Dec. 12, 1967 B. H. BOLDING, SR 3,357,494

SCRATCHER ATTACHMENT FOR OIL WELL CASING

Filed Dec. 7, 1964 2 Sheets-Sheet 1

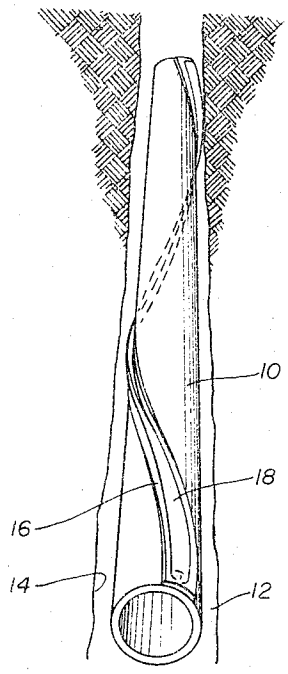


Fig. 1.

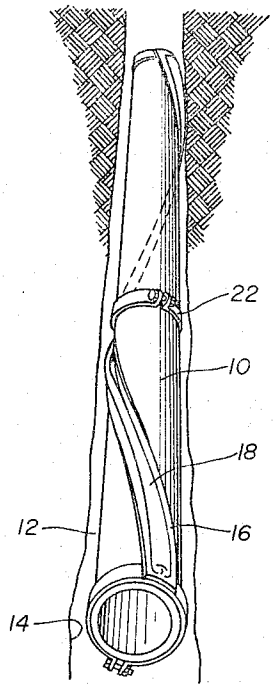


Fig. 2.

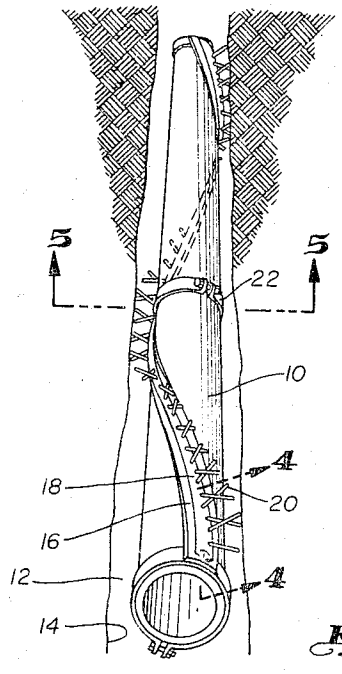


Fig. 3.

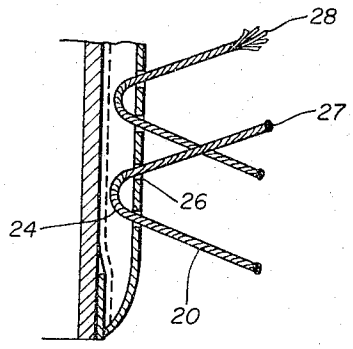


Fig. 4.

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SCRATCHER ATTACHMENT FOR OIL WELL CASING

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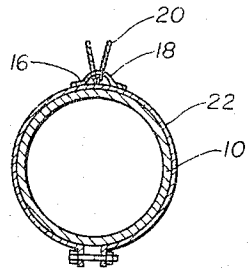


Fig. 5.

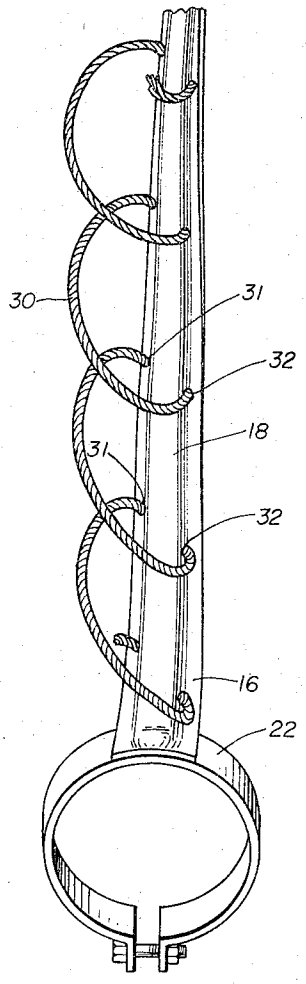


Fig. 6.

