

Dec. 23, 1952

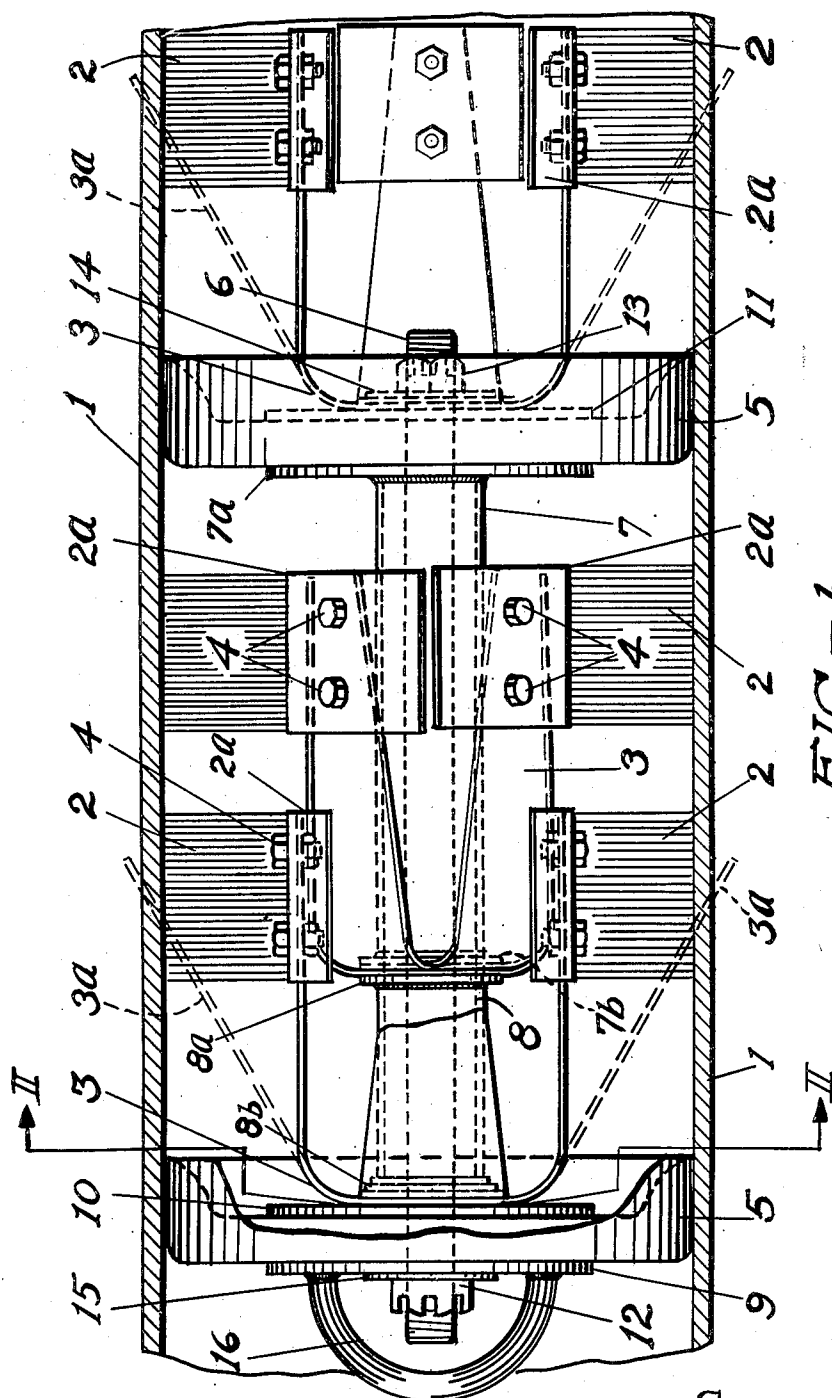
B. VER NOOY

2,622,255

PIPE-LINE CLEANING DEVICE

Filed July 27, 1948

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

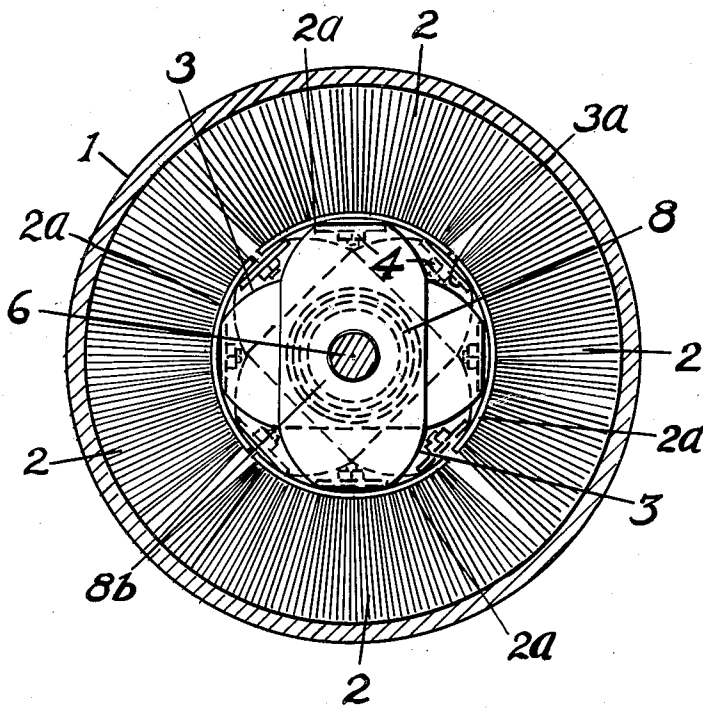


FIG. -2

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2,622,255

PIPE-LINE CLEANING DEVICE

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Application July 27, 1948, Serial No. 40,856

