March 1, 1966 J. E. HALL, SR 3,237,696

WELL WALL SOLIDIFYING CENTRALIZER

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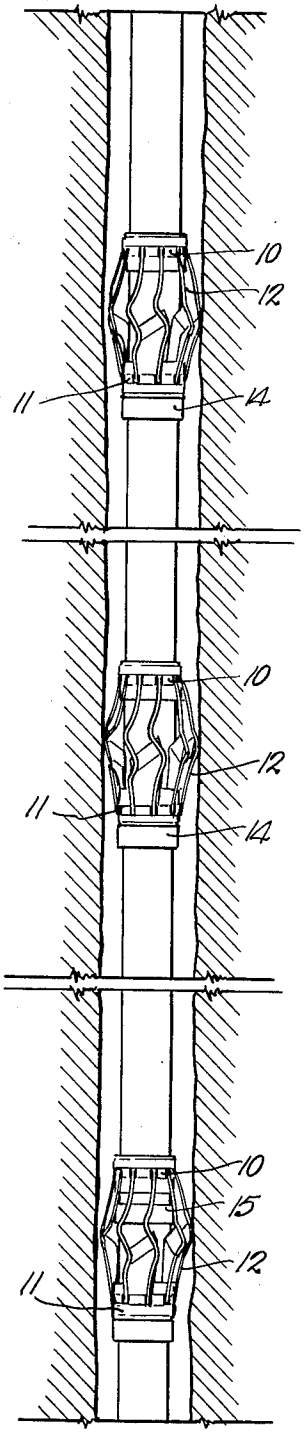


Fig. 1.

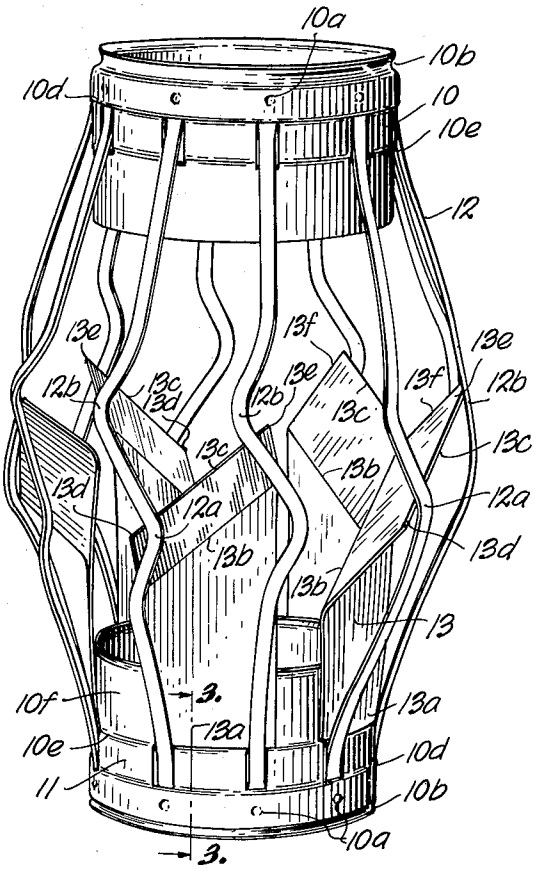


Fig. 2.

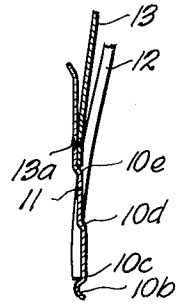


Fig. 3.

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WELL WALL SOLIDIFYING CENTRALIZER

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This invention relates to improvements in a well wall solidifying centralizer and refers more particularly to an improved type of centralizer which, besides maintaining the pipe centrally in the well bore, provides further advantages with respect to drilling and completion operations.

In my prior Patent No. 2,220,237, issued November 5, 1940, there was disclosed a centralizer having spiral bands or blades spanning the collars, which bands were also twisted axially, rendering them operable to scrape the mud from the well wall and impart "a whirling orbital motion to media or cement flowing past it to assist it in cleaning the bore and prevent channeling of the cement." It was explained in that patent that the tangential twist of the band or blades made them effective to impart helical turbulence to the fluids passing through the device which would better clean the wall of the well bore and cause better distribution of the cement in the annular space about the casing.

The present invention supplements this patent in that there is provided deflector vanes within the blades of the centralizer, which vanes are anchored at their lower ends within the lower collar of the device to prevent detachment during use.

The collars of the solidifying centralizer are circumferentially grooved at the upper edge of the upper collar and the lower edge of the lower collar to facilitate mounting of the device on the casing and sliding of the device along the casing during use in completion operations.

Another object of the invention is to provide deflector vanes or baffles of sufficient size and contour to give a scouring action to the mud circulating during drilling and better distribution of the cement when the annular column is placed.

Attachment of the deflector vanes to the lower collar, besides offering protection against dislodgement, protects the anchored ends from well wall abrasion, while the free ends of the vanes are confined within the blades of the device and offered both support and protection from dislodgement and distortion.

A further object of the invention is to provide deflector vanes of sufficient size and contour to force or project the heavier sealing materials into the pores, interstices, cracks or fissures of the well wall or formation, thereby minimizing the hazards of lost circulation.

The turbulence and scouring action produced by the deflectors likewise removes excess unstable growths from the casing and formation face. This turbulence produced by the deflectors is not only advantageous in maintaining the casing and well wall surfaces free from accumulated mud, but provides more intimate mixture of the cement stream forming a solid casing to formation bond by filling more completely the holes, apertures and fissures in the well wall, whereby channeling of the cement within the annulus is to a great extent eliminated.