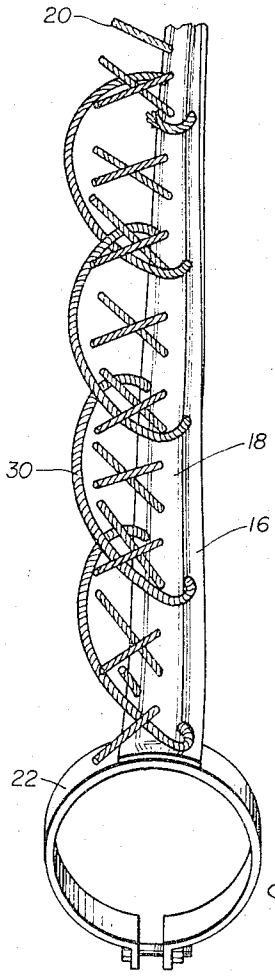


Fig. 7.

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3,357,494
SCRATCHER ATTACHMENT FOR OIL WELL CASING

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6 Claims. (Cl. 166—173)

This invention relates to oil well devices, and more particularly to oil well casing scratchers which at the same time serve as a means of centering the oil well casing in the bore hole to create a known annulus.

It is a conventional practice in oil well drilling to circulate drilling mud down the hole during the drilling operation in order to lubricate the drill bit, aid in the removal of drilling chips and other debris, and place additional weight upon the drilling bit. As the drilling operation progresses, some of this drilling mud coats the bore hole walls and various particles become embedded in the walls. Subsequent cementing of the casing is undertaken by first setting the casing in place and then pumping cement down through the casing so that it rises upward through the annulus between the casing and the bore wall to hold the casing in place. This cementing operation also serves the purpose of sealing off the oil well to prevent communication between different zones, thus permitting the driller to produce from any zone he sees fit. The cementing also serves the purpose of reinforcing or strengthening the casing. However, if the residual drilling mud is permitted to coat the bore hole walls, the cement which is later applied will not be able to adhere to the walls efficiently and thus loses its effectiveness.

Various kinds of oil well casing scratchers have been devised to remove the drilling mud coating prior to the cementing operation. Some of these are described in United States Patents 2,826,253; 2,868,298 and 3,087,550. All of these patents disclose various kinds of casing scratchers attached to the outer wall of the casing so that the bore hole wall is cleaned as the casing is put in place. Some require reciprocation and/or rotation of the casing before the scratchers become operable. Others are so bulky that they tend to clog the annular space between the casing and the bore hole wall and thus tend to slow down the flow of cement during the cementing operation and consequently require excessive pressure in order to circulate the cement. In those situations where the oil well scratchers are attached to a cable-like device, the device will occupy such a limited space that a turbulent, directed flow of the cement will be prevented.

A primary object of this invention is to provide a casing scratcher which will effectively clean the bore hole walls and prepare these walls for the ensuing cementing operation and at the same time permit the turbulent flow of cement up a known annular space at a minimum of pressure. Another object of this invention is to provide a device which will permit the oil well casing to remain in substantially the central portion of the bore hole.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings in which:

FIGURE 1 is a perspective view of a solid, weld-on spiral embodiment for creating a known annulus.

FIGURE 2 is a perspective view of the type shown in FIGURE 1 utilizing a clamp.

FIGURE 3 is a perspective view of a spiral bristle type casing scratcher.

FIGURE 4 is a cross-sectional view through the section 4—4 of FIGURE 3.

FIGURE 5 is a cross-sectional view of the casing and scratcher through the section 5—5 of FIGURE 3.

FIGURE 6 is a partial perspective view of another embodiment of this invention.

FIGURE 7 is a partial perspective view of a further modification of this invention.

