

June 9, 1953

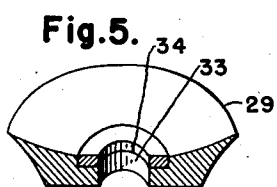
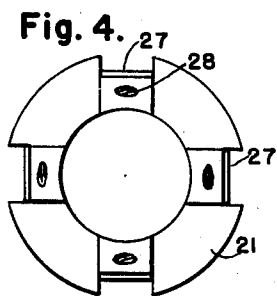
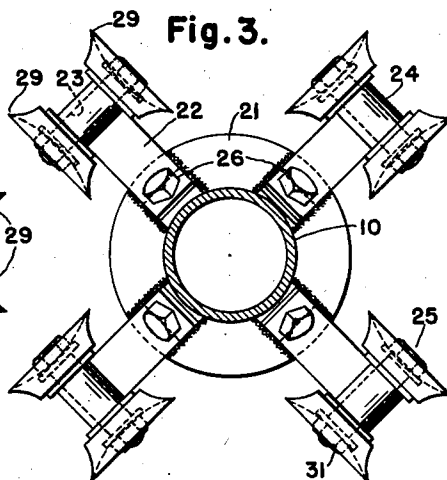
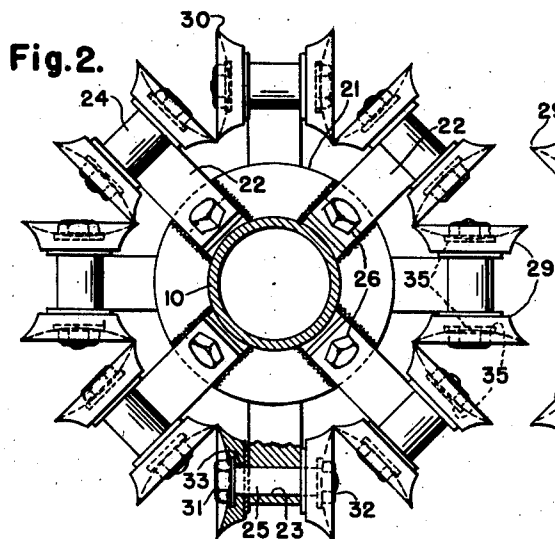
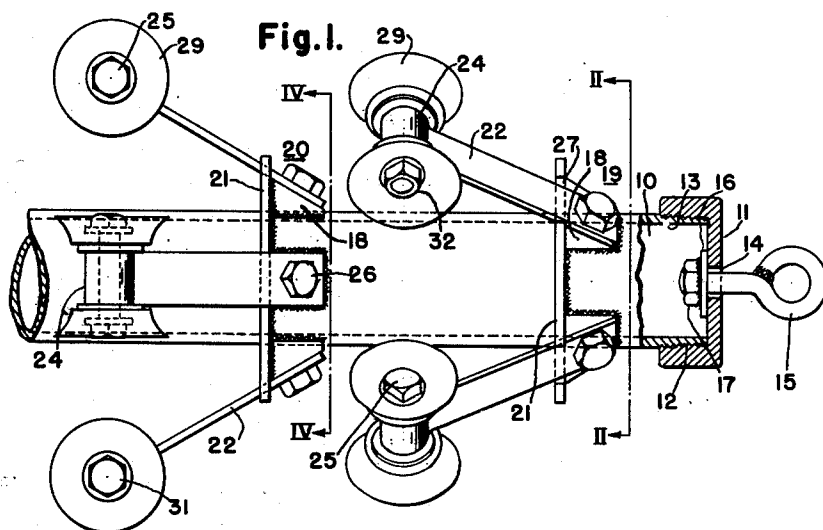
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2,641,010

