March 15, 1960 J. C. TRIPPLEHORN 2,928,473

OPPOSED-SLOT SPIRAL SCRAPERS

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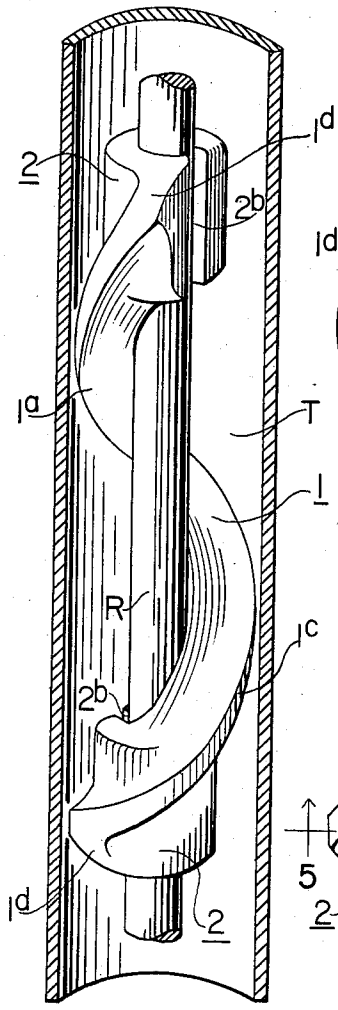


Fig. 1

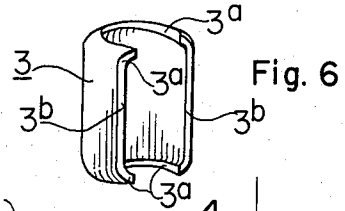


Fig. 6

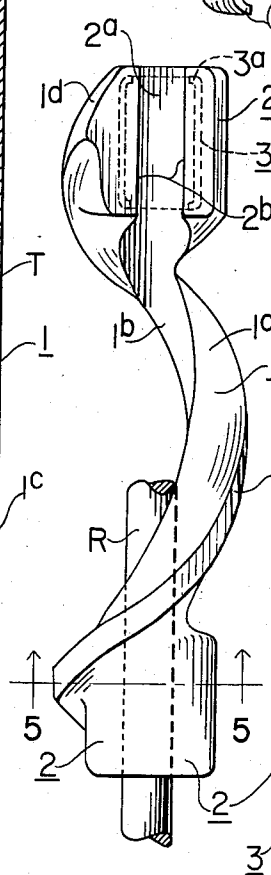


Fig. 2

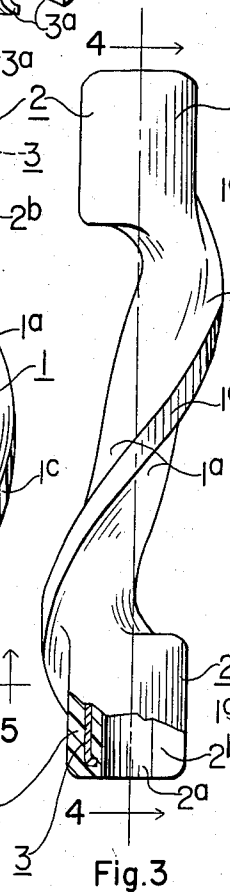


Fig. 3

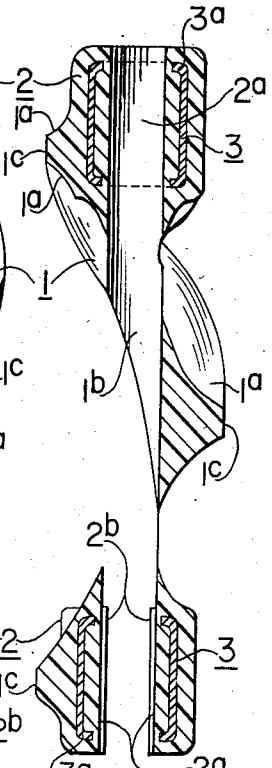


Fig. 4

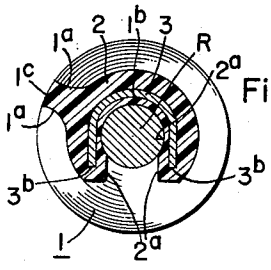


Fig. 5

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OPPOSED-SLOT SPIRAL SCRAPERS

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14 Claims. (Cl. 166—176)

This invention relates to paraffin scrapers of the type intended to be mounted at spaced intervals along sucker rods while the latter are being reciprocated within a tubing string during the pumping of an oil well. More particularly, the invention relates to scrapers which are made of resilient deformable material and which are provided with novel structure for engaging the sucker rod and for frictionally preventing slipping of the scrapers on the rod when subjected to severe axial forces.

A principal object of the invention is to provide a scraper which may be securely installed at any position along the length of a sucker rod between the tool joints at the ends thereof, such installation being accomplished without the necessity of altering the standard sucker rod or performing any operation thereon which might weaken the same, as for instance, welding.

More particularly, it is a principal object of the present invention to provide a plastic scraper having an improved type of frictional rod-engaging structure which structure will be referred to hereinafter as opposed-slot mounting.

