May 5, 1953 C. F. MORAIN 2,637,056

PIPE BRUSHING APPARATUS

Filed March 7, 1949 2 SHEETS--SHEET 1

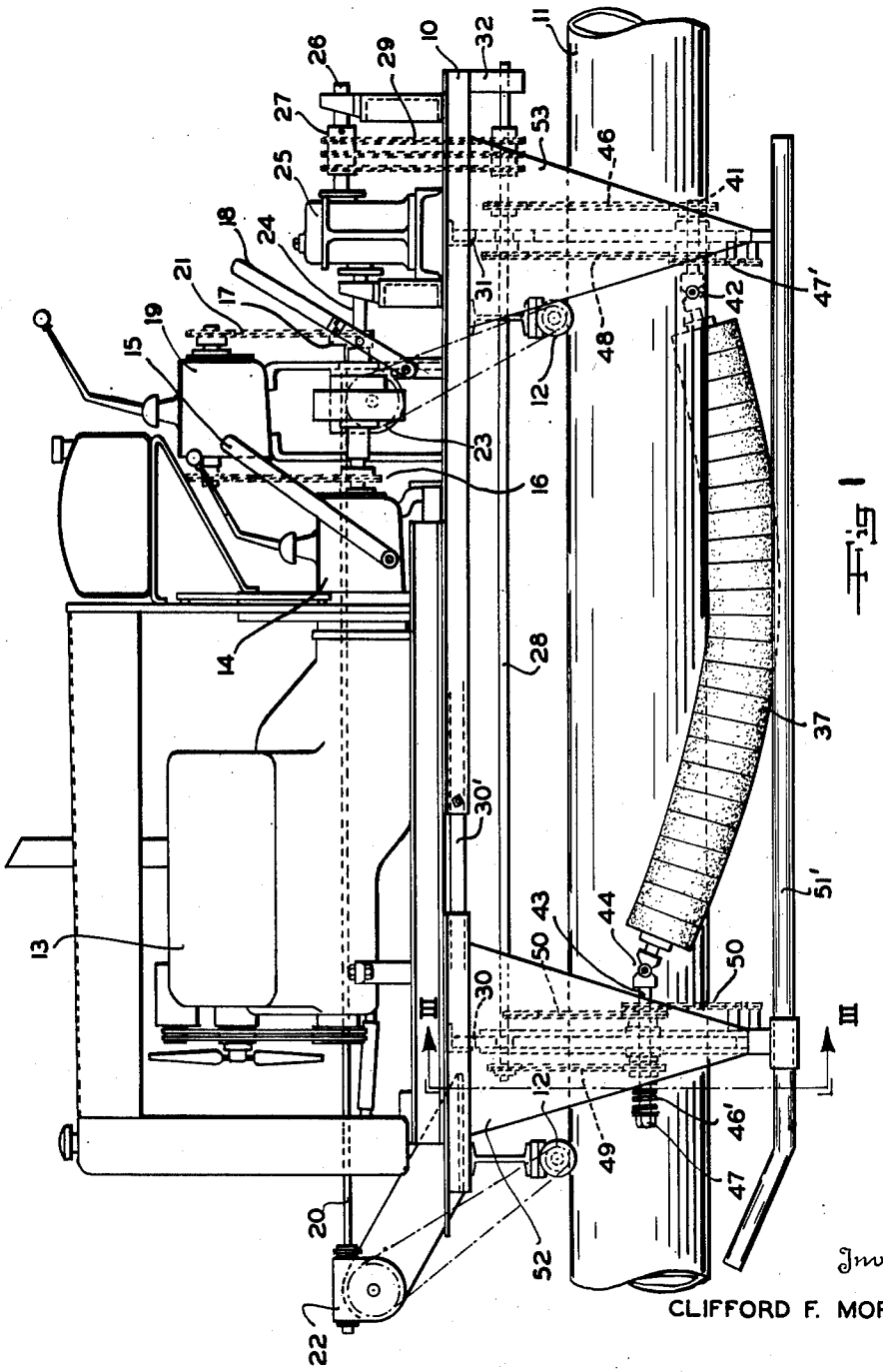


Fig. 1

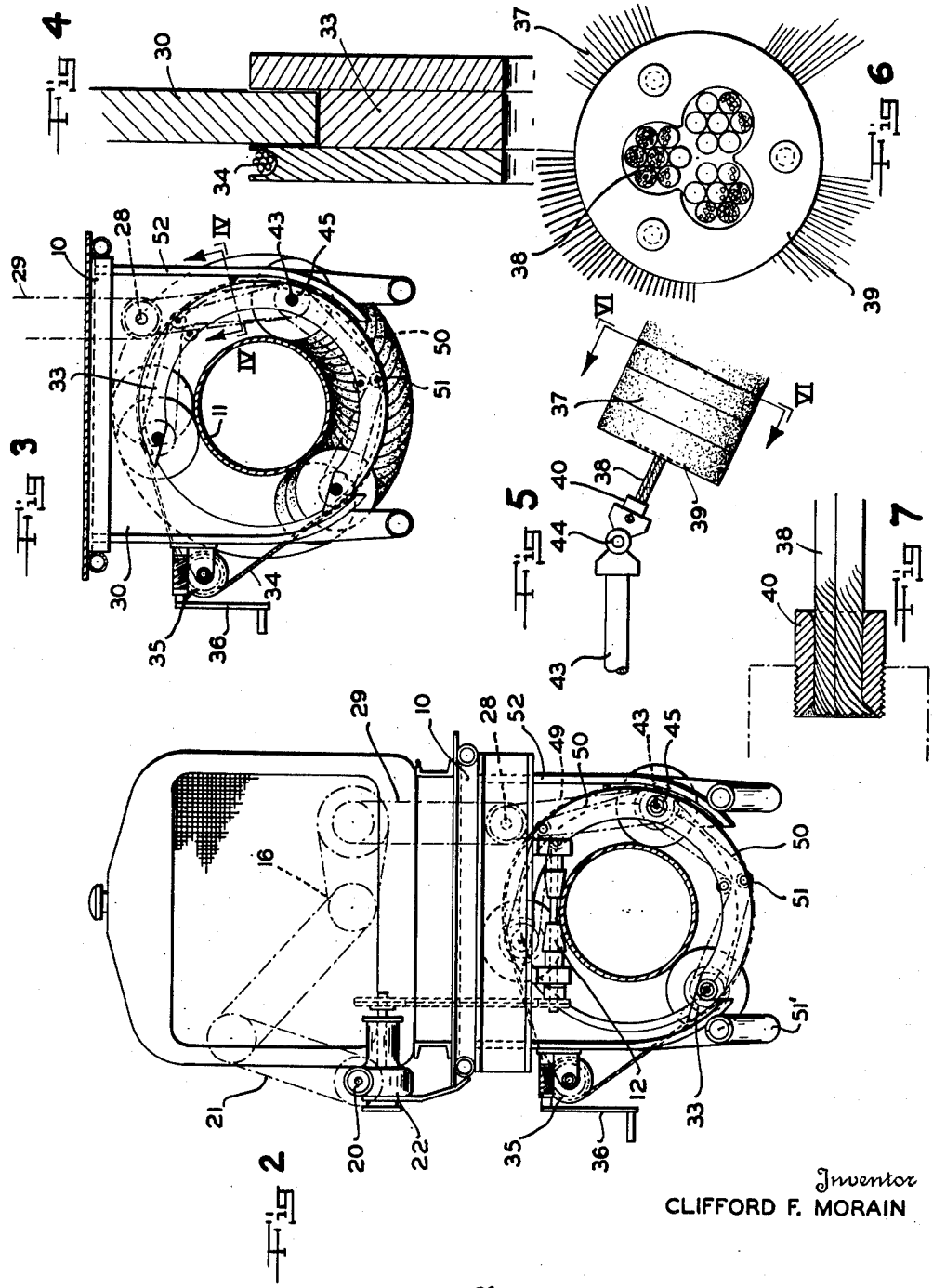
Inventor
CLIFFORD F. MORAIN

By
Francis J. Klempay,
Attorney

May 5, 1953 C. F. MORAIN 2,637,056

PIPE BRUSHING APPARATUS

Filed March 7, 1949 2 SHEETS—SHEET 2



Inventor
CLIFFORD F. MORAIN

By Francis J. Klempay,
Attorney.

Patented May 5, 1953

2,637,056

UNITED STATES PATENT OFFICE

2,637,056

PIPE BRUSHING APPARATUS

Clifford F. Morain, Youngstown, Ohio

Application March 7, 1949, Serial No. 80,074

7 Claims. (Cl. 15—88)

1

This invention relates to pipe cleaning apparatus and more particularly to a power driven brushing assembly which is adapted to have longitudinally relative movement with respect to a pipe length or a pipe line to remove rust, scale and other debris from the exterior surface of the pipe. The invention seeks to provide a more practical apparatus for the stated purposes and more particularly, apparatus of this nature which is simple in design yet rugged and durable in operation and which is operative to apply to the exterior surface of the pipe a more intense and rapid brushing action than has heretofore been obtained in apparatus heretofore proposed for the stated purpose.