ROTARY CUTTER DEVICE FOR PIPE CLEANERS

Filed May 16, 1947

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

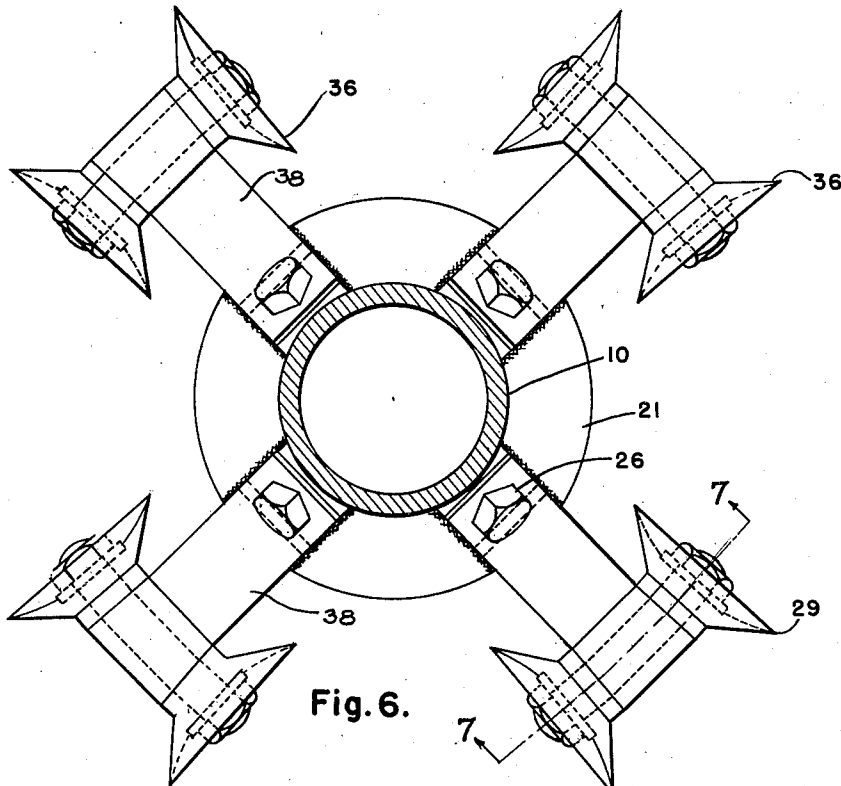


Fig. 6.

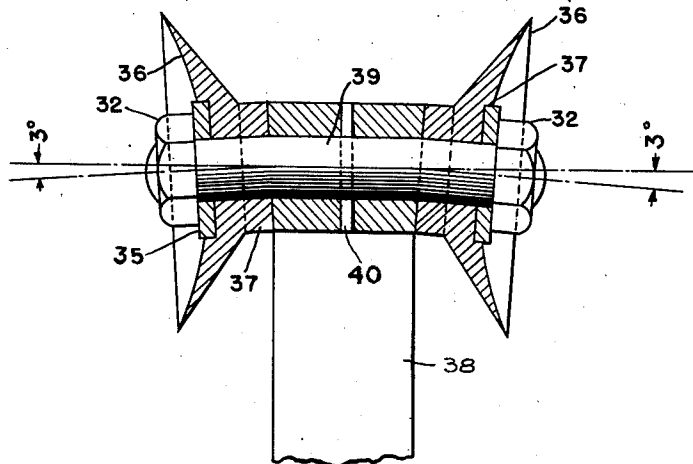


Fig. 7.

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## UNITED STATES PATENT OFFICE

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## ROTARY CUTTER DEVICE FOR PIPE CLEANERS

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7 Claims. (Cl. 15—104.15)

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The invention relates, generally, to pipe cleaners, and more particularly to the cutting members for pipe cleaners.

The object of the invention is the provision of a pipe cleaner that will cut the deposit to be cleaned from a pipe into strips and then exert a lifting action to the sides of the strips to effectively remove the deposit.

It is also an object of the invention to provide cutting wheels for a pipe cleaner which are so shaped and mounted that in addition to cutting into the deposit on the inner surface of pipe they will exert a lifting action on the deposit at the trailing edge as they leave the deposit.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention, accordingly, comprises the features of construction, combinations of elements, and arrangements of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a view partly in side elevation and partly in section showing features of the structure,

Fig. 2 is a view in section along the line II—II of Fig. 1,

Fig. 3 is a view in section along the line IV—IV of Fig. 1,

Fig. 4 is a view in end elevation of the boss structure provided on the stem of the pipe cleaner,

Fig. 5 is a perspective view of a section of a cleaning wheel showing details of its construction,

Fig. 6 is a view in end elevation showing modified cleaning wheels arranged around the hollow stem, and

Fig. 7 is a view partly in section and partly in elevation taken along a plane lying in the plane of a spring for carrying a cutting wheel showing details of the modified spindle for the cleaning wheels.

