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CASING SCRAPER

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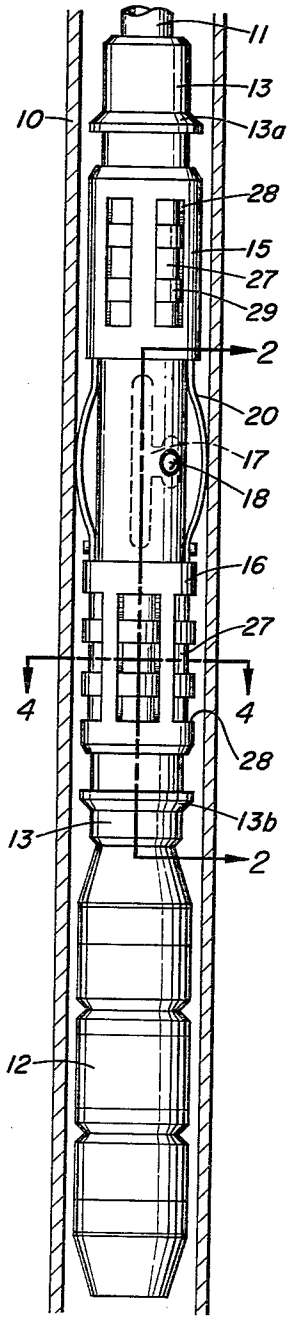

FIG. 1

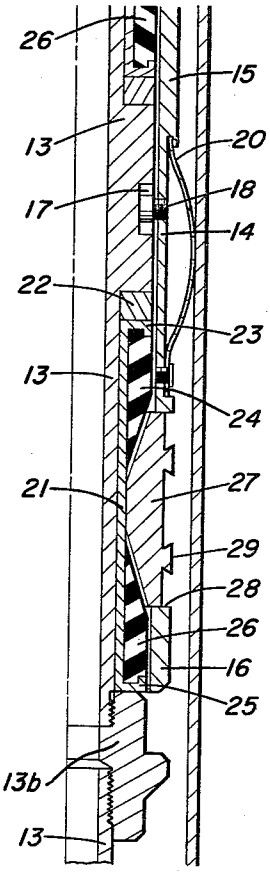

FIG. 2

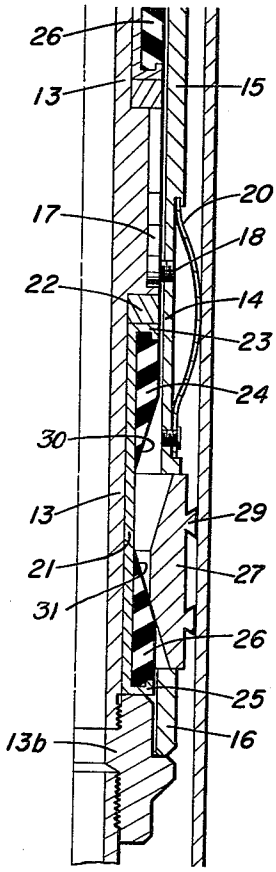

FIG. 3

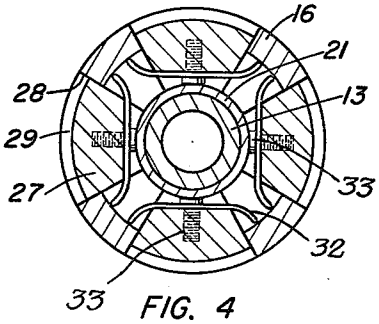

FIG. 4

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CASING SCRAPER

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This invention relates to casing scrapers for use in oil wells or the like and more particularly to a scraper capable of removing cement, paraffin or any type of scaly material from the inner wall of a casing string or liner in a well by vertical movement therethrough.

It is often important to clean the inside of a casing in a well. This may be necessary before tools or a pump can be run into the well. It is often desirable to clean the inside of the casing before a packer is set therein, so that the packer may succeed in making an effective seal.

Various scraping devices have long been in use for clearing casing of obstructions, and the art is fairly well developed.

The present invention is directed to an improved scraper which functions to remove the obstructions by vertical movement of scraping blades through the casing, and in which the blades are held in position against the casing by means of resilient wedges or spreader blocks. The blades may be run into the well on drill pipe or tubing in connection with a packer, and be held in a retracted or inoperative position until the desired location is reached, and then extended to engage the casing and scrape only a limited section thereof to form a good seat for the packer.

The scraper of the present invention thus is capable of overcoming certain objections to the use of prior art scrapers and of accomplishing certain novel objects, as will be apparent to those skilled in the art from the following description of the preferred form of the invention, when taken in connection with the accompanying drawing, in which:

FIGURE 1 is a side view of a scraper and packer assembly constructed in accordance with the principles of the invention, the assembly being shown located in oil well casing shown in vertical cross section;

FIGURE 2 is a view in vertical quarter section of a segment of the device of FIGURE 1, being taken on the line 2—2 thereof and showing a blade of the scraper in retracted or inoperative position;

FIGURE 3 is a view similar to that of FIGURE 2, but showing a blade of the scraper engaging the casing; and

FIGURE 4 is a view in transverse cross section of the device of FIGURE 1, the view being taken on the line 4—4 thereof.