Another and more specific object of the invention is the provision of an improved pipe brushing machine of the type applicable to an existing continuous pipe line, of an improved arrangement for affixing the apparatus on the pipe line and detaching the same therefrom, and of an improved brush construction therefor whereby the brushes employed will have a much greater total contacting area and consequently a much longer life as compared with the useful life of the brushes now employed in similar apparatus.

The above general objects are attained by the present invention primarily by employing a plurality of circumferentially spaced elongated but flexible power driven brushing elements, each of which assumes a spiral position about the exterior surface of the pipe being cleaned when the apparatus is set up for operation. The spiral positions assumed by the brushes are sufficiently tight that the trailing ends of the respective brushes overlap the leading ends of the brushes in a longitudinal direction so that all the surface of the pipe is effectively cleaned by a single longitudinal pass of the apparatus over the pipe. Since the brushes rotate at high speed about their own curved axes, effective and rapid cleaning action is attained even while the apparatus traverses the pipe line at a fairly high rate of speed.

By varying the angle of twist or tightness of the spiral positions of the respective brushes the apparatus may be readily adjusted for operation on pipe lines of different diameters, particularly if the longitudinal spacing of the ends of the flexible brushes is maintained substantially constant. In this regard another valuable feature of the apparatus of the invention is that by yieldingly anchoring the trailing ends of the brushes against movement in a forward longitudinal direction the flexible brushes may readily yield in a radially outward direction to pass over common

2

couplings and other minor protrusions which may appear on the outer surface of the pipe line.

The above and other objects and advantages of the invention will become apparent upon consideration of the following detailed specification and the accompanying drawing wherein there is disclosed a preferred embodiment of the invention.

In the drawing:

Figure 1 is a side elevation of a pipe brushing machine constructed in accordance with the principles of my invention;

Figure 2 is a front elevation of the apparatus of Figure 1;

Figure 3 is a transverse section taken along the line III—III of Figure 1;

Figure 4 is a fragmentary section taken along the line IV—IV of Figure 3;

Figure 5 is a fragmentary detailed view showing the structure of one of the assemblies of the apparatus;

Figure 6 is a transverse section taken along the line VI—VI of Figure 5; and

Figure 7 is a sectional view illustrating the anchoring of one end of one of the brush supporting cables of the apparatus.

Referring to the drawing in detail the reference numeral 10 designates a rigid frame adapted to be supported in longitudinal alignment above a pipe line 11 by means of serrated mounting rollers 12 which are journaled in blocks depending from the frame 10. Supported on the frame 10 is an engine 13 which is preferably of the automotive type and as such is provided with an attached speed changing transmission 14 and a built-in clutch. For actuating the latter I provide an operating lever 15. Extending rearwardly of the transmission 14 is a drive shaft on which is mounted a sprocket 16 and a clutch 17 operable by a lever 18. A second speed changing transmission 19 is adapted to be driven by a chain from the sprocket 16 and the output of the transmission 19 is coupled with the longitudinally extending drive shaft 20 by means of a chain 21. A shaft 20 is arranged to drive a pair of worm gear reducers 22 and 23, the slow speed output shafts of which are coupled to the rollers 12 for propelling the apparatus along the pipe line 11 as will be readily understood.

A shaft 24 which is driven by the transmission 14 through the clutch 17 is coupled with the input of a speed-reducing unit 25, the output shaft of which is shown at 26 and as mounting a number of driving sprockets 27. Journaled in bearings provided in spaced brackets rigidly secured to and depending below the frame 10 is a longitudi-

nally extending drive shaft 28 which is arranged to be driven by the sprockets 27 by means of the chains 29. These brackets are represented by reference numerals 30, 31 and 32 and the two foremost brackets 30 and 31 are vertical transverse plate-like members, each having a large diametered longitudinally extending circular opening therein to receive the pipe 11. The lower ends of the plates 30 and 31 are cut away to provide, in effect, inverted U-shaped yokes whereby the plates may be readily lowered vertically over the pipe line to position the center of the pipe at the geometric centers of the circular apertures mentioned.

