Aug. 28, 1962 A. E. BETZEL, SR 3,050,759

BRUSH DRIVE MEANS FOR CLEANING CYLINDRICAL SURFACES

Filed Sept. 29, 1961 4 Sheets-Sheet 1

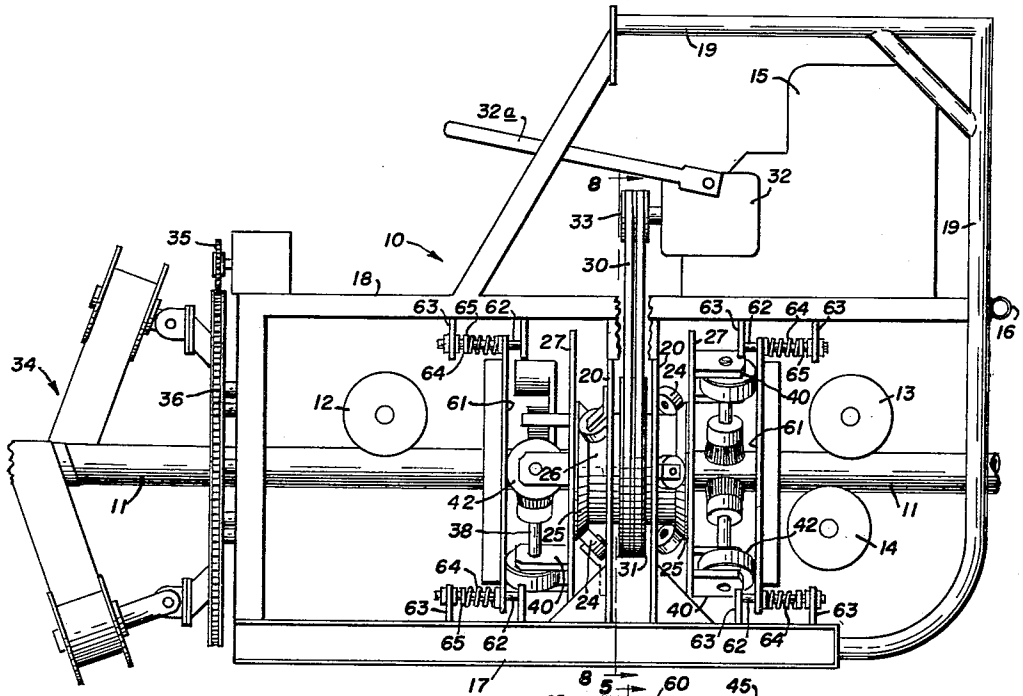


FIG. 1.

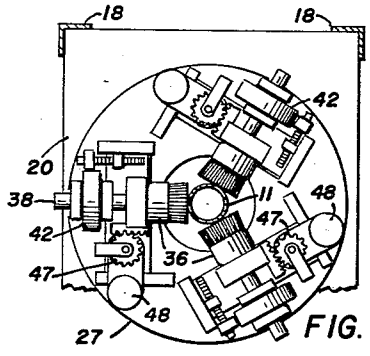


FIG. 2.

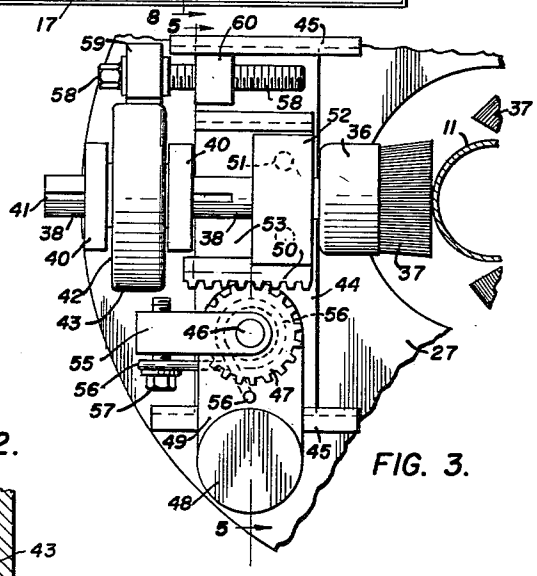


FIG. 3.