Referring now to the drawing and Fig. 1 in particular, the pipe cleaner comprises a hollow stem 10 which may be made from some suitable steel pipe. The size and length of the stem and the thickness of the pipe wall will depend on the operation for which the pipe cleaner is to be utilized.

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connecting the pipe cleaner to a propelling unit comprises a cap 11 having an internal thread 12 for engaging an external thread 13 provided on the end of the stem 10. The cap will preferably be made from some suitable material having strength commensurate with the stem 10.

As illustrated, the cap 11 is provided with a centrally disposed opening 14 for receiving an I-bolt 15. The diameter of the bolt 15 is smaller than the diameter of the opening 14, so that it may move freely. In order to connect the bolt 15 to the cap 11, a washer 16 and nut 17 are provided. As shown, the nut 17 is welded to the washer 16. The provision of the nut and washer combination welded to one another gives an adequate bearing surface on the cap 11 to withstand heavy stresses in the propelling of the cleaner along a pipe.

As shown in Fig. 1, bosses 18 are welded to the stem 10 at two different locations indicated generally at 19 and 20. In this embodiment of the invention, the bosses at the different locations 19 and 20 are disposed on what may be described as a circumferential band of the stem 10 thereby so aligning them that they abut against an annular plate 21 that is welded to the stem 10 and to the bosses 18. In this manner, a plurality of bosses evenly spaced circumferentially around the stem at locations 19 and 20 are firmly mounted to carry springs 22 that will be described hereinafter. Reference to Fig. 2 will reveal that the bosses 18 disposed on the different bands of the stem 10 are not in alignment along the stem but are staggered. As shown the upper face of each boss 18 is flat and disposed at an angle to the stem 10 to adapt it for carrying a spring to be described hereinafter.

The springs 22 may be made from spring steel plate having adequate strength. In this embodiment of the invention, the springs 22 are flat and have an opening at one end and the other end turned back on itself to provide a bearing 24 for a spindle 25, the function of which will be described hereinafter.

A spring 22 is mounted on each boss 18 by means of a screw bolt or lag screw 26. The annular plate 21 is notched at 27, best shown in Fig. 4, to receive the springs 22. The bosses 18 have threaded openings 28 for receiving the screw bolts 26. Thus when a spring 22 is mounted on the boss 18 by means of the screw bolt 26, it is held against lateral movement by the side walls defining the notches 27 in the annular plate 21.

Each spring 22 carries a pair of cutting wheels 29, as shown in Figs. 1, 2 and 3. The wheels of

In this particular embodiment, the means for

each pair are disposed on opposite sides of the spring 22 and rotatably disposed on the spindle 25 which rotates in the bearing 24. While a pair of wheels is disposed on each spring in this modification of the invention, for some purposes it may be sufficient or even desirable to employ only one wheel per spring.

Referring now to Figs. 2 and 3, it will be seen that the cutting wheels 29 are evenly disposed around the stem 10. The cutting edges 30 of the wheels 29 of adjacent pairs are spaced about the same distance apart that the cutting edges 30 of each pair are spaced.

The spindle 25 for mounting the wheels 29 may be of any well known construction. In this embodiment of the invention, it is made to simulate a bolt with a hexagonal head 31 to facilitate the holding of it with a wrench. The end of the spindle 25 opposite the head 31 is threaded to receive a nut 32. This nut is also hexagonal in shape to facilitate the gripping of it with a wrench.

The cutting wheels 29 are made dish-shaped as best shown in Fig. 5. Each wheel has a bore 33 for receiving the spindle 25 and is countersunk to provide a depression 34 for receiving washers 35 disposed under the head 31 and the nut 32. Provision of these washers facilitates the rotation of the cutting wheels 29.

The cutting wheels may be cast from some suitable alloy which will retain a reasonably sharp cutting edge under many conditions. However, it has been found preferable to machine the wheels 29 out of a high grade tool steel. When the tool steel is carefully selected, a wheel that will have a long life and which can be sharpened a reasonable number of times may be provided. In some instances, it may be desirable to case harden the cutting wheel after it has been machined.

In the modification illustrated in Fig. 6, the cleaning or cutting wheels 26 are provided with inwardly extending hubs 37. The remainder of the wheel is the same as in Fig. 5.