In the accompanying drawings which form a part of the instant specification and are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views, there is shown a preferred embodiment of the invention.

FIG. 1 is an interrupted sectional view of an oil well in which the solidifying centralizers are shown mounted on a casing.

FIG. 2 is an enlarged elevational view of the centralizers shown in FIG. 1.

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2 in the direction of the arrows.

Referring to the drawings and particularly to FIG. 2, the deivce has an upper collar **10** and a lower collar **11**. Spanning the collars are a plurality of springs, bands or blades **12**, which, in the device shown, have an S-shaped bend midway their length between the collars. This S-shaped bend centrally of the bands or blades serves to more effectively clean the well wall and acts as supports for the upper free ends of deflectors **13**. The collars are perforated at spaced intervals circumferentially to receive the ends of the blades **12** which, after passing through the apertures, are fixedly attached to the insides of the collars by riveting or spot welding as shown at **10***a*. The upper edge of the upper collar, and the lower edge of the lower collar are grooved circumferentially as shown at **10***b*, which flanges the edges of the collars outwardly facilitating mounting of the device on the casing and the sliding of the centralizer along the casing while reciprocating the pipe during setting of the pipe in the well. The shoulder formed by grooving the edges of the collar also serves as a seat or stop for the ends of the blades, shown best in FIG. 3 at **10***c*.

The shoulders or ridges **10***d* and **10***e* are rolled into the collar at the upper and lower extremities of the rectangular apertures through which the blade ends pass. The raised ridge formed in the collars produced by rolling in shoulders **10***d* of the device, supplies a space under the collars and between the collar and casing for reception of the blade ends. The shape of the apertures and reduced diameter **10***f* of the collars below shoulders **10***e* permits the blades to lie closer against the casing when the centralizer bands or blades are constricted or confined by the well bore. The shoulder **10***e* in the lower collar also provides a seat upon which the anchored ends of the deflector blades **13** rest with rigid attachment to the portion **10***f* of the collar by spot welding, riveting or otherwise fastening diagrammatically shown at **13***a*.

The upper free ends of the deflectors are contoured centrally outwardly and upwardly by a bend formed diagonally across the vanes so the upper slanting edges or extremities **13***c* lie behind two of the blades or bands **12**. When shaped and bent in this fashion the lower corners of the upper edges of the deflectors are behind and normally rest, when not in use, against the lower curved portions **12***a* of one of the blades, while the upper corners **13***e* of the same deflectors are behind and rest against the upper curved portions **12***b* of an adjoining blade.

The centralizers may be mounted on the casing collars **14** or between casing couplings as shown in FIG. 1 with reference to the application of the upper two devices permitting free longitudinal movement along the casing, or they may be mounted or attached to the casing by a stop collar **15** within the device between its collars as shown by the lower centralizer in FIG. 1. This latter type mounting obviously limits the longitudinal movement of each device along the casing to substantially the distance between the centralizer collars.

In operation, after the devices have been mounted and while the casing is being run prior to cementing, it is recommended that it be reciprocated substantially the distance between the centralizers while mud fluid is being circulated. On the down stroke besides centering the pipe the deflector vanes produce helical turbulence in the mud stream and a jetting action of the fluid from the edges of the free ends of the vanes or baffles Since these deflectors or baffles are free to flex, they do not form a barrier against the passage of the fluid as they would had they been mounted directly upon the relatively rigid blades, but

instead serve only to increase the velocity of the fluid manyfold as it passes the extremities of the vanes. Due to the shape of the blade and their contour fluid passing the slant edges **13***c* is projected against the well bore where it scours the surface, removing loose accumulations of mud, tailings or bit cuttings which would impede or prevent obtaining a satisfactory bond between the cement column and formation Well fluid projected or jetted from the edges **13***f* of the deflectors scours and flushes solids accumulated on the casing surface. Thus the deflectors have a dual cleaning purpose to remove contamination from both the well bore and casing surface while being protected against detachment and distortion due to scraping or abrasive action of the well wall by the strong centralizer blades.

Another feature and advantage obtained from jetting the well fluid against the well bore is to drive the heavier particles suspended in the mud into the formation which plugs the pores and fissures through which the fluids tend to escape, thereby reducing chances of possible circulation loss.

The turbulence generated by the deflectors also keeps the cement particles intimately mixed in the well fluid assuring a uniform cement throughout the length of the cemented area.

From the foregoing it will be seen that the invention is well adapted to attain all the ends and objects hereinbefore set forth together with such other advantages as are obvious and which are inherent to the structure.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A centralizer for mounting on well casing during well completion operations comprising

upper and lower collars slidably fitted to the exterior of the casing,

a plurality of bowed spring members spanning the space between the collars, one end of said members attached to the upper collar, the other end to the lower collar, said members equally spaced circumferentially,

diversion vanes extending upwardly part way between the collars, their lower extremities anchored to the lower collar, their upper free ends contoured centrally outwardly and upwardly by a bend formed diagonally across the vanes so the upper slanting edges lie between the spring members and casing and are restricted as to radial movement by the bowed portions of the spring members and the exterior of the casing.

2. A centralizer as in claim **1**, with

perforations at spaced intervals circumferentially of the collars,

the ends of the bowed spring members passed through said perforations and fastened within the collars as protection against well wall abrasion and detachment.

3. A centralized as in claim **1**, wherein the diversion vanes have an axial twist.

4. A centralizer as in claim **1**, wherein S-bends formed centrally of the bowed spring members provide rest supports for the free ends of the diversion vanes.

5. A centralizer as in claim **1**, wherein circumferential shoulders formed in the collars provide a seat for the anchored ends of the diversion vanes and protection against detachment.

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