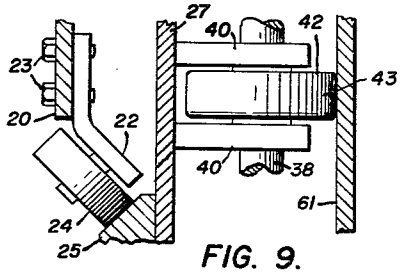


FIG. 9.

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BRUSH DRIVE MEANS FOR CLEANING CYLINDRICAL SURFACES

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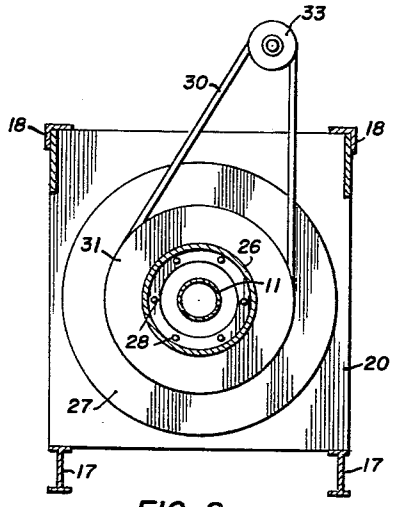


FIG. 8.

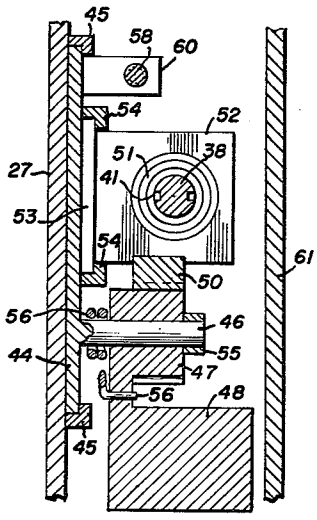


FIG. 5.

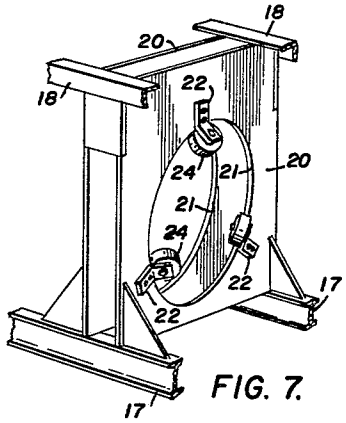


FIG. 7.

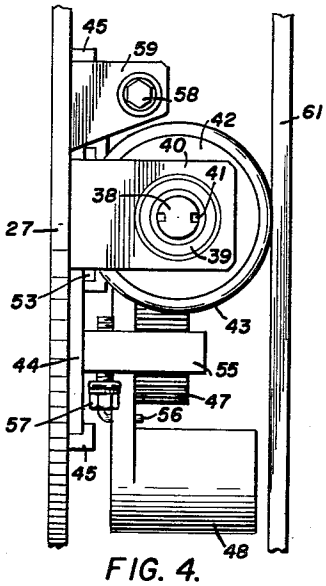


FIG. 4.

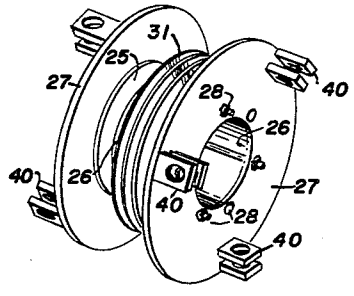


FIG. 6.

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BRUSH DRIVE MEANS FOR CLEANING CYLINDRICAL SURFACES

Filed Sept. 29, 1961 4 Sheets-Sheet 3

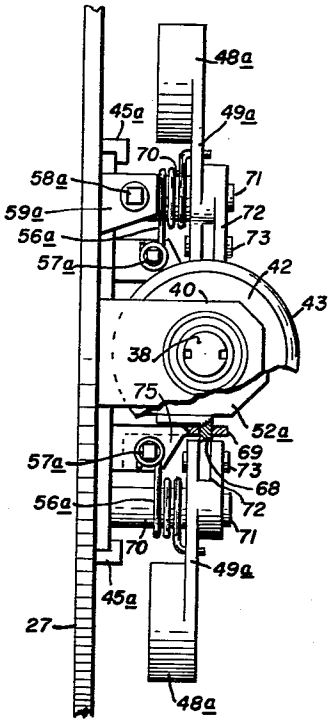


FIG. 11.