Referring to the drawing in detail, it will be seen that the casing of an oil well is indicated in cross section at 10 in FIGURES 1, 2 and 3. An assembly of a scraper and a packer is shown in FIGURE 1 as being run into the well on tubing 11, but it will be understood that a packer may or may not be used.

The packer of FIGURE 1 is indicated at 12 and may be of any known construction, it forming no part of the invention, per se.

The novelty in the present invention resides particularly in the consrtuction of the scraper.

It consists of a central tubular mandrel 13 integrally connecting the tubing 11 to the packer 12. Upon the mandrel there is slidably mounted an outer sleeve 14, which is all in one piece but which has upper and lower window sections 15 and 16.

Collars 13*a* and 13*b* are provided with shoulders which limit longitudinal travel of the sleeve 14 on the mandrel 13.

The outer sleeve 14 can have but limited rotational

movement on the mandrel 13, being connected thereto by a conventional J-slot 17 and pin 18. The J-slot 17 is formed in the mandrel 13, and the pin 18 which is adapted to slide in the J-slot is threadedly secured to the outer sleeve 14. The sleeve 14 is provided with suitable drag springs 20 which contact the interior of the casing 10 at all times and frictionally hold the sleeve 14 against rotation or longitudinal movement in either direction in the casing.

Inasmuch as the sections 15 and 16 are alike, only section 16 will be described in detail. It has an inner metal flanged sleeve 21 fixedly clamped on the mandrel 13 between the two collars 13*a* and 13*b* thereof. There may be a spacing ring 22 at one end of the sleeve 21 to space it properly on the mandrel 13.

The upper flange 23 of the sleeve 21 serves to retain in fixed position thereon a frusto-conical wedge or spreader block 24 made of rubber or like resilient material.

Likewise the lower flange 25 of the sleeve 21 serves to retain a similar spreader block 26. The block 24 has a surface 30 tapering downwardly and radially inwardly and the block 26 has a surface 31 tapering upwardly and radially inwardly.

The blocks 24 and 26 may be rubber-bonded to the cylindrical portion of sleeve 21 in addition to being bonded to its flanges.

Four circumferentially spaced windows 28 are cut in each of the sections 15 and 16 of the outer sleeve 14, and it will be observed, as shown in FIGURE 1, that the windows in the upper section 15 are circumferentially spaced at an angle of 45 degrees from those in the lower section.

It will also be observed that the taper surfaces 30 and 31 of the spreader blocks 24 and 26 are opposed. Accordingly, a number of scraper blades 27 may be slidably mounted on the sleeve 14 in windows 28 and these scraper blades 27 have inner surfaces tapered to conform to the surfaces 30 and 31 on the spreader blocks.

Thus, when the mandrel 13 and integral inner sleeve 21, with its spreader blocks 24 and 26, are moved vertically with respect to the outer sleeve 14, the scraper blades 27 will be forced outwardly by one or the other of the spreader blocks, to cause the scraper blades 27 to engage the casing.

Each blade 27 has one or more teeth 29 thereon to assist in removing obstructions from the casing.

The rear portion of each blade 27 is provided with a leaf spring 32, as shown in FIGURE 4, which bears against the interior of the sections 15 and 16 of the outer sleeve 14 and tends to force the blades inwardly radially at all times against the action of the spreader blocks 24 and 26. These leaf springs 32 are secured to the blades 27 by set screws 33.

In operation, the assembly is run into the well with the parts in the relative positions shown in FIGURES 1, 2 and 4, the blades 27 being held in retracted position by the springs 32.

When the depth in the well has been reached where it is desired to scrape the casing, the tubing 11 is rotated to the left, as viewed from above. Since the sleeve 14 is held against rotation by the drag springs 20, and since the pin 18 is on the sleeve 14, this rotation will cause the pin 18 to enter the longer leg of the slot 17, so that there can then be relative longitudinal movement between the mandrel 13 and the outer sleeve 14, limited only by the collars 13*a* and 13*b*.

The assembly is then raised and lowered in the casing. As each upward stroke takes place the spreader blocks 26 resiliently urge the blades 27 outwardly to scrape the casing. As each downward stroke takes place the spreader blocks 24 correspondingly function to cause the blades 27 to scrape the casing.

Attention is called to the fact that as the scraping ac-

tion takes place, the spreader blocks take only a small part of the load imposed on the blades 27 when they strike an obstruction in the casing. The spreader blocks function mainly to resiliently force the blades outwardly, but the main load of the scraping action is transmitted by the blades 27 to the sills of the windows 28 and thus from the outer sleeve 14 to the shoulders 13*a* and 13*b* of the mandrel 13.

The packer, if the scraper is run in combination with a packer, may then be set, or, if desired, the assembly can be removed from the well.

