Nov. 3, 1953 R. A. J. DAWSON 2,657,409

ROWEL TYPE PIPE CLEANING TOOL

Filed May 6, 1949 2 Sheets-Sheet 1

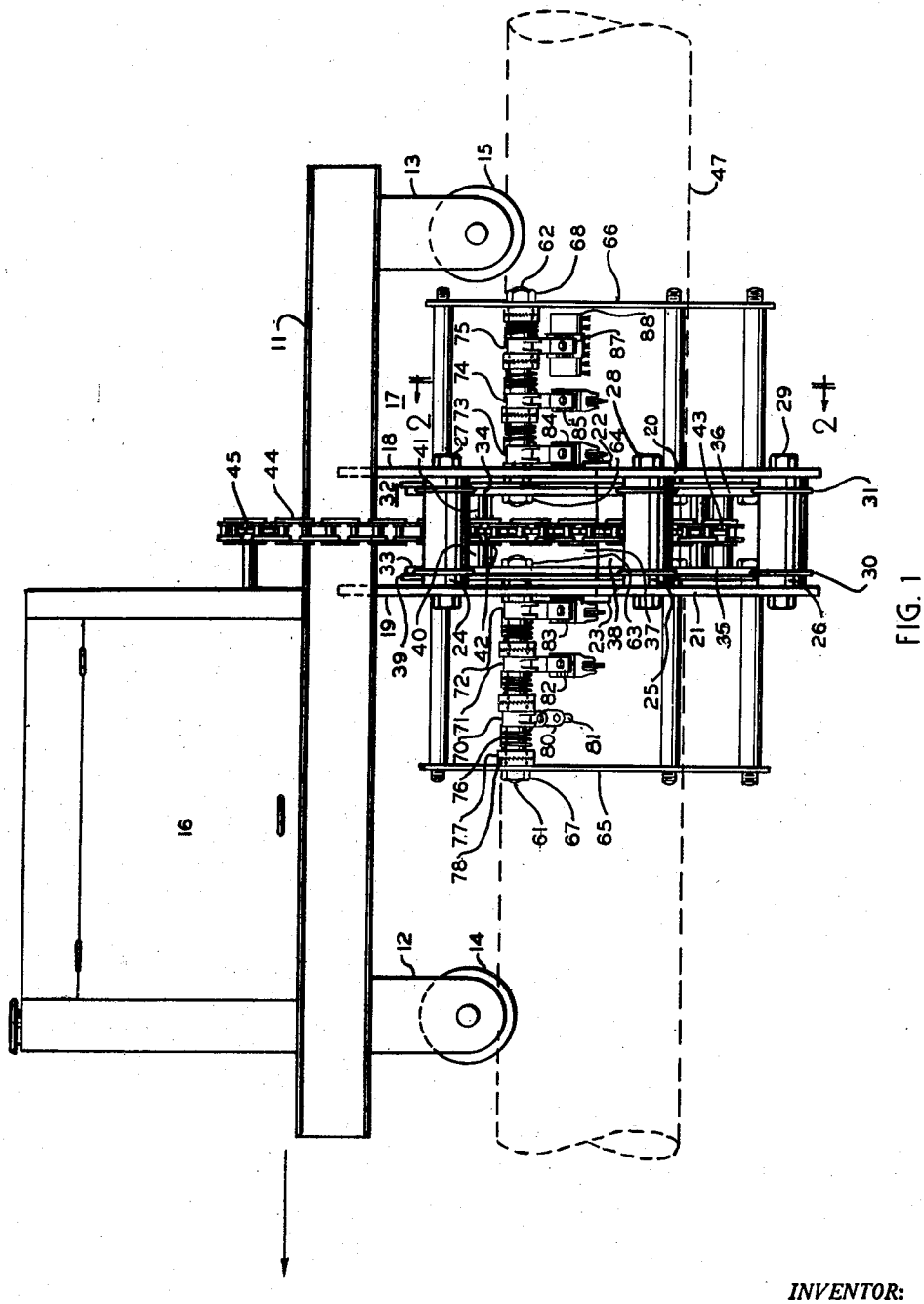


FIG. 1

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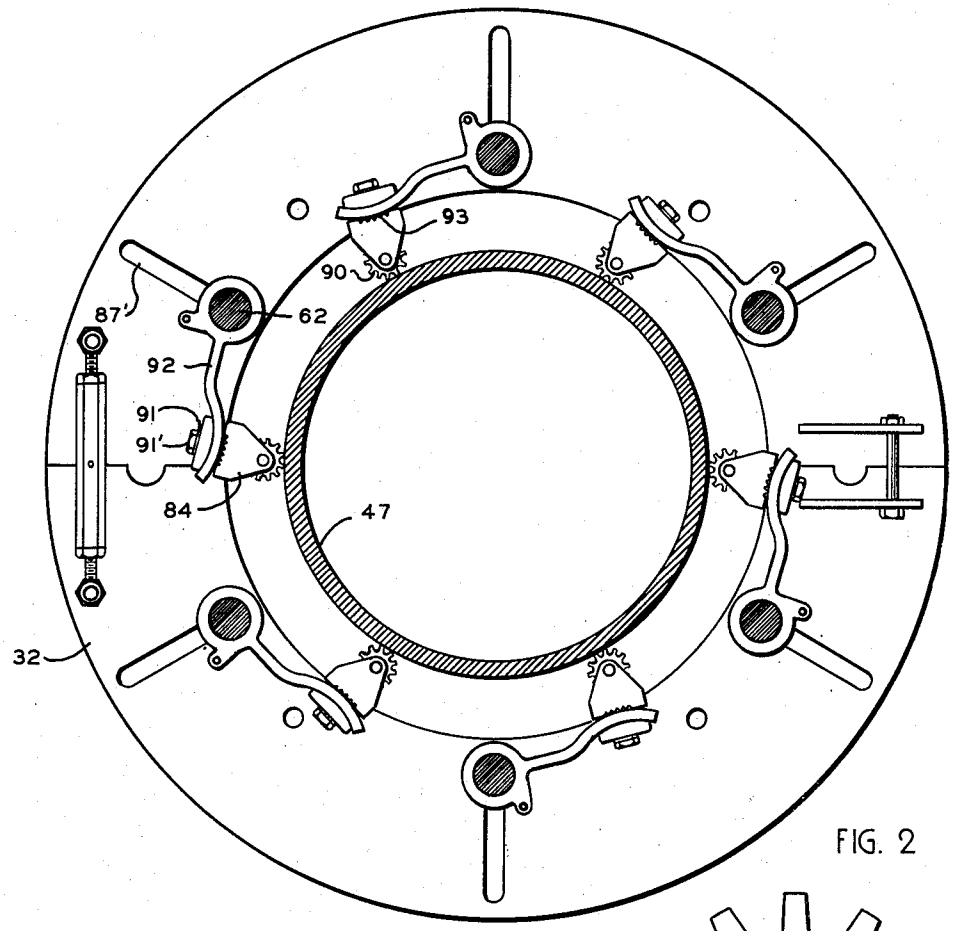


FIG. 2

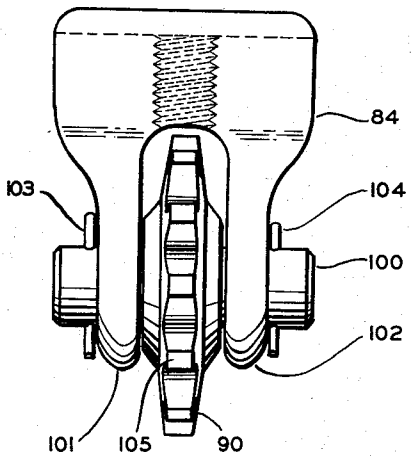


FIG. 3

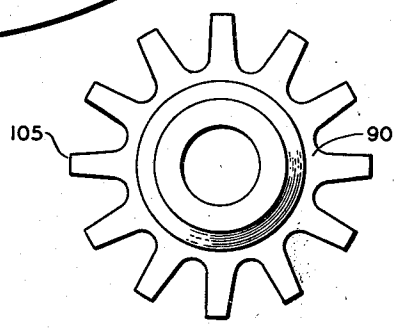


FIG. 4

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Patented Nov. 3, 1953 2,657,409