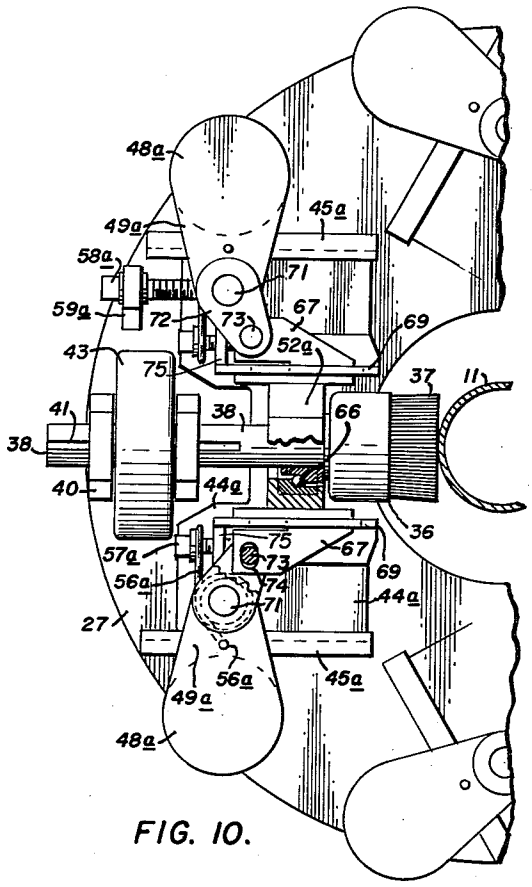


FIG. 10.

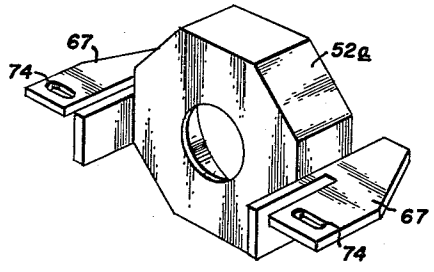


FIG. 12.

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BRUSH DRIVE MEANS FOR CLEANING CYLINDRICAL SURFACES

Filed Sept. 29, 1961 4 Sheets-Sheet 4

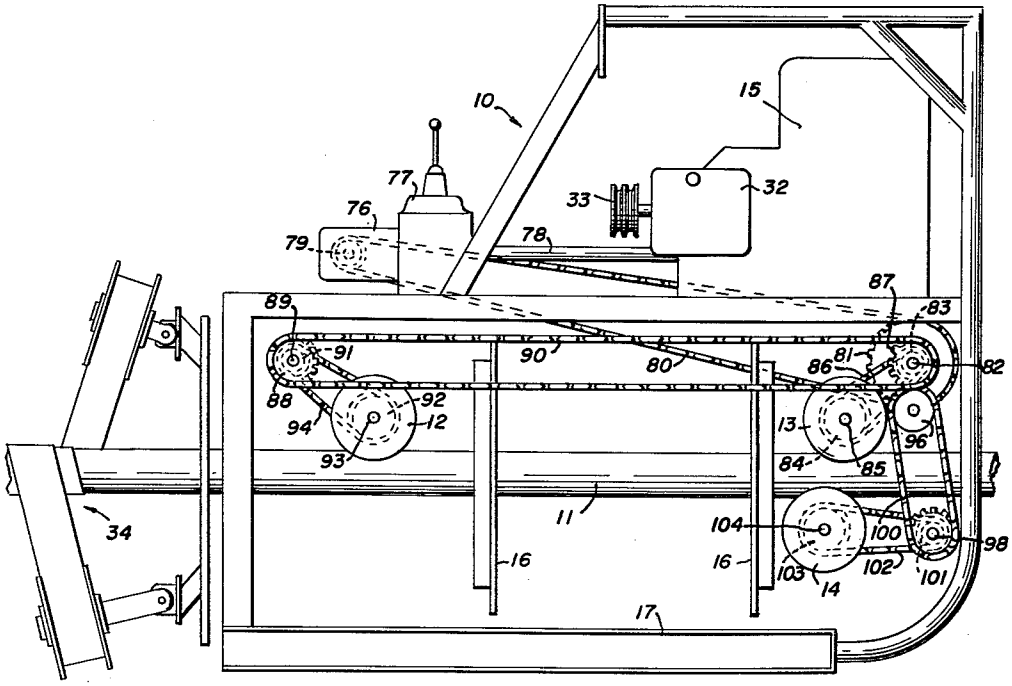


FIG. 13.

