

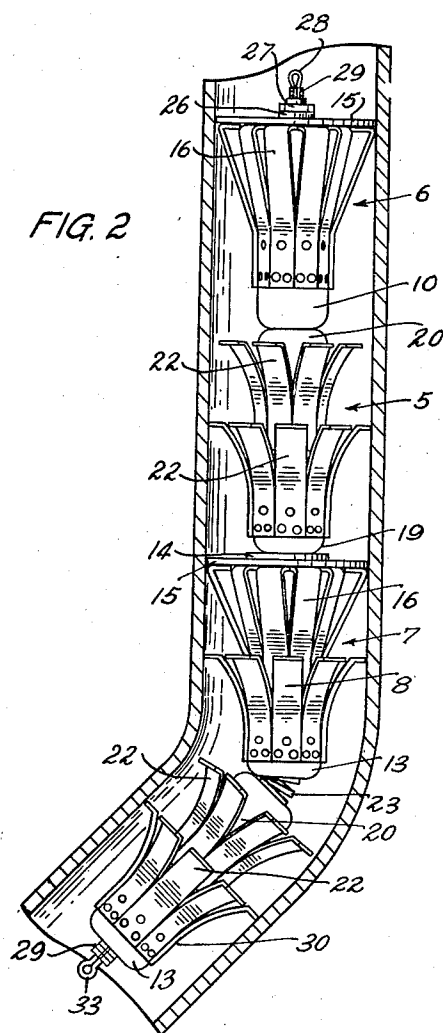
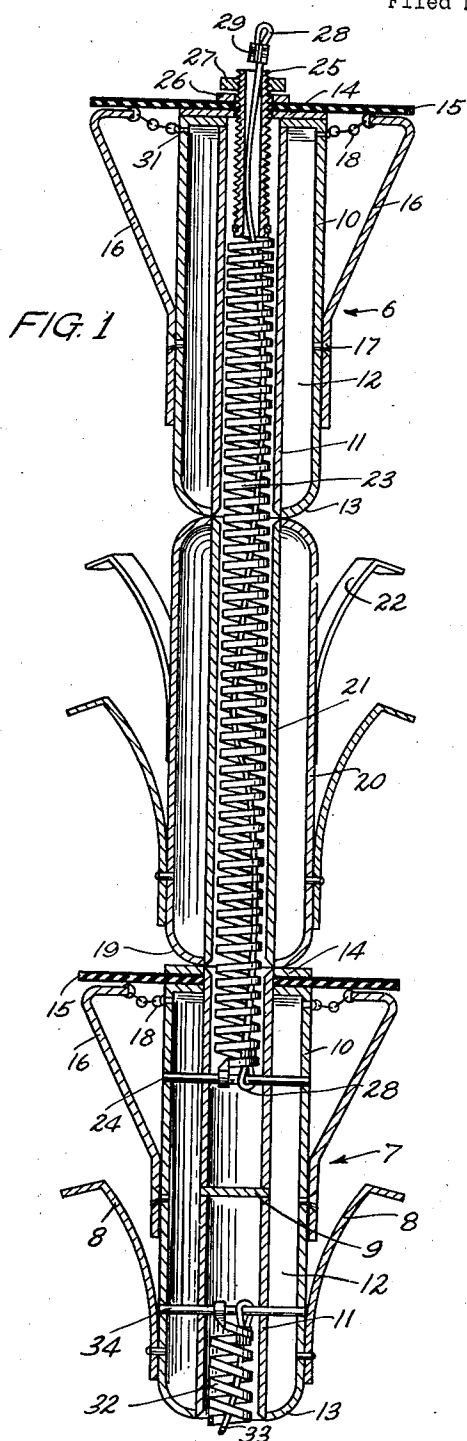
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PIPE CLEANING TOOL

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PIPE CLEANING TOOL

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This invention relates to pipe cleaning tools, and more particularly to jointed, scraper type, flexible, pipe cleaning tools for use in cleaning underground pipe systems, particularly water mains.

Generally the invention comprises an elongated tool made up of individual sections or cylinders flexibly joined together so as to permit the tool to travel through ordinary bends and turns which may occur in the pipe line, certain ones of the sections or cylinders being equipped with radially extending scraper blades for scraping the interior wall of the pipe, and certain other sections or cylinders being equipped also with a suitably supported packing for urging the tool through the pipe by means of water pressure.

