July 8, 1952 R. C. BAKER 2,602,512

CASING CENTERING DEVICE

Filed Feb. 12, 1949

Fig. 1.

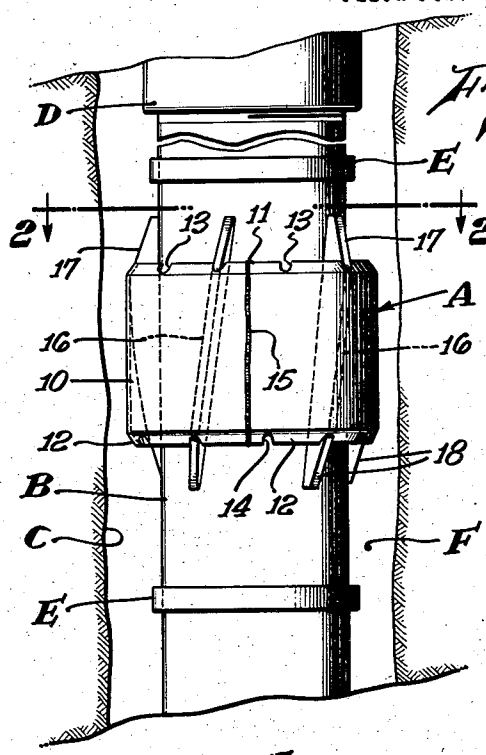


Fig. 2.

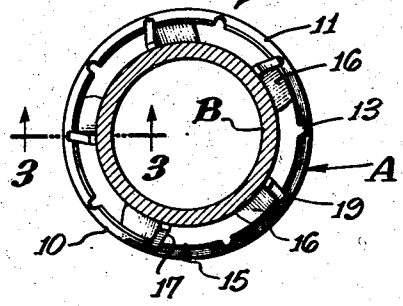


Fig. 4.

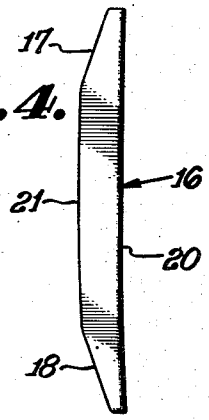


Fig. 3.

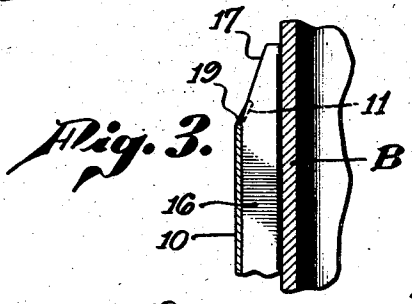
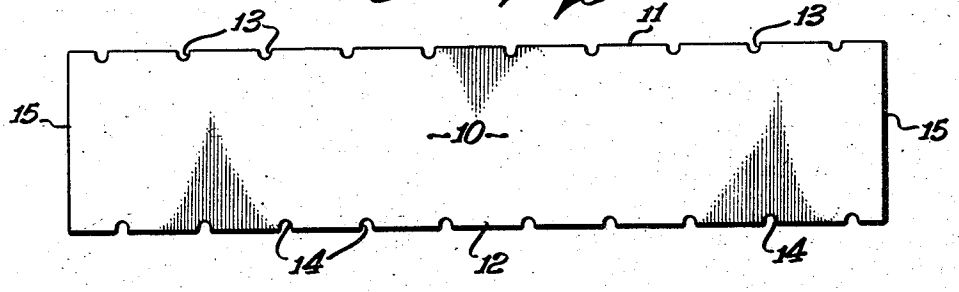


Fig. 5.



REUBEN C. BAKER,
INVENTOR.

BY Mellen and Hanscom
ATTORNEYS

Patented July 8, 1952

2,602,512

UNITED STATES PATENT OFFICE

2,602,512

CASING CENTERING DEVICE

Reuben C. Baker, Coalinga, Calif., assignor to Baker Oil Tools, Inc., Vernon, Calif., a corporation of California

Application February 12, 1949, Serial No. 76,147

5 Claims. (Cl. 166—4)

1

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

An object of the present invention is to provide an improved device for centering well conduits in well bores.

Another object of the invention is to provide a device for centering casing and the like in well bores, which allows ample room for fluid circulation around the exterior of the casing and through the device.

Still another object of the invention is to provide a casing centering device, which tends to prevent channeling of cementitious material deposited behind the casing.

A further object of the invention is to provide a centering device for casing and the like, which is of simple, light, and sturdy construction, and which is comparatively inexpensive to manufacture.