# UNITED STATES PATENT OFFICE

2,657,409

## ROWEL TYPE PIPE CLEANING TOOL

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Application May 6, 1949, Serial No. 91,695

1 Claim. (Cl. 15—104.04)

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This invention pertains to rowel type pipe cleaning tools. Although the invention is of general utility in connection with all types of cleaning machines, it is best adapted for use in rotary cleaning machines for cleaning exterior or interior generally cylindrical surfaces and is particularly adapted to be used in pipe cleaning machines of the general type exemplified by U. S. Patent 1,611,920, granted December 28, 1926, to Frank Kinzback, and by my own applications for patent, S. N. 37,124, now Patent No. 2,635,270, and S. N. 90,253, co-pending herewith, entitled "Tool Carriage Ring for Pipe Cleaning Machine" and "Pipe Cleaning Machine," filed respectively July 6, 1948, and April 28, 1949.

Machines of the aforementioned type are intended particularly to be used to clean iron or steel pipe such as is used to carry gas, oil, or water, and comprise a bearing within which is mounted an annular shaft or ring of large enough interior diameter to fit over the pipe to be cleaned. The ring is driven by suitable power means and thereby caused to rotate in the bearing. The ring carries a plurality of rods extending along the length of the pipe and suitable pipe cleaning tools are pivotally mounted on the rods and spring biased or pressed towards the pipe. Different tools may be mounted on the rods to perform different pipe cleaning functions. A usual assembly comprises a number of sets of knife or scraper tools and one set of brushes, a set meaning a group of tools mounted one on each rod and all in the same plane perpendicular to the pipe axis. In this case the brushes would follow the knives with respect to the relative motion of the pipe cleaning machine along the pipe. It may be noted here that either the pipe cleaning machine can be driven along the length of the pipe or the machine can be stationary and the pipe passed therethrough. In either case the knives scrape off most of the dirt, debris, paper wrapping, tar coating, surface rust and scale, following which the brushes dust off the pipe, removing small fragments previously loosened by the knives.

Occasionally the sets of knives are replaced by a group of spindles, each held at its ends in a pair of rocker arms pivotally mounted on one of the rods and each spindle carrying a large number of gear-shaped discs strung thereon, as shown for example in the aforementioned Kinzback patent. The function of these toothed discs is substantially the same as that of the knives in removing the exterior debris from the pipe. Neither the knives nor the toothed discs are capable of removing substantially any of the rust in pits.

At the present time, after a pipe has been cleaned with a machine it is necessary to have all the rust pits cleaned out manually with a

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hammer and chisel so as to expose the bare metal. Then a welder fills up each pit with weld metal. This takes a great deal of time and is very expensive, so that if there are too many pits the pipe is discarded. Another troublesome problem with the present method of preparing pits for welding lies in the fact that the chippers fail to remove all the rust. Sometimes they clean the pit only at the surface and the welder fills up the hole so that it looks all right on the surface, while actually there is a rusty pit just below the weld metal that may extend clear through to the inside of the pipe. Alternatively the chipper may not get the rust out very completely at any point, so that the welder has very little bare metal to which he can weld. This means he may have to make several dozen tack welds before he can get the hole welded up, and the resulting weld is not very strong.

The object of this invention is to provide a tool that will thoroughly clean an uneven irregular surface, such as a rusty pipe, in which example it will remove all the rust and scale, both on the surface and in pits, as well as remove the paper, tar, and other debris from the article being cleaned.

It is a further object of the invention to provide a tool for mechanically cleaning that will produce a bright, clean finish.