1 Claim. (Cl. 15—104.06)

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The present invention relates to a pipeline or conduit cleaning device. More particularly the invention relates to a plug type cleaning device provided for movement through a conduit under impulse of a stream of fluid flowing through the conduit, and in which a plurality of scraper elements are arranged about the body of the device for scraping contact with the conduit walls, to afford substantial aid in centering the device, and to maintain continuous contact with the conduit walls in spite of irregularities therein, or normal wear of the scraper members.

The invention and its indicated objects may be fully understood from the following description, when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a side elevational view of the device positioned in a conduit with parts broken away to expose structural details of the device, and

Fig. 2 is a cross-sectional view along the line II—II of Fig. 1.

In the embodiment of the invention illustrated by the drawings, with the device in operating position within a conduit 1, a plurality of scraper elements 2, illustrated as brush elements, are mounted on the outer surface of the ends of the opposed leg portions 3a of a plurality of U-shaped spring members 3. The spring leg portions 3a, when the device is not confined in a conduit, normally extend outwardly from the base portion of the members 3, in the manner indicated by dotted lines in Fig. 1. When confined, as shown, the leg portions exert a pressure radially outward, forcing the scraper elements 2 against the conduit wall 1. Each brush element is formed with a back portion 2a set with bristles of substantially equal length. The brush elements, including the back and bristle portions, are arcuately shaped laterally. The brush elements, with the supporting spring members, are disposed in sets, the lateral curvature of the scraper elements in each set substantially conforming to the curvature and diameter of the conduit in which the device is to be used, so that, when inserted in a conduit the elements will make substantially uniform contact with the conduit wall under pressure of the expansible leg portions 3a of the spring members 3. In Fig. 1, only the brush bristles extending vertically upward or downward are shown to avoid confusion with other portions of the device. It is preferred that each element be included substantially within an arc of from about 80° to about 90°, whereby, in a set of four, an arcuate distance of from about 5° to about 10° will remain between element edge

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portions to provide space for compression of the spring members when confined and in contact with the conduit walls. Each brush element is mounted on a spring member leg portion by means of machine bolts 4 bristles being omitted in the brush for bolt holes therethrough.

As stated, the U-shaped spring members are arranged in sets, usually of two members, with the center line of the leg portions of each member opposed and spaced arcuately at 180° from the other, the spacing of leg portions of one member from those of the other in the set when compressed being about 90°. Where two or more sets are used, each additional set is disposed in the assembly in altered angular relation with reference to any other set, so as to provide an overlapping disposition of the brush members longitudinally of the device. For example, in the device illustrated by Fig. 1, with the leading set disposed so as to have leg portions centered on the 360°, 90°, 180° and 270° positions, the trailing set is disposed so as to have leg portions centered on the 45°, 135°, 225° and 315° positions, as is specifically indicated by dotted lines in the showing of Fig. 2. As shown, the brush elements 2 are slightly offset longitudinally, substantially as shown in Fig. 1. This results from the overlapped relationship of the base portions of members 3, but may be accomplished where desired either by suitable adjustment of the brush elements 2 on the leg portions of U-shaped members 3, or by making the leg portions of one member longer than the leg portions of the other member of the set. Other forms of scrapers, including knives, serrated metal blades and the like may be substituted for brush elements 2 as desired or required in service.

At each end of the device is mounted a piston element 5. As shown, a pressure cup element 5 is utilized, with the cupped portion of each element facing for rearward exposure as the device is inserted in a conduit. These cup elements are preferably formed of a flexible, resilient material, which may be leather, rubber, or a synthetic rubber base material, such as those containing polymers of butylene or isobutylene, depending upon the service for which intended. In any event, the primary purpose of the elements 5 is to provide a surface against which pressure of a stream of fluid flowing through a conduit may be exerted to move the device through the conduit under impulse of such stream. The cup elements also serve to maintain cleaning debris moving ahead of or along with the device, to be removed at spaced points in the line. Loose particles in the fluid

ahead of the device are swept ahead by the leading element, while particles loosened from the conduit walls by the brushes 2 are swept along with the device by means of the trailing element. By tapering the side wall portions of the cups as shown, the pressure of the conduit stream tends to expand the cup elements and maintain a close but flexible contact with the conduit walls. Where desired, annular flat disk shaped piston elements may be substituted for the cup elements shown, without substantially reducing the efficiency of the device.