Yet a further object of the invention is to provide a centering collar which may be mounted readily on a well casing, or similar tubular string.

Another object of the invention is to provide a centering collar which will not tend to interfere with the movement of a casing string, on which the collar is mounted, in a well bore.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to 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 centering device mounted on a string of casing and disposed in a well bore;

Fig. 2 is a cross-section taken along the line 2—2 on Fig. 1;

Fig. 3 is an enlarged fragmentary, longitudinal section taken along the line 3—3 on Fig. 2;

Fig. 4 is a side elevation, on an enlarged scale, of one of the ribs forming part of the centering device; and

Fig. 5 is a view, in a single plane, showing a metallic blank, with its upper and lower marginal portions notched, and prior to its formation into a collar.

2

As disclosed in the drawings, a centering device A is mounted on a casing, liner, or similar conduit string B positioned in a well bore C. The centering device is designed to prevent engagement of the casing B with the wall of the well bore, in order to retain a suitable annular area completely around the casing, in which cement slurry or other cementitious materials may be deposited.

The centering device includes a collar 10 having upper and lower bent-in portions or inturned flanges 11, 12, which are provided with notches or slots 13, 14 at spaced points around their circumferences. The upper notches 13 are preferably uniformly spaced from one another, which is also true of the lower notches 14.

As disclosed in Fig. 5, the collar 10 may be formed from a single sheet of metal of proper gauge or thickness, with the upper and lower margins 11, 12 provided with the notches 13, 14 to the required depth. After the blank has been suitably notched, it is rolled into a cylindrical form and its ends 15 are butt-welded to one another. Thereafter, the marginal portions 11, 12 may be bent inwardly to provide the tapered upper and lower ends.

The notches 11, 12 are so spaced from one another on both the upper and lower margins as to be uniformly spaced from one another when the blank is rolled into a cylindrical form. Such uniform spacing also occurs between the notches on opposite sides of the butt-welded joint 15. If desired, the notches 14 on the lower margin of the collar may be staggered or offset with respect to the upper marginal notches 13, although this is not indispensable.

Following formation of the collar 10 with its inturned flanges 11, 12, a plurality of longitudinally extending ribs 16 are mounted on the interior thereof. These ribs each have tapered upper and lower portions 17, 18 extending longitudinally outwardly of the collar and toward the collar axis. Each rib is disposed within the collar, with its upper portion 17 received within an upper notch 13 and its lower portion 18 within a lower notch 14. Each rib is suitably integrated to the collar at the notches, as by use of welding material 19.

It is preferred that the ribs 16 be mounted within the collar 10 in a position inclined with respect to planes passing through or parallel to the collar axis. For this reason, each rib is disposed within an upper notch 13 and also within a lower notch 14 offset with respect to the upper notch, as disclosed most clearly in Fig. 1. As de-

scribed above, the lower notches 14 are offset with respect to the upper notches 13. The extent of this offsetting determines the angle of inclination of the ribs 16 to radial collar planes. Of course, if the upper and lower notches 13, 14 were in longitudinal alignment with each other, then the ribs 16 could still be inclined by extending them from an upper notch 13 to a lower notch 14 displaced to one side of the lower notch in alignment with the upper notch.

In view of the inclination of the ribs 16, their inner surfaces 20 are preferably curved, or made concave, so as to have surface bearing contact upon a casing B, on which the centering device A is to be mounted. Similarly, the outer surface 21 of each rib may also be curved in convex fashion so as to conform to the curvature of the inner wall of the collar 10. In view of the fact that the extent of inclination of the ribs 16 to the vertical or radial planes may not be too great, ample support of the ribs in the collar can be obtained without curving their outer surfaces, by leaving such surface straight. The welding material 19 holds each rib 16 securely to the collar 10. However, if desired, the outer surface 21 of each rib may be curved in the manner above indicated.

The ribs 16 are uniformly spaced around the circumference of the collar 10, the number of ribs employed depending upon the diameter of the collar and of the casing B on which the collar is mounted. As shown in the drawings, by way of example, double the number of ribs may be embodied in the collar than actually illustrated, in view of the number of notches 13, 14, but this number may not be necessary. It is, of course, apparent that the number of ribs and notches can be varied without departing from the invention.

