June 5, 1951 R. C. BAKER 2,555,628

CASING CENTRALIZER

Filed March 8, 1948

Fig. 1.

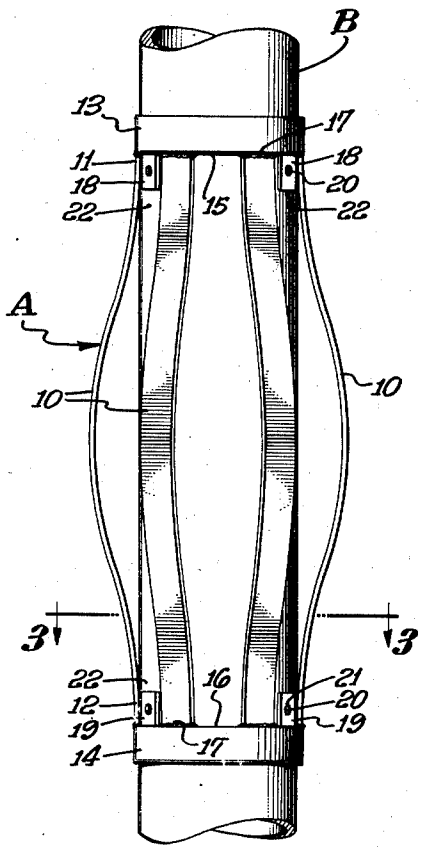
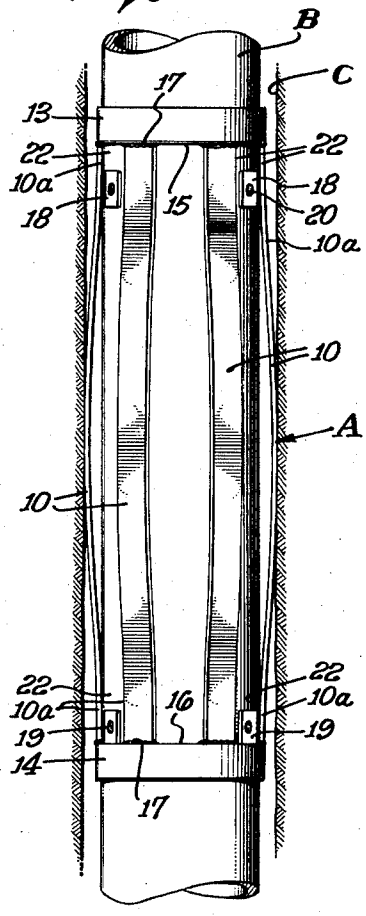


Fig. 2.



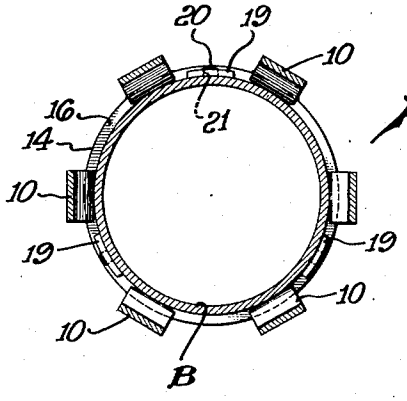


Fig. 3.

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CASING CENTRALIZER

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8 Claims. (Cl. 166—4)

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

Centralizing devices employing outwardly bowed springs are used for centering well casing and the like in well bores. A preferred arrangement insures the pulling, as distinguished from pushing, of the centralizer through restrictions in the well bore, regardless of the longitudinal direction of movement of the well casing, to avoid buckling of the outwardly bowed springs and their possible breaking. These preferred forms, as heretofore constituted, have inherent limitations on the size bore hole in which they can be used. They have not lent themselves to use in so-called "slim" holes of only slightly greater diameter than the diameter of the casing on which they are mounted.

Accordingly, it is an object of the present invention to provide a casing centering device, which can be collapsed inwardly to an effective maximum external diameter that is only slightly greater than the external diameter of the casing on which the device may be mounted.

Another object of the invention is to provide a casing centering device embodying outwardly bowed springs, which can be pulled through the well bore, and which consists of relatively few parts that are economical to manufacture and assemble.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of an embodiment of the invention. For this purpose, there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is a side elevation of a casing centering device mounted on a casing section, with its outwardly bowed springs in fully expanded position;

Fig. 2 is a side elevation of the centering device disposed in a well bore, with the springs partially contracted toward the well casing; and

Fig. 3 is an enlarged cross-section, taken along the line 3—3 on Fig. 1.

The casing center device A is mounted on a casing section, liner, or similar conduit B adapted to be run in a bore hole C. As is well known, the

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purpose of centering devices is to dispose the casing B centrally of the bore hole C.

The centering device includes a plurality of circumferentially spaced, outwardly bowed leaf springs 10 whose upper and lower ends 11, 12 are attached to upper end lower collars 13, 14, respectively, that are slidable along the casing section B. The ends 11, 12 of the springs 10 abut the inwardly facing ends 15, 16 of the collars, to which they are butt welded. An efficient weld can be made through use of an atomic hydrogen arc, a bead 17 being run along the abutting ends of the collar and each spring, which projects but little, if at all, beyond the outer adjacent surfaces of the collar and spring.