The objects of the invention are: to provide a type of piston or "pusher" which has the capacity of making a good seal against the bore of the pipe, yet which, at the same time, provides a flexible yielding action, permitting the piston to pass through irregularities in the interior bore of the pipe including sharp turns, without injuring or rendering the pusher inoperative after it has passed such irregularities; to provide a tool of this class, the sections of which are so attached together that the various sections tend to normally remain in axial alignment, thereby maintaining the forward end of the forward section centered in the pipe through which the tool is traveling; to provide a tool which is so constructed that the tension of the springs which normally tend to hold the various sections in axial alignment may be adjusted easily and quickly without taking the tool apart; to provide a tool which is so constructed that it may actually be pulled through a pipe line by a cable attached to its forward end without injuring the springs which hold the various sections in normal axial alignment, and without the use of water pressure behind the tool; to provide a tool, the body sections of which are substantially hollow and air tight, thus providing a sufficient buoyancy to aid in keeping each of the sections better centered in the bore of the pipe through which the tool travels, thus aiding the scraper blades in removing a substantially equal amount of accumulation from the entire interior surface of the pipe being cleaned.

The details in the construction of a preferred form of our invention, together with other objects attending its production, will be better understood from the following description when read in connection with the accompanying draw-

ing, which is chosen for illustrative purposes only, and in which,

Figure 1 is a sectional view through the rear portion of the device and shows the details in the construction of two different types of pushers or pistons, as well as the details in the construction of one of the ordinary scraper carrying sections; and,

Figure 2 is a side elevation of the tool showing the relative positions of the various sections and pushers as the tool travels through a bend in a pipe, the latter being shown in section.

Like characters of reference designate like parts in both the figures.

The embodiment disclosed includes a plurality of scraper carrying sections, which are designated as a whole by the numeral 5, as well as a plurality of piston or pusher sections, designated as a whole by the numerals 6 and 7. The main difference in the construction of the pushers 6 and 7 lies in the fact that the pusher 7 includes a plurality of scraper blades 8 mounted rigidly in any suitable manner on its forward end, and also includes an interior sealing plate 9, which prevents the circulation of water through the central bore of the tool. Other than these differences the two pushers 6 and 7 are substantially identical and include a tubular outer casing 10 and a tubular inner lining 11, the latter being concentrically arranged inside the outer casing, the adjacent ends of the two being rigidly connected together, as shown, to form a sealed annular hollow space 12 inside the section. The forward end of each of these sections is rounded, as designated by the numeral 13, while the rear end lies in a plane substantially perpendicular to the axis of the section. A metal washer 14 substantially of the same diameter as that of the casing 10, but having a smaller central bore than the bore of the lining 11, is positioned flat against the rear end of the section 6, and serves as a seat for a rubber or composition washer-like sealing element 15. To support that annular portion of the sealing element 15 which extends outward beyond the casing 10, we provide a plurality of spaced spring-like supporting members 16, one end of which is rigidly attached to the wall of the casing 10 in any suitable manner as by rivets 17 or by welding. The opposite ends of these members 16 are turned radially inward, as shown more clearly in Figure 2. The bent ends of these members 16, thereby, serve to prevent the deformation of the sealing element 15 when water pressure is applied to the outer surface thereof. Radial outward movement of the mem-

bers 16 is limited by short lengths of chain 18, one end of each chain being connected directly to the bent end of the member 16, and the other end of each chain being connected in any suitable manner to the wall of the casing 10, as by pins 31.

The pusher 7 is likewise provided with a plurality of spaced spring-like supporting members 16 and chains 18, one for each member, and a sealing element 15. In this pusher, however, the end of the tubular inner lining 11 protrudes slightly beyond the end of the casing 10, and this protruding end serves to center the sealing element 15 as well as the metal washer 14, which, in this particular instance is positioned on the opposite side of the sealing element 15. The metal washer 14 serves as a thrust bearing on which the rounded end 19 of the section 5 bears as the tool passes through a bend in the pipe being cleaned. The metal washer, therefore, protects the sealing element 15 from injury by the end of the section adjacent it.