It is another primary object of the present invention to provide an opposed-slot scraper which, by virtue of its built-in resilience, exerts a powerful frictional grip on the rod to prevent axial slipping of the scraper thereon.

The present invention contemplates an embodiment wherein the scraper is made of a plastic material having springlike qualities which provide the scraper with the aforementioned tight grip on the sucker rod, and the invention further contemplates another embodiment wherein the scraper consists of a similar plastic structure but including in addition thereto one or more spring steel clips designed to augment the grip of the resilient scraper on the rod.

It is a further very important object of the present invention to provide an opposed-slot scraper which is molded from a plastic which, in the presence of high temperatures and corrosive fluids often found in oil wells, exhibits excellent stability with respect to its mechanical dimensions; it is an electrical insulator to prevent electrolysis; and in addition has excellent acid and oil resistant properties. The range of plastics which exhibit satisfactory physical and chemical properties, and at the same time may be molded to the desired form, include the following:

Polyvinylidene chloride
Polyamides; molding type, nylon 10,001, known as Zytel
Polytetra-fluoro ethylene
Polychloro-trifluoro ethylene
Polymethyl alpha chloro-acrylate
Polyester diallyl phthalate
Poly acetal resin

One of the properties exhibited by scrapers made of one of the above plastics includes the important characteristic that the very paraffin which the device according to the present invention is intended to scrape has very little tendency to stick to the plastic surfaces since these surfaces are very smooth and non porous. This is one important and unobvious property which distinguishes the

present plastic scrapers from prior art metal devices, the paraffin having a strong tendency to adhere to the metal scrapers in the same manner as it adheres to other metal objects located in the well, such as the tubing and the sucker rod.

Still another object of the present invention is to provide a plastic paraffin scraper having minimum weight, and having maximum oil-passage clearance so as to permit the maximum flow of oil therepast and the maximum washing effect of the flow of oil in contact with the scraper to reduce paraffin deposits on the latter.

Another object of the invention is to provide an improved spring clip which may be embedded in the bosses at the ends of the scraper so as to increase the grip thereof on the sucker rod. This improved clip has been crimped at its longitudinally opposed ends so as to provide flanges which may be employed to increase the grip of the spring clip while at the same time permitting the use of lighter-gauge metal than would be possible with the purely C-shaped clip. In addition, by using a clip having crimped ends, when the clip is embedded in the plastic, the concave portions of the clip will be heavily coated with the plastic so as to provide a thicker plastic pad between the metal clip and the bore of the boss, which thicker plastic pad provides better protection of the clip against corrosion by well fluids, and which thicker pad may be placed under compression against the surface of the rod by the steel clip so as to provide an improved grip on the rod. The improved spring clip has also been provided with two tangential portions which extend outwardly on each side of the slot through the boss and provide backing for the slot, which backing tends to force the walls of the slot together in such a way as to provide an increased grip on the rod. The improved clip not only provides a better grip on the rod employing lighter-gauge metal, but in addition permits a wider tolerance in the dimensions of the clip during manufacture thereof as a result of the thicker pad of plastic material disposed between the metal clip and the bore of the boss.

It is another object of the present invention to provide a scraper having transverse end surfaces which are rounded at their outer peripheries so as to provide the scraper with tapered ends designed to reduce the tendency of the latter to snag upon tubing joints in order to facilitate the free reciprocation of the device within the tubing.

Further objects and advantages of the invention will become apparent during the following discussion of the drawing wherein:

Figure 1 is a perspective view of one of the present paraffin scrapers mounted on a sucker rod and located within a length of pump tubing, the tubing being shown cut away so as to make the scraper visible.

Fig. 2 is an elevation view of a paraffin scraper showing a section of sucker rod extending part-way through the length of the scraper.

Fig. 3 is an elevation view of the scraper rotated 90 degrees with respect to the view shown in Fig. 2, the lower boss of the scraper in Fig. 3 being shown particularly in cross section.

Fig. 4 is a longitudinal section view through the paraffin scraper taken along line 4—4 of Fig. 3.

Fig. 5 is a cross section taken along line 5—5 of Fig. 2.

Fig. 6 is an enlarged perspective of the spring clip as included in the illustrations of Figs. 2, 3, 4 and 5.

Referring now to the drawing, Fig. 1 shows a sucker rod R disposed within a length of pump tubing T, the latter being shown in cross section so as to illustrate a paraffin scraper according to the present invention located within the tubing. The paraffin scraper illustrated in Fig. 1 may or may not contain spring clips intended to increase the grip of the scraper on the sucker rod R.

The paraffin scraper itself comprises a body 1 hav-

ing upper and lower similar end bosses 2. Cross sections indicative of the structure of the body portion 1 can be seen in Figs. 4 and 5 which illustrate that the body 1 comprises a spiral blade having sides 1*a* and having an inner peripheral surface 1*b* and an outer peripheral surface 1*c* which will be more fully described hereinafter. The side surfaces 1*a* of the blade taper toward each other as they extend outwardly away from the central axis of the scraper and are smoothly curved so as to facilitate the flow of well fluids therepast and so as to discourage the tendency of paraffin to build up on the surface of the scraper. The outer peripheral surface 1*c* comprises a bearing surface which is comparatively narrow and which coincides with a cylinder coaxial with the scraper. The bearing surface 1*c* travels against the inner wall of the tubing T during scraping of paraffin deposits therefrom. The bearing surface 1*c* also serves the additional purpose of abutting the walls of the tubing T to center the sucker rod R therein, and the ends 1*d* of the bearing surface 1*c* curve inwardly and blend into the bosses 2.

