Cl. 166—4)

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The present invention relates to centralizers, and more particularly to centralizers for centering casing, liners, and similar conduits in well bores.

It is preferred to pull, and not push, casing centralizers embodying outwardly bowed leaf springs through restrictions in well bores as the casing on which the centralizer is mounted is elevated or lowered. The pulling action facilitates passage of the centralizer through the restriction without danger of damage to the parts. Especially in connection with the cementing of a string of casing in a well bore, it is sometimes desirable to rotate the casing to insure the uniform distribution of cement around its exterior. Such rotation should be imparted to the casing without any need for rotating the centralizer, in view of the dragging of the outwardly bowed centralizer springs around the wall of the formation, with consequent damage or destruction to its parts.

It is, accordingly, an object of the present invention to provide a simple, sturdy, and comparatively inexpensive casing centralizer, which can be pulled through the well bore upon movement of the casing string therein in either longitudinal direction, and which permits rotation of the casing string without corresponding rotation of the centralizer itself.

The invention has other objects that will become apparent from a consideration of the embodiment shown in the drawings accompanying and forming part of the present specification. This form will now be described in detail; but it is to be understood that such detailed description should be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a side elevation of a casing centralizer mounted upon a casing section disposed in a well bore;

Fig. 2 is an enlarged cross section, taken along the line 2—2 on Fig. 1; and

Fig. 3 is a partial, isometric, exploded view of the centralizer.

The casing centralizer A is mounted upon a section of casing B forming part of a casing string, in order to center the latter in a well bore C in which it is disposed. The centralizer includes longitudinally spaced upper and lower generally cylindrical collars 10, 11, to which a plurality of circularly spaced, outwardly bowed springs 12 are secured. These collars are slidably mounted upon the casing section B, in order to

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permit relative longitudinal and rotary movement to take place therebetween.

It is to be noted that each collar has a plurality of circularly spaced, longitudinally extending slots 13 corresponding in number and angular spacing to the leaf springs 12. The inner ends 14 of these slots are disposed inwardly of the inner end 15 of each collar, and their outer ends 16 are disposed inwardly of the outer end 17 of the collar. Accordingly, the inner ends 15 of the collars are circumferentially continuous and provide a smooth surface upon which other elements are not prone to catch or snag.

The ends 18 of the leaf springs 12 are disposed over the inner ends 15 of the collars, fitting within the slots 13, with the terminal portions 19 of the springs abutting the collar material at the outer ends 16 of the slots. Such terminal portions are firmly secured to the collar at the outer ends of the slots by welding material 20. A satisfactory weld can be performed in several different manners without substantially affecting the properties of the leaf springs 12. It has been found that an atomic hydrogen arc weld integrates the ends 19 of the springs to the collars 10, 11 without failure of the welds 20 or of the centralizer parts themselves upon collapsing of the springs inwardly to their fullest extent against the casing section B.

For the purpose of moving the centralizer A through the well bore with the casing string A, a stop ring 21 is attached to the casing section between the upper and lower collars 10, 11. This ring may be split initially to facilitate its mounting on the casing section B between the collar members. Thereafter, it is secured to the casing section by depositing welding material 22 in holes 23 provided in the ring. In addition, if deemed necessary, the adjacent ring ends defining the split 24 may also be welded to one another and to the casing B.

Because of the location of the stop ring 21 between the upper and lower collars 10, 11, the casing centralizer will be pulled through the well bore regardless of the direction of longitudinal movement of the casing B therein. Downward movement of the casing engages the stop ring 21 with the inner circumferentially continuous portion 15 of the lower collar 11, exerting a pulling action on the outwardly bowed springs 12. Similarly, upward movement of the casing string engages the stop ring 21 with the circumferentially continuous inner portion 15 of the upper collar 10, and causes an upward pulling action to be exerted on the outwardly bowed

spring 12. Full bearing engagement of the stop ring 21 with either collar is assured because of the circumferential continuity of the inner ends 15 of the collars and the fact that the bowed springs 12 are disposed over the exterior of such circumferentially continuous portions. As a result, the springs do not interfere with engagement of the ring with the collars. Of course, to avoid such interference, the external diameter of the stop ring 21 is preferably no greater than the external diameter of the collars themselves.

In addition to insuring the pulling of the centralizer through the well bore, as distinguished from its being pushed through the well bore, the casing string B may be rotated freely within the upper and lower collars 10, 11 of the centralizer. This is evident, since there is no connection whatsoever between the casing and the collars. The stop ring 21 will either be disposed out of engagement with both collars 10, 11, so as not to interfere with the free rotation of the casing within the collars, or they may actually be engaged with either collar and will still allow the casing to be freely rotated within the collar, since the stop ring merely rides along the circumferentially continuous inner end 15 of the collar.

The inability of the casing string B to rotate the casing centralizer A insures the ability of the casing string to rotate freely, and also insures against the necessity for dragging the centralizer springs 12 around the walls of the formation, which might produce their breakage.

It is apparent that the centralizer is relatively simple and compact, in view of its comparatively few parts. Its overall maximum diameter, when the springs 12 are in fully collapsed condition against the casing, is the outside diameter of a collar 10 or 11, plus twice the thickness of a centralizer spring. This small overall diameter permits the centralizer to be moved through other casing sections and through well bores whose internal diameters are only slightly greater than the external diameter of the casing on which the centralizer is mounted. In addition, the collapsed external diameter of the centralizer is very little, if any, greater than the external diameter of the usual casing collars which couple the casing sections together.

The inventor claims:

1. A centering device; including a pair of spaced, generally cylindrical members, said

members having circumferentially continuous inner ends facing each other and also having circularly spaced slots longitudinally spaced away from said inner ends; outwardly bowed springs extending between said members, the ends of said springs being disposed over the inner ends of said members and extending into said slots, at which points they are secured to said members; and stop means disposed between and engageable with said inner ends of said members.

2. A centering device; including a pair of spaced, generally cylindrical members, said members having circumferentially continuous inner ends facing each other and also having circularly spaced slots longitudinally spaced away from said inner ends; outwardly bowed springs extending between said members, the ends of said springs being disposed over the inner ends of said members and extending into said slots, said spring ends being welded to said members at the outer ends of said slots; and a stop ring disposed between and engageable with said inner ends of said members.

3. In combination with a casing; a centering device including a pair of spaced, generally cylindrical members slidable on said casing, said members having circumferentially continuous inner ends facing each other and also having circularly spaced slots longitudinally spaced away from said inner ends; outwardly bowed springs extending between said members; the ends of said springs being disposed over the inner ends of said members and extending into said slots, said spring ends being welded to said members at the outer ends of said slots; and a stop ring secured to said casing between said members for selective engagement with the circumferentially continuous inner ends of said members.

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