If the operator wishes, he may again lock the blades 27 in the retracted position, by rotating the tubing to the right, to cause the pin 18 to again enter the short portion of the slot 17, to facilitate removal of the scraper, or to avoid wear upon it.

Due to the fact that the windows 28 in the upper section 15 of the sleeve 14 are offset or staggered with respect to those in the lower section 16, all of the inner surface of the casing 10 will be scraped when the blades 27 are in engagement therewith.

As mentioned above, the scraper of the present invention may find application other than in connection with the setting of a packer in a well. Also, it is within the purview of the invention to provide the tool with only one spreader block, so that it operates to scrape only in one direction.

Accordingly, while only one embodiment of the invention has been shown and described herein, it will be obvious that various changes may be made without departing from the spirit of the invention or the scope of the annexed claims.

I claim:

1. In a casing scraper for use in wells, a central mandrel, a tapered spreader block of resilient rubber material fixed thereon, an outer sleeve slidably mounted on the mandrel, friction drag means mounted on the sleeve engageable with the casing, a shoulder on the mandrel for limiting longitudinal movement of the sleeve thereon, and scraper blades slidably mounted on the sleeve for radial movement with respect thereto, said scraper blades having inner tapered surfaces coacting with said tapered spreader block to be urged resiliently outwardly thereby and engage and scrape the casing when the mandrel is moved through the casing, while the main load of the scraping action is transmitted by the sleeve to the shoulder on the mandrel.

2. The casing scraper defined in claim 1 in combination with a pin and slot connector between the mandrel and sleeve whereby longitudinal movement therebetween can be prevented when desired.

3. In a casing scraper for use in wells, a central mandrel, a set of tapered spreader blocks of rubber resilient material having oppositely disposed tapered surfaces fixed on said mandrel, an outer sleeve slidably mounted on the mandrel and having windows therein, friction drag means mounted on the sleeve engageable with the casing, spaced shoulders on the mandrel for limiting longitudinal movement of the sleeve thereon, scraper blades disposed in the windows and slidably mounted on the sleeve for radial movement with respect to said sleeve, said scraper blades having inner tapered surfaces coacting with said tapered spreader blocks to be urged resiliently outwardly thereby and engage and scrape the casing when the mandrel is moved through the casing in either direction, while the main load of the scraping action is transmitted by the sleeve to the shoulders on the mandrel.

4. The casing scraper defined in claim 3 in combination with a pin and slot connector between the mandrel and sleeve whereby longitudinal movement therebetween can be prevented when desired.

5. In a scraper device for use within a well casing, the combination of: a mandrel, a spreader block formed of resilient rubber material, the spreader block being fixed to the mandrel and having a tapered outer surface, a sleeve slidably mounted for longitudinal movement on the mandrel, friction drag means mounted on the sleeve engageable with the casing, a shoulder on the mandrel for limiting relative longitudinal movement of the sleeve, means including top and bottom sills on the sleeve defining a plurality of windows in the sleeve, a plurality of scraper blades mounted in said windows for radial sliding movement on said sills, said scraper blades having inner tapered surfaces cooperable with said tapered outer surface on said spreader block, whereby longitudinal movement of the mandrel with respect to the sleeve is effective to cause the spreader block to move the scraper blades outward through the windows to engage the casing, and whereby continued longitudinal movement of the mandrel causes positive longitudinal movement of the scraper blades within the casing while resiliently holding them radially in scraping contact with the casing.

6. In a scraper device for use within a well casing, the combination of: a mandrel, a pair of spreader blocks each formed of resilient rubber material, said spreader blocks being fixed to the mandrel and having a tapered outer surface, said spreader blocks being positioned with their tapered portions oppositely directed, a sleeve slidably mounted for longitudinal movement on the mandrel, friction drag means mounted on the sleeve engageable with the casing, shoulders on the mandrel for limiting relative longitudinal movement of the sleeve in both directions, means including top and bottom sills on the sleeve defining a plurality of windows in the sleeve, a plurality of scraper blades mounted in said windows for radial sliding movement on said sills, said scraper blades each having a pair of oppositely directed inner tapered surfaces cooperable with said tapered outer surfaces on said spreader blocks, whereby longitudinal movement of the mandrel with respect to the sleeve in either direction is effective to cause the spreader blocks to move the scraper blades outward through the windows to engage the casing, and whereby continued longitudinal movement of the mandrel causes positive longitudinal movement of the scraper blades within the casing while resiliently holding them radially in scraping contact with the casing.

7. In a scraper device for use within a well casing, the sub-combination of: an annular spreader block formed of resilient rubber material and having a tapered outer surface, a longitudinally movable sleeve positioned concentrically of said annular spreader block, friction drag means mounted on the sleeve for engagement with the casing, means including top and bottom sills on the sleeve defining a plurality of windows in the sleeve, a plurality of scraper blades mounted in said windows for radial sliding movement on said sills, said scraper blades having inner tapered surfaces cooperable with said tapered outer surface on said spreader block, and means to effect longitudinal movement of the spreader block with respect to the sleeve to move the scraper blades outward through said windows to engage the casing.

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