In the complete assembly, the elements and members are maintained in their operation relationships by means of a mandrel rod 6 over which are disposed spool elements 7 and 8, and enlarged washer or backing plate elements 9, 10 and 11, the assembly being held in fixed relationship by means of mandrel nuts 12 and 13. These may be castellated and held by means of cotter pins through rod 6. Of the two spool elements, the trailing end element 7 is provided with an enlarged annular flange portion 7a, and a smaller flange 7b at the forward end. Flange portions 8a and 8b are provided on the spool element 8 also, but both are substantially equal to the portion 7b on element 7. If desired, however, the flanges may all be formed as are 7b, 8a and 8b, and an additional backing plate element used to replace the enlarged flange 7a. The flange portions 7 and 8, the plates, 9, 10 and 11, and the piston elements 5 are each provided with a central opening substantially equal in diameter to that of the rod 6.

Where desired, or required in service, additional sets of scraper elements may be added to the assembly. These may be inserted between the piston elements 5 with the inclusion of additional spool elements 8, forwardly of the element 7, and a longer rod 6 or, as shown, by addition to the trailing end of the device between the plate 11 and washer 14. In any event, the number of sets of scraper elements is largely determined by the conditions of the conduit, and by the radius of curvature of bends or turns in the line to be travelled by the device. However, due to the inherent flexibility of the device, within reasonable limits, the result to be achieved may be the primary determinant.

Although the device may be assembled from either end of the mandrel rod 6, it is preferred that the assembly be made from trailing end to leading end. Thus the nut 13 is first applied to an end of the rod 6. With the nut applied, the rod is then inserted through the central openings of the respective elements in order, as follows:

1. A washer 14, which may be a lock washer.
2. An enlarged washer or backing plate 11.
3. A piston element 5.
4. The spool element 7, with the flange 7a toward the element 5.
5. A set of U-shaped spring members 3, with the leg portions and scraper elements extending toward the trailing end of the device.
6. The spool element 8.
7. A second set of spring members 2 disposed in the same fashion as that first mentioned.
8. A backing plate 10.
9. A second piston element 5.
10. An enlarged washer or backing plate 9, which as shown is provided with a ring element 16 welded to the outer surface of the plate 9 to serve as a handle for the assembled device.
11. A washer 15, which may be a lock washer, and

12. A second mandrel nut 12.

Obviously the elements may be assembled in reverse order to accomplish the same result. Also, when additional spring members, scrapers, and spool members are to be utilized, they are added to the assembly as shown by Fig. 1, or as previously described.

With the several elements in position the sets of spring members and scrapers are adjusted to dispose them in the desired angular relationship, and the nuts are tightened to fix the elements rigidly in the desired relationship to one another.

In use, the assembled device is inserted in a conduit through a suitable conduit trap or entrance gate, with the ring element 16 facing in the direction of fluid flow through the conduit. The device may be removed from the line by way of an exit trap or gate located at any given point beyond the place of introduction. The inherent flexibility of the piston elements 5 and spring members 3 permits considerable latitude of use of any given device in lines of slightly varying inside diameter, and also where conduit curvatures are not uniform, thus substantially avoiding the possible difficulties to be experienced by a cleaning device becoming wedged in the line. Also, by use of paired members, in sets, arranged as set forth, the device is balanced longitudinally in the conduit, and is substantially self centering, avoiding excessive and uneven wear on the flexible cup members 5.

What is claimed is:

A conduit cleaning device assembly, consisting of rigid mandrel rod threaded at each end and, mounted on said rod, concentric therewith and in succession from one end thereof, an assembly retainer nut threaded on one end of said rod; an annular backing plate, one side bearing against said nut; an annular piston element, one side bearing against and extending radially beyond said plate; an elongated, spacer spool element, flanged at each end, one flanged end engaging the other side of said piston element; a pair of U-shaped spring members each having a spring base portion engaged by said rod and the other flanged end of said spool element, and opposed, spring leg portions extending angularly outward from said base portion and toward said piston element; a second flanged spacer spool element bearing at one flanged end against said spring members; a second pair of spring members bearing against the other flanged end of said element; another annular backing plate bearing against the second pair of spring members; a second annular piston element bearing against the latter backing plate on one side, and extending radially beyond said plate; a third backing plate bearing against the other side of the latter piston element and of lesser diameter than the element; a second assembly retainer nut threaded on said rod, the two nuts between them adapted to secure and retain the assembly as a rigid unit with said mandrel rod, in which unit said spring member base portions are disposed in right angular relation in each pair, with the respective pairs in altered angular relation to each other; and a scraper element mounted on each spring member leg portion extending outwardly therefrom, substantially at right angles thereto and including an additional pair of such U-shaped spring members, each having a spring base portion engaged by said rod, said first mentioned annular backing plate and said first mentioned assembly retainer nut, the spring leg portions of said members extending angularly outward from each base por-

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tion longitudinally away from said first mentioned piston element.

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