Briefly described the invention comprises an individually mounted toothed disc, usually a plurality of such discs, each disc being spring biased against the article to be cleaned, and means for moving the discs over the article to be cleaned, either oscillating or reciprocatory or rotary or a combination thereof. The individual mounting has a two-fold effect: First, it permits a tooth of a disc to penetrate into a rust pit or other depression below the pipe surface; second, as the disc turns it causes each tooth to hammer against the pipe due to the uneven radius of the toothed disc. This combined penetration and hammering added to the cutting and scraping action of the edges of the teeth of the discs causes them not only to remove all the dirt, paper, asphalt, and other debris from a metal pipe or other article, and all of the scale and surface rust, but also to clean out the rust pits. The final result is a bright, clean surface. In the case of metal pipe the surface will have a hammered or stippled appearance.

The advantages of the invention lie in the elimination of the necessity for hand chipping of rust pits, achievement of single operation mechanical cleaning, reduction of time and cost of cleaning, and utmost reliability of cleaning, particularly of pits with the attendant saving in time, expense, and greater reliability in the welding of the pits.

A further object of the invention is to provide

a toothed disc which is suitable for cleaning an article according to the invention and that will not dull immediately after being put into use, but instead will be self-sharpening and will last for a long time.

Briefly, the last-stated object is achieved by sharpening each of the teeth in the disc so that each is of nearly uniform cross-sectional area perpendicular to the tooth radius and so as to provide a small hammer end perpendicular to the tooth radius that has sharp cutting edges. As the tooth wears down it will remain small enough to penetrate rust pits and its edges will remain sharp.

Other objects and advantages of the invention will appear from the following detailed description of a preferred embodiment thereof in which:

Figure 1 is a side elevation of a pipe cleaning machine of a type in which the invention may be used.

Figure 2 is a section on the line 2—2 of Figure 1 showing the relation of the toothed discs with respect to the pipe.

Figure 3 is a detail showing the manner of mounting the discs.

Figure 4 is a plan view of one of the discs.

Referring now to Figure 1, there is shown the general arrangement of a pipe cleaning machine comprising a frame 11 mounted on legs such as those shown at 12 and 13 within which are journaled crawler wheels 14 and 15. A motor 16 is mounted on top of the frame for rotating the pipe cleaning tools and also for driving the crawler wheels to advance the machine along the pipe.

Connected to the underside of the frame is a tool carriage assembly designated generally by the reference number 17. This assembly comprises a bearing annulus formed of two upper semi-circular annular plates 18 and 19 and two lower semi-circular annular plates 20 and 21, hingedly connected together at one side at 22 and 23 and detachably fastened together at the other side by means not shown. Between the two annular plates thus formed are carried a plurality of rollers such as those shown at 24, 25 and 26, which are rotatably mounted on shafts which are secured at their ends to the plates by nuts as shown at 27, 28, and 29. Each roller has a pair of annular flanges as shown on roller 26 at 30 and 31.

Within the bearing annulus is a tool carriage ring designated generally by reference character 32. This ring comprises upper and lower pairs of semi-circular annular plates 33, 34, 35, and 36, welded at their radially inner edges to semi-cylindrical plates 37 and 38. The upper and lower halves of the ring thus formed are hingedly connected together at one side and detachably secured together at the other side by means not shown. Each of the plates forming the side of the ring is provided with a radially extending flange as shown at 39. These flanges cooperate with the flanges 30, 31 on the rollers of the bearing annulus to keep the ring in axial alignment therewith.

Held between the two sides of the ring by means of spacers such as those shown at 40 and 41 are two semi-circular sprocket wheel segments 42, 43. A drive chain 44 connects the sprocket wheel to gear 45 driven by the motor 16. The motor acting through the drive chain and sprocket will cause the tool carriage ring to rotate within the bearing annulus and around the pipe 47.



A plurality of tool supporting rods such as those shown at 61 and 62 are secured adjustably in slots in the tool carriage ring by means of nuts 63, 64, screwed onto their threaded ends. The opposite ends of the rods are likewise threaded and secured in slots in the stabilizing rings 65, 66 by means of nuts 67, 68. These stabilizing rings are split diametrically and detachably secured together by suitable means not shown.