The leaf springs 10, as welded to the upper and lower collars 13, 14, are slidably mounted upon a casing section B, the springs occupying their inherently outwardly bowed position, such as illustrated in Fig. 1. It is desired to pull the centralizing device A through the well bore C, as distinguished from pushing such device through the well bore, upon movement of the casing string through the well bore in either longitudinal direction. To achieve this purpose, suitable stop members, such as lugs 18, 19, are placed at spaced intervals adjacent the inner ends 15, 16 of the upper and lower collars 13, 14 between leaf springs 10. The lugs 18 adjacent the upper collar 13 are in transverse alignment, because of their abutting with the latter, and this is also true of the lower set of stop members or lugs 19, which are in transverse alignment by virtue of their abutting with the inner end 16 of the lower collar 14. When properly placed on the casing B, the lugs 18, 19 are secured to it by means of a plug weld 20 disposed within a hole 21 in each lug, and integrated with the casing.

The provision of the upper and lower sets of stop members 18, 19 between the upper and lower collars 13, 14 and adjacent their inner ends 15, 16 insures the pulling of the centralizing device through the well bore. As is evident from Fig. 2, downward movement of the casing string B in the well bore causes the lower stop lugs 19 to engage the lower collar 14 and pull the springs 10 downwardly through the well bore C. The bowed springs 10 contract toward the casing B, which shifts the upper collar 13 out of contact with the upper set of lugs 18, as is evident from Fig. 2. If a pull in the reverse direction, or upwardly, were to take place, the upper set of lugs 18 would engage the upper collar 13, and the lower set of lugs 19 would be spaced upwardly from the lower collar 14. The lugs 19, however, would remain

in the spaces 22 between adjacent leaf springs 10, since the range of movement of the lugs 18 or 19 from the collars 13 or 14 is insufficient to permit relative rotation of the casing to dispose the lugs 18, 19 under any springs 10.

It is to be noted that the thickness of the leaf springs 10 and lugs 18, 19 are preferably no greater than the thickness of the upper and lower collars 13, 14, in order that these elements will not project outwardly beyond the upper and lower collars in the event it is necessary to collapse the springs 10 completely against the casing B. That is to say, the minimum effective outside diameter of the centering device A is the diameter of the upper and lower collars 13, 14, which enables the casing centralizer to be run in well bores whose internal diameter need have only a slight running clearance with respect to the collars 13, 14. When used in such extreme "slim" holes, the springs 10 can be collapsed substantially fully against the casing B, leaving no elements projecting outwardly beyond the upper and lower collars. The placing of the stops 18, 19 between the springs permits such full collapsing to occur. Of course, the springs will expand and exert the necessary force to maintain the casing centered in bore holes that are substantially greater in diameter than the casing string and upper and lower collars 13, 14.

It is, accordingly, apparent that a simple and inexpensive casing centralizer has been provided whose minimum effective external diameter is very little greater than the external diameter of the casing section B itself, on which the casing centralizer is slidably mounted. As a matter of fact, the outside diameter of the collars 13, 14 need be no greater than the external diameter of the usual couplings securing adjacent casing sections together. The centralizer, therefore, imposes no limitations on the minimum diameter bore hole in which it can be used. The side edges 10*a* of the springs 10 prevent the stop members 18, 19 from inadvertently shifting under the springs 10, which would prevent their full inward collapsing, while the disposition of the stop members with respect to the collars themselves insures the pulling of the centralizer through the well bore upon longitudinal movement of the casing string through the well bore in both directions.

The inventor claims:

1. A centering device; including a generally cylindrical member; circumferentially spaced, outwardly bowed springs having ends secured to an end of said member; and stop means disposed adjacent and engageable with said end of said member and projecting laterally outward between adjacent springs; said stop means being confined from substantial angular movement by engagement with the side edges of said adjacent springs.

2. A centering device as defined in claim 1; in which said stop means and the ends of said springs do not extend laterally beyond said member.

3. A centering device; including upper and lower spaced, generally cylindrical members; circumferentially spaced, outwardly bowed springs disposed between said members with their upper and lower ends substantially abutting and secured to the inner ends of said upper and lower members, respectively; and stop means disposed adjacent and engageable with the inner end of each of said members and projecting laterally outward between the end portions of adjacent springs; said stop means being confined from substantial angular movement by engagement with the side edges of said adjacent springs.

4. A centering device as defined in claim 3; in which said stop means and the ends of said springs do not extend laterally beyond said members.

5. In combination with a casing; a generally cylindrical member slidable on said casing; circumferentially spaced, outwardly bowed springs secured to an end of said member; and stop means secured to said casing and disposed adjacent and engageable with said end of said member and projecting laterally outward between adjacent springs; said stop means being prevented from movement under said springs by engagement with the sides of said adjacent springs.

6. In combination with a casing; upper and lower spaced, generally cylindrical members slidable on said casing; circumferentially spaced, outwardly bowed springs disposed between said members with their upper and lower ends substantially abutting and secured to the inner ends of said upper and lower members, respectively; and stop means secured to said casing and disposed adjacent and engageable with the inner end of each of said members and projecting laterally outward between the end portions of adjacent springs; said stop means being prevented from movement under said springs by engagement with the sides of said adjacent springs.

7. A centering device; including a generally cylindrical member; circumferentially spaced, outwardly bowed springs having ends secured to an end portion of said member; and a lug disposed adjacent and engageable with said end portion of said member and projecting laterally outwardly between adjacent springs out of alignment with said springs; said lug being confined from substantial angular movement by engagement with the side edges of said adjacent springs.

8. A centering device; including upper and lower spaced, generally cylindrical members; circumferentially spaced, outwardly bowed springs disposed between said members with their upper and lower ends secured to the inner end portions of said upper and lower members, respectively; and lugs disposed adjacent and engageable with the inner ends of each of said members and projecting laterally outwardly between the end portions of adjacent springs and out of alignment with said springs; said lugs being confined from substantial angular movement by engagement with the side edges of said adjacent springs.

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