Referring now to the drawings in detail, an oil well casing **10** is shown in position in a bore hole with the annular space **12** designated between the casing **10** and the bore wall **14**. In FIGURE 1, the strip **16** is shown as being welded longitudinally of the casing **10** so that the strip **16** forms a gentle helical coil around the casing. The central portion of the strip **16** is curved outward as with channel portion **18** which provides a space for attaching the wire scrapers, and acts as a centralizer for the casing in addition to causing spiral turbulent flow to the cement slurry. The preferred embodiment of the invention has the central portion **18** raised longitudinally of the strip **16** so that the raised central portion **18** is in the form of a smooth curve with respect to the flattened side portion of strip **16** as clearly shown in FIGURE 5. The smooth curve assumed by a cross section of the raised central portion might be described as semi-circular or semi-elliptical. Or, the raised central portion itself might be described as being semi-cylindrical. However, it is also possible to construct this raised central portion so that a cross section thereof would be rectangular, and in this configuration the scraper element **20** and **30** could extend from openings placed in the sides of the rectangular raised portion, which sides are perpendicular to a tangent to the casing **10**. In FIGURE 2, the strip **16** is not welded to the casing **10** as in FIGURE 1 but is gently spiraled around the casing **10** and is held in position by the periodic placement of friction bands **22**. The friction bands **22** are simply welded-on metallic bands surrounding the casing **10** to hold the strip **16** in spiral position. The bands **22** may have their ends tied together and secured in place by any conventional holding means. The strip **16** shown in FIGURE 3 may be maintained in position either in the manner of FIGURE 1 or by the method of FIGURE 2. That is, the strip **16** may either be welded in position as in FIGURE 1 or may be held in its spiral condition by friction band **22** as in FIGURE 2. Preferably, the ends of the channel **18** are closed to prevent the by-pass of either cement or other oil well treating agents used in later completing the well. The embodiment of FIGURE 3 describes the arrangement of the wire scrapers **20** which are positioned longitudinally along the inverted channel **18**. These wire scrapers **20** are short lengths of a durable aircraft type, multi-strand wire cable inserted through openings **26** in the inverted channel **18**. Each end of a small length of wire cable is inserted through adjacent openings **26** without the necessity of separate fastening means. After insertion, the loop **24** formed inside the channel causes an outward bias to the wire scrappers **20** which tends to hold them in place. In one embodiment, after placement of the scrapers, the ends **27** of scraper wires **20** are welded together by touching a torch thereto. In some instances however, it is desirable to fray the ends of the cable as depicted by numeral **28** in FIGURE 4, or allow them to fray during usage to provide more efficient scraping plus increased reinforcement for the cement.

Referring now to FIGURE 6, a scratcher cable **30** is shown in a loop spiral configuration. In this embodiment, the cable wire is woven through spaced pairs of openings **31** and **32** in a "back-loop" manner. It has been found that the placement of openings **31** and **32** is a critical limitation in this invention. Each pair of openings **31** and **32** are positioned on or adjacent each side of channel **18** and lie in a plane at an angle to the channel. This causes the wire loops to assume a slanted or canted position such that upon rotation of the casing the loops will all lie to one side. In addition, the loops cannot become

sheared or pinched at the connection through openings **31** and **32** when the casing slams or positions itself against the wall of the well because of the protective nature of the outward channel. This is in contradiction to those devices wherein the openings lie in a plane along the channel as shown in the prior art.

In operation, the strip **16** is welded to the casing as in FIGURE 1 or applied to the casing by being held in place by the friction bands **22** of FIGURE 2. As shown in FIGURE 3, the wire scrapers **20** are inserted through the openings **26** before the strip **16** is welded or attached to the casing. To put these wire scratchers in use, the casing containing the wire scratchers is simply lowered in position down the bore hole in the usual manner and, because of the spiral condition of these casing scratchers, a more thorough contact with the bore hole wall is had than if the casing scratchers were aligned longitudinally or radially of the casing. That is, an inherent rotative application of the forces is achieved even if no rotation of the casing is done while the casing is being lowered. However, an even more efficient operation could be had by the simple maneuver of rotating the casing while it is being lowered or periodically raising and lowering the entire casing over a short distance during the insertion operation, as occurs when adding stands of casing.