Pivotally mounted on the tool supporting rods are a plurality of rocker arms such as shown at 70, 71, 72, 73, 74, 75. Each rocker arm is spring biased to turn about the rod toward the pipe by means of a helical spring such as that shown at 76 connected at one end to arm 70 and at the other end to the movable part 77 of a ratchet, the other part of the ratchet 78 being pinned to the rod. Each rod carries a holder for a particular pipe cleaning instrument, such as the holder 80 for knife 81, the rowel holders 82, 83, 84, 85, and the holder 87 for brush 88. Similar rocker arms and tool holders (not shown) are mounted on all of the rods, like holders and tools usually being used in any set of tools in one plane perpendicular to the pipe axis.

The arrangement described comprising a first set of knives followed by several sets of rowels or hammer cutter toothed discs, and a final set of brushes is a preferred arrangement of general utility, but is open to modification, according to circumstances. It is intended that the pipe cleaning machine will travel along the pipe in the direction indicated by the arrow, the set of knives removing the great bulk of dirt, debris, paper and tar or asphalt, and the several sets of hammer cutters removing the scale and rust and cleaning out the pits, the final set of brushes dusting off the pipe and removing loose particles freed by previous sets of tools, thereby exposing the bright, hammered clean, metal surface produced by the hammer cutters.

Referring now to Figure 2 there is shown the disposition about the pipe 47 of a set of hammer cutters such as that shown at 90. Each holder, such as 84, is secured to the rocker arms by means of a screw as shown at 91 passing through lock washer 91', a clamp plate 92, and a slot in the end of the rocker arm into the holder 84. The top of the holder is serrated, as shown at 93, better to grip the under side of the rocker arm. The end of the rocker arm, the top of the holder, and the bottom of the clamp plate are curved so that the position of the holder relative to the arm can be changed according to the size of the pipe to be cleaned at the same time the positions of the rods are adjusted in the slots, e. g., rod 62 in slot 87'.

Referring to Figure 3 there is shown one of the rowels or hammer cutters 90, the rowel being rotatably mounted on shaft 100 passed through holes in the arms 101, 102 of the holder 84 and held by cotter pins 103, 104. The substantially square rectangular section of the teeth of the rowel is exemplified by tooth 105, the end of which appears in plan in the drawing. In Figure 4 there is shown a side view of the rowel 90, illustrating the shape of the teeth to maintain their cross-section uniform until nearly worn off. The edges of the teeth parallel to the shaft 100 serve as cutting edges as the rowels are rotated about the pipe and the end faces of the teeth serve as hammers. As the teeth wear down the cutting edges remain sharp due to the nearly radial sides of the teeth.

In some cases it may be desirable to turn the

holders so that the shafts on which the rowels rotate are not quite parallel to the pipe axis. This reduces the speed of rotation of the rowels and increases their scraping action. Such adjustment can be accomplished by loosening the screws holding them on the rocker arms and then turning the holders about thes crews. The radius of curvature of the tops of the holders is great enough to permit this to be done. However, it is usually best to have the shafts 100 parallel to the pipe axis so that the rowels will make a maximum number of revolutions giving a maximum hammering effect.

While a preferred embodiment of the invention has been illustrated and described, it is obvious that many modifications thereof could be made by one skilled in the art. It is desired to protect by Letters Patent all forms of the invention falling within the scope of the appended claim.

I claim:

A tool carriage assembly for a rotary pipe and shaft cleaning machine comprising a tool carriage ring, a plurality of tool support rods extending axially therefrom, a plurality of sets of tools mounted thereon, said sets of tools each comprising a plurality of rocker arms pivotally mounted one on each rod, each arm carrying a single peripherally toothed hammer-cutter disc, rotatably mounted all by itself thereon, spring means connected to each of said arms to urge the disc carried thereon toward the ring axis and the article to be cleaned, the cross-sections



of the teeth of each disc being rectangular to provide cutting edges and the lengths of the sides of each rectangular cross-section being of the same order of size to minimize the largest dimension of the cross-section for any given area thereof so as to allow each tooth to penetrate the smallest diameter pits in the article to be cleaned for given hammer area constituted by the end of the tooth, the spacing of the teeth about the periphery of each disc being constant and substantially uniform and greater than the peripheral extent of each tooth, said single disc on each arm being the sole cleaning device mounted on said arm in position to contact the article to be cleaned.

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