The springs 38 are widened slightly at the end that is rolled back on itself to provide a bearing. The purpose of widening the springs 38 is to provide on both sides of each spring bearing faces for the hubs 37 of the wheels 36.

In mounting a pair of wheels 36, they are so disposed that they spread apart slightly from the leading edge to the trailing edge for a purpose that will be described hereinafter.

Any suitable method may be employed for mounting the wheels in such manner. In Fig. 6, the spindle 33 at both ends is bent forwardly and slightly downwardly, or generally in the direction in which the pipe cleaner is to be moved, through an angle of 3° best shown in Fig. 7. As will be observed, the central portion of the spindles or the portions in the bearings formed by rolling back the outer ends of the springs 38 are straight while the ends are bent forward. The widening or flaring outwardly of the bearing ends of the springs 38 will be made to correspond to the bend in the spindles 39. In some cases, it may not be necessary to flare the springs 38 outwardly but in such structures there will not be proper bearing surfaces for the hubs of the cutting wheels 36 and the springs will be quickly worn by the hubs.

In mounting the bent spindles 39, any suitable method well known in the art may be employed. A convenient method is to fit the spindles into the bearing ends of the spring before they have been completely rolled back on themselves to form bearings. After the spindles 39 are in position

in the partly closed bearing, the ends of the springs may be pressed down to complete the bearings for the spindles. It is also feasible to bend the spindles 39 after they have been fitted into the bearings.

As shown in Fig. 7, the wheels are held on the spindles by washers 35 and nuts 32. Since the spindles 39 are bent, nuts are provided on both ends.

In the operation of a cleaner such as shown in Figs. 1, 2 and 3, when it is desired to clean a pipe carrying a deposit on the inside, the pipe cleaner is propelled through the pipe by some suitable propelling unit commonly used in the art. The cleaner selected by a particular job will be of such a size that it will, through the springs 22, exert an adequate biasing pressure on the cutting wheels 29 to cut through the deposit. Thus as the cleaner moves longitudinally of the pipe, the deposit is cut into strips.

As described hereinbefore, the cutting wheels are of a special shape. Reference to Fig. 5 will reveal that the wheels are dish-shaped. The curvatures of the inside and outside of the wheel may vary a great deal without departing from the scope of the invention.

When the wheels are dish-shaped and toed-in slightly in the forward direction, they will tend to undercut the deposit on the inside of the pipe as it is cut into strips, and thus exert a lifting action on the deposit at the trailing edges of the wheels. In describing the wheels as toed-in we mean that planes through the rims of a pair of wheels are inclined toward one another in the forward direction, that is, the direction in which the cleaner will be moved to clean the pipe.

When the wheels are mounted on spindles that are bent forward, that is, in the direction in which the pipe cleaner is to move, through a small angle such as 3°, best shown in Figs. 6 and 7, they will not only tend to undercut the deposit on the inside of the pipe as it is cut into strips but they will exert a lifting action on the strips of deposit. The operation will be something like that of the discs of the well known disc harrow employed in agriculture. The dish-shaped wheels will cut into the deposit tending to undercut and at the same time the trailing edge will exert a side thrust on the strip of deposit on the pipe.

Therefore, in the operation of a pipe cleaner unit, such as described, the deposit on the inside of the pipe will be cut into strips and the strips either partially or entirely torn loose from the interior surface of the pipe. The completeness of the cleaning operation will depend on the job at hand and a study of the number of cutting wheels and the spacing of the cutting wheels required to remove the particular deposit.

It will be readily appreciated that in the construction of the cleaner any number of cutting wheels may be provided and staggered around the stem 10. Thus the deposit on the inside of the pipe may be cut into innumerable narrow strips and pried loose from the surface. The narrower the strip, the easier it is for the cutting wheel to dislodge it from the interior surface of the pipe. It will also be readily appreciated that the springs 22 may be made of such a size, length and strength to meet any operating condition that may be encountered.

In locating the wheels 29, it is preferable to keep the bosses 18 spaced a predetermined distance apart. When a large number of cutting wheels are desired in order to cut the deposit into narrow strips, the number of locations such as 19

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and 20 on the stem can be increased to give any desired number of staggered cutting wheels 29.