Rotatably mounted in the circular aperture in the plate 30 is a yoke 33 which has a grooved outer periphery as shown in Figure 4 to prevent longitudinal movement of the yoke 33 relative to the plate 30 and to maintain the geometric center of the yoke 33 at the geometric center of the circular opening through the plate 30. To rotate the yoke 33 about the axis or geometric center of the circular opening in the plate 30 I provide a cable 34 which fits in a small peripheral groove formed in the yoke 33 and which is arranged to be moved by a small hand operated windlass 35 having an operating crank 36. For a purpose to be later described the cable 34 is provided with a quick make and break connection, not shown, but it should be obvious that when the parts are properly assembled rotation of the crank 36 in one direction will rotate the yoke 33 in one direction while rotation of the crank 36 in the opposite direction will rotate the yoke 33 oppositely.

The apparatus of my invention utilizes a plurality of flexible brushing elements, each consisting of a multiplicity of circular wire bristle brushes 37 mounted on a flexible steel cable assembly preferably constructed of three separate steel cables 38 arranged triangularly as shown in Figure 6. Each of the brush units 37 is formed with a core or hub of lead or other suitable material for retaining the steel bristles and such brushes are commonly made with sheet steel end plates 39 (Figure 6). In accordance with the present invention such hubs and end plates, if any, are apertured complementarily to the outer peripheral contour of the triangular cable assembly formed of the steel cables 39 so that the various brushes 37 of each brush assembly may be easily strung over the cable assembly and so that rotation of the cable assembly will result in positive driving of each of the brushes. The opposite ends of each of the cable assemblies are terminated by exteriorly threaded cap members 40 and it will be understood that in the manufacture of a brushing assembly a cap 40 is first brazed or soldered onto one end of the multiple cable assembly, after which the brushes 37 are strung onto the cable assembly from the free end thereof, after which said free end is capped by brazing or soldering-on one of the elements 40.

In the specific embodiment illustrated three of the flexible brushing shafts, each consisting of the parts 37 through 40, are employed, but for general purpose machines, particularly those to be used on the larger diametered pipe lines, it is preferable to use four of the brushing shaft assemblies since then the twist of the brushing shafts about the pipe need not be so pronounced. In the machine illustrated three short shafts 41 are journaled in the plate 31 in circumferentially spaced relation for rotation about axes extending parallel with the principal axis of the pipe 11. To the forward end of each of the shafts 41 is attached one end of a brushing assembly by means of a universal joint 42. The opposite ends of the flexible brushing shafts are secured to splined shafts 43 by means of the universal joints 44 and the shafts 43 are slidably received in spindles 45 which are journaled in the yoke 33 carried by the plate 30. The spindles 45 are circumferentially spaced about the yoke 33 and are oriented for rotation about axes parallel with the principal axis of the pipe 11. The shafts 43 project through and forwardly of the spindles 45 and to bias the shafts 43 in a forward direction coil springs 46' are interposed between nuts 47 threaded onto the forward extremities of the shafts 43 and the forward ends of the spindles 45. The spindles 45 are so disposed on the yoke 33 that when the yoke is oriented to align its opening with the vertically downward opening in the plate 30 one of the shafts 43 is aligned with one of the shafts 41 and as is apparent from Figures 2 and 3 the shafts 43 are all circumferentially outward of the downward opening in the yoke 33 and plate 30, thereby permitting the entire machine assembly to be moved vertically down onto the pipe line 11. Of course, when the yoke 33 is so oriented the shafts 41 and 43 supporting the respective brushing shafts are substantially aligned.

I provide means to drive both ends of each of the flexible brushing shafts, and as shown in Figure 1 one of the shafts 41 is driven from the shaft 28 by means of a chain 46. Interconnecting this shaft 41 and a second of the shafts 41 is a sprocket and chain assembly 47', while the third of the shafts 41 is driven directly from the shaft 28 by means of the chain 48. At the forward end of the machine one of the spindles 45 is driven directly from shaft 28 by means of chain 49, while this one spindle is interconnected with the other two spindles on the yoke 33 by means of the chain and sprocket assemblies 50. In order that the chains 50 may gyrate well outside of the space taken by the pipe 11, guide rollers 51 are journaled on the yoke 33 substantially as shown in Figures 2 and 3. The chain 49 is of the kind which can be readily adjusted as to length or, if desired, a suitable idling take-up sprocket, not shown, may be employed in the assembly, as will be understood. One or the other of these expedients is required since the distance between the centers of rotation of the shaft 28 and the spindle 45 to which the chain 49 is connected will vary, depending on the extent of rotation of the yoke 33 and the consequent extent of twisting of the brushing cables 37—40. It should be observed, however, that both ends of each of the flexible brushing shafts 37—40 are positively driven in the same direction and at the same speed and, further, that coil springs 46 allow the shafts 43 to slide rearwardly, thereby permitting the brushes 37 to bow outwardly to pass over the common pipe joints or other reasonable projections which may protrude radially outward of the general cylindrical outer surface of the pipe 11. The springs 46 perform the further important function of maintaining each of the brushes 37 in resilient pressure contact with the outer surface of the pipe whereby an effective brushing action is attained.