The complete centering device A is mounted on a casing section B by sliding it over one of its ends. The centering device may be left free on the casing section, since the inner surfaces 20 of its ribs have an effective diameter slightly greater than the outside diameter of the casing, which will allow the centering device to slide up and down on the casing, as well as permit rotation of the casing therewithin. The centering device will be limited in its longitudinal movement by the usual couplings D at the upper and lower ends of the casing section on which the centering device is mounted. If it is desired to further limit the extent of longitudinal movement of the centering device, a suitable stop ring E may be welded on the casing section above or below the centering device, or both above and below the centering device. Usually, it is preferred to place a centering device A immediately above the casing shoe (not shown) and prevent substantial travel of the device away from the casing shoe, in order to insure centering of the shoe, and the casing joint attached to it, within the well bore. At such point of installation of the centering device, a stop ring E may be welded on the casing a short distance above the centering device.

The centering device A may also be mounted on the casing section and rigidly secured thereto in any suitable manner, as by welding the ends of the ribs 16 directly to the casing B.

As many centering devices as are needed are mounted on the casing string, which is run in the well bore to the desired extent. During running of the casing string in the well bore, the lower inturned flange 12 and the lower tapered ends 18 of the ribs form guiding surfaces preventing the centering device and casing string from being stopped or arrested by minor obstructions or restrictions in the well bore. Similarly, the upper tapered flange 11 and upper tapered ends 17 of the ribs 16 provide guiding surfaces for the centering device in the event of upward movement of the casing string in the well bore.

When the bottom of the casing string has reached its intended location, circulating or washing fluid may be pumped down the casing string for upward passage through the annulus F within the well bore around the exterior of the casing B. Despite the fact that the centering device is bridging the annular space to a certain extent, the washing fluid has ample area for traveling through the annulus, since it can flow within the interior of the collar 10 between the ribs 16, as well as around the exterior of the collar 10. The space between adjacent ribs is quite substantial, and allows almost unimpeded circulation of the washing fluid through the collar. In addition, the inclination of the ribs 16 to the vertical causes the washing fluid to "whirl" as it proceeds upwardly through the collar, creating turbulence, which is effective in aiding the proper conditioning of the well bore.

After the well has been conditioned by the circulating fluid, the necessary quantity of cement slurry, or other cementitious material, may be pumped down the casing string B, passing out through the shoe, or other point in the casing string, for upward passage through the annulus F around the casing. Since the collar device A is holding the casing B substantially centered in the well bore and spaced from its wall, a uniform deposit of cement slurry may be placed behind the well casing. As this slurry passes upwardly through the collar 10, it is also caused to "whirl," or become turbulent, which minimizes, if not eliminates, channeling of the cement slurry, and insures a uniform cement sheath around the well casing.

It is apparent that the casing centering device is of comparatively light and sturdy construction, and inexpensive to manufacture. It can effectively center the well casing in the bore hole; it produces a "whirling" action on the fluid passing longitudinally along the exterior of the casing; and it is readily guided past any obstructions or restrictions in the well bore, in view of its tapered upper and lower ends.

The inventor claims:

1. A prefabricated casing centering device comprising a substantially cylindrical collar having inturned flanges at either end thereof, said flanges having circumferentially spaced notches therein, and substantially longitudinally disposed ribs within said collar and notches, said ribs being secured to said collar.

2. A prefabricated casing centering device comprising a substantially cylindrical collar having inturned flanges at either end thereof tapering inwardly in opposite directions toward the axis of the collar, said flanges having circumferentially spaced notches therein, and substantially longitudinally disposed ribs within said collars and notches, said ribs being secured to said collar.

3. A prefabricated casing centering device comprising a substantially cylindrical collar having inturned flanges at either end thereof, said flanges having circumferentially spaced notches therein, and substantially longitudinally disposed ribs within said collar and notches, said ribs

being secured to said collar, and each rib being inclined to a radial plane of the collar.

4. A prefabricated casing centering device comprising a substantially cylindrical collar having inturned flanges at either end thereof, said flanges having circumferentially spaced notches therein, and substantially longitudinally disposed ribs within said collar and notches, said ribs being secured to said collar, each rib being inclined to a radial plane of the collar, the inner surface of each rib being concave.

5. A prefabricated casing centering device comprising a substantially cylindrical collar having inturned flanges at either end thereof, said flanges tapering inwardly in opposite directions toward the axis of the collar, said flanges having circumferentially spaced notches therein, and substantially longitudinally disposed ribs within

said collars and notches, said ribs being secured to said collar, each of said ribs being inclined to a radial plane of the collar, the inner surface of each rib being concave.

REUBEN C. BAKER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,616,666	Nebergall	Feb. 8, 1927
1,767,198	Baker	June 24, 1930
2,288,124	Creighton	June 30, 1942
2,424,027	Gist	July 15, 1947
2,496,179	Schwarz	Jan. 31, 1950