Since certain changes may be made in the above device and different embodiments of the invention can be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. In a pipe cleaner for removing deposits from the inner surface of pipes, in combination, a hollow stem, bosses disposed on the hollow stem, the upper faces of the bosses extending at an angle to the stem, springs mounted on the upper faces of the bosses, the springs also extending at a predetermined angle to the stem, and pairs of dish-shaped wheels disposed in toed-in relation on the springs to contact the deposit on the inner surface of the pipe under the biasing pressure of the springs, the dish-shaped wheels having cutting edges which cut the deposit on the inner surfaces of the pipe along lines substantially parallel to the axis of the stem as the cleaner is moved in a cleaning operation.

2. In a pipe cleaner for removing deposits from the inner surfaces of pipes, in combination, a plurality of rotatable cleaning cutters, a spindle for carrying the rotatable cleaning cutters at opposite ends thereof, the spindle being so disposed that the cleaning cutters carried on opposite ends are inclined outwardly from the leading edges to the trailing edges, springs for carrying the spindles and for biasing the cutters against deposits on the insides of pipes and means for carrying the springs disposed in a predetermined arrangement.

3. In a pipe cleaner for removing deposits from the inner surfaces of pipes, in combination, a plurality of dish-shaped cutting discs, spindles for carrying the cutting discs at opposite ends thereof, the spindles having their ends on which the discs are carried bent at an angle to the central portion forwardly in the direction of travel of the pipe cleaner a pair of toed-in discs carried by each spindle, spring members carrying the spindle, the springs serving to bias the discs against the deposit on the inside of a pipe and a stem for carrying the springs in a predetermined arrangement.

4. In a cleaner for removing deposits from the inside of pipes, in combination, a stem, bosses provided on the stem, a notched annular plate carried by the stem, the notches in the annular plate being in alignment with the bosses, springs carried by the bosses and disposed in the notches in the annular plate, the annular plate serving to keep the spring circumferentially spaced on the stem and dish-shaped cutting wheels rotatably mounted on the springs, the dish-shaped cutting wheels being disposed in pairs and in planes inclined outwardly and rearwardly with respect to the longitudinal axis of the springs whereby as the dish-shaped cutting wheels cut into the deposit on the inside of a pipe, they cut under it and effect a lifting action at the trailing part of the wheel as it leaves the deposit, the cutting wheels performing the cutting and lifting operation upon movement of the stem longitudinally of the pipe.

5. In a cleaner for removing deposits from the inside of pipes, in combination, a stem, bosses

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provided on the stem, a notched annular plate carried by the stem, the notches in the annular plate being in alignment with the bosses, springs carried by the bosses and disposed in the notches in the annular plate, the annular plate serving to keep the springs spaced circumferentially on the stem, and dish-shaped cutting wheels rotatably mounted on the springs with alternate wheels facing in the opposite directions, the cutting wheels being toed-in to give a predetermined lifting action on the deposit as they cut into the deposit when the stem is moved longitudinally of the pipe.

6. In a cleaner for removing deposits from the inside of pipes, in combination, a stem, bosses provided on the stem and a notched annular plate carried by the stem, the notches being disposed in alignment with the bosses, springs extending at an angle to the stem carried by the bosses and disposed in the notches in the annular plate, the annular plate serving to keep the springs circumferentially spaced on the stem, bearings formed on the outer ends of the springs, the bearings having ends inclined at a predetermined angle to the middle line of the spring, axles with bent ends mounted in the bearings, dish-shaped cutting wheels rotatably mounted on the axles at an angle to the axis of the stem to accommodate them to the inclined ends of the bearings, the mounting of the wheels in toed-in and inclined arrangement serving to enable the dish-shaped cutting wheels to exert a lifting action on the deposit.

7. In a cleaner for removing deposits from the inside of pipes, in combination, a stem, spring members mounted on and extending at an angle to the stem, means for keeping the spring members spaced circumferentially on the stem, bearings formed in the springs, axles mounted in the bearings, each end of the bearings presenting a bearing face extending in a plane substantially parallel to the axis of the spring, axles disposed in the bearings, the ends of the axles being bent at an angle to the axis of the bearing, cutting wheels mounted on the portions of the axle bent at an angle to the axis of the bearing thereby disposing each pair of cutting wheels in a toed-in arrangement.

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