To suport the machine when not in use and to facilitate the handling thereof I provide a pair of spaced parallel pipe skids 51' which extend longitudinally of the machine well below the lowermost portions of the plates 30, 31 and the yoke 33. To brace the plate 30 I provide the side

gusset plates **52** and similar plates **53** rigidly brace the plate **31**. To balance the machine on the pipe line **11** a long laterally extending boom, not shown, is rigidly adapted to a fixed part of the apparatus as the frame **10**, for example, all in accordance with usual practice.

It should now be apparent that I have provided an improved machine for cleaning and brushing the exterior surface of pipes and pipe lines, which accomplishes the objects initially set out. The apparatus is simple in design, easily constructed and maintained and dependable and durable in service, while yet being of minimum weight and highly efficient in operation. The apparatus may be quickly and easily applied onto an unbroken pipe line and is readily adjustable for operation on pipes or pipe lines of different diameters.

By constructing the apparatus with four of the flexible brushing shafts rather than with three as herein shown, the apparatus may be made shorter in over-all length, which is of advantage when a scale breaking attachment (commonly termed a "rattler") is mounted ahead of the brushing machine and/or when a coating applying attachment is to be mounted at the rear end of the brushing machine.

It should now be apparent that the above specifically described embodiment of the invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit or scope of the invention. Reference should therefore be had to the appended claims in determining the scope of the invention.

I claim:

1. Pipe brushing apparatus comprising a frame supporting a pair of longitudinally spaced fixed yokes adapted to be positioned over a pipe line, a movable yoke rotatably mounted on one of said fixed yokes for rotation about the longitudinal axis of said pipe line, a plurality of circumferentially spaced but longitudinally extending shafts journaled in the other of said fixed yokes, a plurality of circumferentially spaced but longitudinally extending shafts journaled in said movable yoke, flexible elongated brush shafts interconnecting the shafts journaled in said fixed and movable yokes and adapted to be driven thereby, a plurality of contiguous brush wheels fixed on each said brush shaft throughout substantially the whole of the length of said brush shaft, said flexible brush shafts and said wheels forming elongated flexible rope-like brushing units adapted to have intimate spiral engagement with the pipe to be cleaned, and power means on said frame to drive the shafts journaled in said fixed yoke.

2. Apparatus according to claim 1 further characterized in that each of said brush shafts comprises a flexible cable, said brush wheels being strung on said cable, and universal joints interconnecting the ends of said cables to said shafts journaled in said fixed and movable yokes.

3. Apparatus according to claim 1 further including means to rotate said movable yoke about the longitudinal axis of said pipe line whereby said flexible brush shafts may be twisted about the pipe to assume varying spiraling positions.

4. Apparatus according to claim 1 further including transmission means interconnecting said power means and said shafts journaled in said movable yoke to drive said last mentioned shafts.

5. Apparatus according to claim 1 further including a pair of spaced parallel skids secured to the lower free ends of the legs of said yokes and extending substantially parallel with the longitudinal axis of said pipe line.

6. Pipe brushing apparatus comprising a frame supporting a pair of longitudinally spaced fixed yokes adapted to be positioned over a pipe length, a movable yoke rotatably mounted on one of said fixed yokes for rotation about the longitudinal axis of said pipe length, a plurality of circumferentially spaced flexible elongated brush shafts journaled at one end in one of said fixed yokes and at the other end in said movable yoke, a plurality of contiguous brush wheels fixed on each said brush shaft throughout substantially the whole of the length of said brush shaft, said flexible brush shafts and said wheels forming elongated flexible rope-like brushing units adapted to have intimate spiral engagement with the pipe to be cleaned, and power means on said frame to rotate each of said brush shafts about their own respective axes.

7. Apparatus according to claim 6 further including yielding means to maintain said flexible brush shafts in a taut condition in a longitudinal direction.

CLIFFORD F. MORAIN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,218,005	Schlemmer	Mar. 6, 1917
1,809,725	Roe	June 9, 1931
2,050,036	Boax	Aug. 4, 1936
2,178,912	Leahey	Nov. 7, 1939
2,238,720	Duaei	Apr. 15, 1941
2,427,129	Fields	Sept. 9, 1947

FOREIGN PATENTS

Number	Country	Date
277,801	Great Britain	Sept. 29, 1927