The spring clip 3 is best illustrated in Fig. 6, although its installation in the bosses of the paraffin scraper is illustrated in Figs. 2 through 5 inclusive. The spring clip 3 is generally C-shaped and in addition is provided with crimped-in ends 3*a* which increase the grip of the clip 3 without the necessity of increasing the gauge of metal from which the clip is manufactured. In addition, as shown in Fig. 5, the clip includes two tangentially disposed portions 3*b* adapted to underlie the walls of the slot 2*b* of the boss 2. Each of the bosses 2 has a bore 2*a* which together with the inner peripheral surface 1*b* of the blade define an axial opening through the scraper body.

Although the drawing illustrates a paraffin scraper having only one turn of the spiral body 1 about the sucker rod R, it is to be understood that the invention contemplates other embodiments wherein a plurality of spaced convolutions of the spiral body 1 may be employed. The slot 2*b* in each of the bosses 2 should face away from the location of the junction of the body 1 with the boss 2. In a short paraffin scraper employing only one turn of the spiral, as shown in the drawings, it is desirable to have the two slots 2*b* face in mutually opposite directions transversely of the axis of the scraper. However, in the case of longer scrapers embodying additional convolutions of the spiral body 1, the direction in which the slots 2*b* face with respect to one another becomes less important.

I do not limit my invention to the exact form shown in the drawing for obviously changes may be made therein within the scope of the following claims.

I claim:

1. A paraffin scraper of deformable material adapted to spiral around and frictionally grip a sucker rod, comprising an open helical scraping blade standing normal at each point along its length to the surface of the rod, the adjacent points on the blade being mutually spaced axially of the scraper; two rod gripping ends each comprising a boss substantially encompassing the rod and having a bore therethrough aligned with the axis of the helical blade and of diameter no greater than that of the rod, the blade terminating at each end in an adjacent boss and each boss having a slot through its side wall into said bore and forming an opening no wider than the diameter of said rod; and a C-shaped spring clip embedded in each boss surrounding a length of each bore and having an opening registering with the adjacent slot.

2. In a scraper as set forth in claim 1, said deformable material being a molded plastic, and said spring clip being metal and embedded in said plastic during molding of the scraper.

3. In a scraper as set forth in claim 1, said deformable material being molded nylon, and said spring clip being metal and embedded in the nylon during molding of the scraper.

4. In a scraper as set forth in claim 1, the diameter of the sucker rod being slightly greater than the diameters of said bores and the widths of said openings.

5. In a scraper as set forth in claim 4, said clips terminating in tangentially disposed portions on each side of the opening therethrough and said tangential portions extending radially outwardly parallel with the walls of the slot in the boss.

6. In a scraper as set forth in claim 4, the longitudinal ends of the clip being crimped inwardly toward the bore and slot to stiffen the spring grip.

7. In a scraper as set forth in claim 1, the inner periphery of said blade having a rod engaging surface smoothly joining the bore in each boss and complementary in shape with and partially surrounding said rod at any cross-section taken through the scraper normal to the longitudinal axis thereof.

8. In a scraper as set forth in claim 7, the outer periphery of said blade comprising a bearing surface lying in a cylinder coaxial with the axes of said bores, and the ends of the blade and of the bosses being rounded inwardly from their peripheral surfaces and terminating in transversely disposed end surfaces.

9. In a scraper as set forth in claim 1, the slots in the two bosses facing in mutually opposite directions transversely of the axis of the scraper.

10. A one-piece molded plastic paraffin scraper having an axial opening therethrough to receive and frictionally grip a sucker rod, said scraper comprising an open helical scraping blade of at least one turn; and rod-gripping ends each comprising a boss molded to one end of the blade and having a bore formed by said axial opening, the diameter of each bore being slightly smaller than the diameter of the rod, and each boss having a slot through its side wall into the bore and slightly narrower than the diameter of the rod, the slot in each boss being circumferentially spaced from the junction of the blade with the boss.

11. The scraper as set forth in claim 10, wherein said plastic is nylon.

12. In a scraper as set forth in claim 10, the inner periphery of said blade having a rod engaging surface smoothly joining the bore in each boss and complementary in shape with and partially surrounding the rod at any cross-section taken through the scraper normal to the longitudinal axis thereof.

13. In a scraper as set forth in claim 12, the outer periphery of said blade comprising a bearing surface lying in a cylinder coaxial with the axis of said bores, the blade and the bosses being rounded inwardly from their outer peripheral surfaces and terminating in transversely disposed end surfaces.

14. In a scraper as set forth in claim 10, the slots in the two bosses opening in mutually opposite radial directions from the axis of the scraper.

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