The homogeneous application of the cement is insured by the known annulus construction of the casing scratchers in a spiral configuration. However, as pointed out above, if the casing has too many spirals around the casing per unit length of casing, the path of the cement is greatly lengthened and the pumping pressure becomes excessively high. The gentle spiral configuration of this invention permits the efficient turbulent flow of the cement while at the same time insuring a homogeneous filling of the annular space with cement without permitting unoccupied spaces.

In a typical embodiment, the spiral element **16** is adapted to make one revolution about the casing for each five feet of length. The scratcher elements are constructed of 7 by 7⅝₂ inch aircraft cable. Where a 4½ inch casing is to be placed in a 7⅞ inch open hole, the scratcher elements are cut 7 inches long, leaving 3 inch fingers outward thereof. In some instances, the void space on the back side of the elements is filled with a cement material.

Since many different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that the specific embodiments described in detail herein are not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

What is claimed:

1. An oil well casing centralizer and scratcher comprising

at least one strip having a longitudinally outwardly directed semi-circular central portion, said strip retained longitudinally along the exterior surface of said oil well casing and encircling said casing helically for not more than one revolution, said strip having pairs of openings spaced periodically longitudinally along said strip, each pair comprising a first opening on one side of said central portion and a second opening on the other side of said central portion, said openings positioned below the top of said central portion adjacent the junction of said central portion and said strip, and

a continuous length of wire cable threaded through said first opening to said second opening under said central portion thence outwardly to form a large loop across said central portion and threaded similarly through the next adjacent pair of openings continuously the length of said strip.

2. An oil well casing centralizer and scratcher according to claim **1** wherein said strip is attached to a plurality of bands disposed coaxially about and clamped to said casing.

3. An oil well casing centralizer and scratcher according to claim **1** wherein said strip describes substantially one helically encircling revolution of said oil well casing in five feet of longitudinal length.

4. An oil well casing centralizer and scratcher comprising

at least one strip having a longitudinally outwardly directed semi-circular portion, said strip retained longitudinally along the exterior surface of said oil well casing and encircling said casing helically for not more than one revolution, said strip having a first series of pairs of openings spaced periodically longitudinally along said strip, each pair comprising a first opening on one side of said central portion and a second opening on the other side of said central portion, said openings positioned below the top of said central portion adjacent the junction of said central portion and said strip,

a continuous length of wire cable threaded through a first opening to a second opening under said central portion thence outwardly to form a large loop across said central portion and threaded similarly through the next adjacent pair of openings, continuously the length of said strip,

a second series of periodically spaced openings arranged longitudinally along said central portion, and

wire scrapers consisting of a plurality of lengths of wire cable, each end of which extends outward through two adjacent openings of said second series of openings to form a partial bend at the central portion of said wire which occupies a position between said strip and said casing.

5. An oil well casing centralizer and scratcher according to claim **4** wherein said strip describes substantially one helically encircling revolution of said oil well casing in five feet of longitudinal length.

6. An oil well casing centralizer and scratcher according to claim **4** wherein said strip is attached to a plurality of bands disposed coaxially about and clamped to said casing.

References Cited

UNITED STATES PATENTS

1,342,618	6/1920	Bashara	166—173
1,959,368	5/1934	Kennedye	166—241 X
2,433,955	1/1948	Meynig	166—170
2,717,650	9/1955	Hall	166—173 X
2,826,253	3/1958	Wright et al.	166—173
2,903,073	9/1959	Coyle	166—173 X
3,087,550	4/1963	Tyrrell	166—241 X
3,268,008	8/1966	Turbyfill	166—173

FOREIGN PATENTS

580,142	7/1959	Canada.
1,091,120	10/1954	France.
663,675	12/1951	Great Britain.

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