As shown, both ends of the blade carrying sections 5 are rounded. Each section of this type is made up of an outer casing 20, a concentrically arranged tubular inner lining 21, the ends of the two tubular members 20 and 21 being sealed together, as by welding, in a manner similar to the manner in which the pushers 6 and 7 are constructed. Each of these sections 5 is provided with one or more rows of circumferentially spaced, radially extending, scraper blades 22, the outer ends of which scrape the pipe as the tool passes through it. It will be understood, of course, that the blades 8 and 22 are made of spring metal and that when the various sections are not confined in a pipe the blades form a substantially circular pattern of larger diameter than the interior of the bore of the pipe which it is intended to clean. As shown clearly in Figure 1, the various sections are held in axial alignment by a contractile spring 23, one end of which is firmly secured, as shown, to a rod 24 which passes through aligned perforations in the outer casing 10 and the inner lining 11 of the pusher 7, and the ends of which are bradded or secured rigidly in any other suitable manner in the perforations in the casing 10. The opposite end of the spring is rigidly secured to the inner end of a tubular, externally threaded, member 25, the outside diameter of which is such as to permit it to pass freely through the washer 14 of the pusher 6, and through a washer 26 which abuts the exterior face of the sealing member 15. A threaded nut 27 is screwed on the protruding end of the member 25 and another nut, not shown, may be used to lock the nut 27 from rotation, if desired. The nut 27 serves to adjust the tension on the spring 23 as desired. A flexible cable 28 is threaded through the member 25 and lengthwise through the spring 23, one of its ends being securely fastened to the rod 24 and its opposite end being looped and clamped by a cable clamp 29. The cable clamp 29 is of such size as to prevent it from entering the bore of the member 25. The cable, as shown, is of slightly greater length than the distance between the rod 24 and the outer end of the member 25. This arrangement permits the various sections to pass through a pipe bend by expanding the spring 23 but also prevents too great a strain being placed on the spring 23. In other words, if the pull on the forward end of the tool is great enough to pull the pushers 6 and 7 apart, the spring 23 is permitted to stretch only until the

cable clamp 29 seats firmly on the protruding end of the member 25. Continued pull on the forward end of the tool is assumed directly by the tightly stretched cable.

While Figure 2 shows the complete tool as being composed of only the pushers 6 and 7 and two blade carrying sections 5 and 30, it will be understood that any number of blade carrying sections or pushers may be secured together in the manner shown in Figure 1. Figure 1 shows only the rear three sections of the tool and the manner of connecting them together. The other sections of the tool may be connected together in a similar manner by means of a spring 32 and a cable 33, each having one end connected to a cross-bar 34 rigidly secured in the section 7, as shown, and each having its opposite end adjustably secured in the forward end of a section 30 by means of a member 25, a washer 26, and a nut 27 for the spring 32, and by means of a cable clamp 29 for the end of the cable 33, all identical to the mounting of the cable 28 and the spring 23 in the rear end of the section 6.

In operation the tool is simply placed in the pipe to be cleaned and water pressure is applied behind the tool in the pipe. The water presses against the sealing elements 15, the peripheries of which seal against the interior bore of the pipe, and the pressure tends to force the entire tool through the pipe. The springs 23 and 32 aid in maintaining the various sections of the tool in axial alignment, yet permit the required relative movement as the various sections move through a bend in the pipe. The spring steel supporting members 16 prevent the water pressure from deforming the sealing elements 15 and passing the pushers 6 and 7. The blades 8 and 22 scrape the interior wall of the pipe as the tool passes through, and the arrangement of the blades, as shown, serves to assure the scraping of the entire interior surface of the pipe. In case the tool should become stuck in the pipe, a pull or jerk on the cable 33 serves to dislodge the tool from its stuck position. The pulling of the cable 33 is transmitted directly to the section 7 without stretching the forward spring 32, thus leaving that spring free at all times to maintain the nose of the foremost section 30 in a central position in the pipe. This is a very distinct advantage, because if the nose of the section 30 was permitted to gravitate to the bottom of the pipe, the chances of lodging the tool in the pipe would be greatly increased. From the section 7 the pull is transmitted directly to the rear cable 28, the length of which is such as to prevent the spring 23 from being stretched or deformed to such an extent as to render it useless during future cleaning operations.

While we have described and illustrated a specific embodiment of our invention, we are aware that numerous alterations and changes may be made therein and we do not wish to be limited except by the prior art and by the scope of the appended claims.

We claim:

1. A piston-like or "pusher" body section for a pipe cleaning tool comprising: a substantially cylindrical body member; a substantially flat flexible sealing disc of larger diameter than said cylindrical body member mounted concentrically on the rear end thereof; and a plurality of resilient circumferentially spaced longitudinally and radially outward extending sealing disc supporting members each having its for-

ward end rigidly secured to the cylindrical body section, and each having its free rear end bent radially inward to lie in a plane parallel to the forward side surface of said sealing disc, and immediately forward thereof, the free ends of said members being adapted to flex radially. 5

2. A piston-like or "pusher" body section for a pipe cleaning tool comprising: a substantially cylindrical body member; a substantially flat flexible sealing disc of larger diameter than said cylindrical body member mounted concentrically on the rear end thereof; and a plurality of resilient circumferentially spaced longitudi- 10

nally and radially outward extending sealing disc supporting members each having its forward end rigidly secured to the cylindrical body section, and each having its free rear end bent radially inward to lie in a plane parallel to the forward side surface of said sealing disc and immediately forward thereof, the free ends of said members being adapted to flex radially; and independent means for limiting the radial outward movement of the free end of each of said sealing disc supporting members.

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