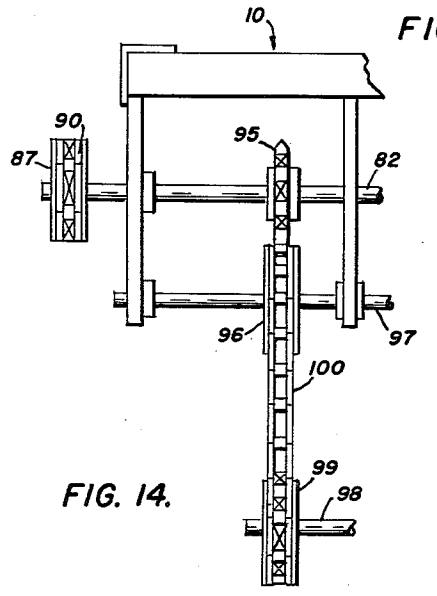


FIG. 14.

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3,050,759

BRUSH DRIVE MEANS FOR CLEANING CYLINDRICAL SURFACES

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Filed Sept. 29, 1961, Ser. No. 141,697
5 Claims. (Cl. 15—104.04)

This invention relates to pipe cleaning and wrapping machines such as those used for conditioning and reconditioning pipe lines and has reference to an improved construction for brushing and cleaning pipe just prior to wrapping or otherwise treating the pipe to prevent corrosion. The type of machines referred to is primarily designed to move along the pipe, but it is to be understood that the pipe may also be fed through the machine while the latter is stationary.

A particular object of the invention is to provide an effective brush assembly in a pipe cleaning and wrapping machine wherein multiple brushes of the cup brush type revolve about their axes and also in planetary movement about the pipe with which they are in contact for removing rust, scale, dirt and other foreign matter.

A particular object of the invention is to provide spring loaded power driven cup brushes making continuous pressure contact with the pipe being cleaned, together with a novel counterweight arrangement for counteracting the centrifugal force caused by the planetary movement of the brushes around the pipe.

These and other objects of the invention will become apparent from the following description and the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of a pipe wrapping machine incorporating the invention.

FIGURE 2 is a cross sectional view through the machine showing an arrangement of brushes.

FIGURE 3 is an enlarged broken elevational view of one brush assembly.

FIGURE 4 is a side elevational view of FIGURE 3.

FIGURE 5 is a vertical section taken on line 5—5 of FIGURE 3.

FIGURE 6 is a perspective of the rotor assembly of the pipe cleaning unit.

FIGURE 7 is a perspective view of the supporting structure in which the rotor assembly operates.

FIGURE 8 is a cross sectional view taken on line 8—8 of FIGURE 1 showing the belt drive for the rotor assembly.

FIGURE 9 is a fragmentary sectional view including a track roller for the rotor and the friction drive roller for a cleaning brush.

FIGURE 10 is a partial front elevational view of a second embodiment of the pipe cleaner showing one complete brush assembly.

FIGURE 11 is a side elevational view of the parts shown in FIGURE 10.

FIGURE 12 is a perspective view of the thrust bearing block shown in FIGURE 10.

FIGURE 13 is a side elevational view, similar to FIGURE 1, and showing an exemplary means for propelling the machine along the pipe.

FIGURE 14 is a fragmentary cross sectional view of the upper left portion of FIGURE 13 and looking toward the rear of the machine.

The machine herein described and illustrated consists of a welded steel frame **10** which surrounds the pipe **11** which is to be cleaned and wrapped, and which rides upon said pipe by means of upper crawler wheels **12**, **13** and a lower crawler wheel **14**. A prime mover **15**, such as a gasoline or diesel engine, is mounted on the frame **10** and by various reduction gears and drive chains of conventional construction, hereinafter described, applies power equally to the crawler wheels **12**, **13** and **14**. Since it is the purpose of this machine to clean and wrap from a few hundred feet to several miles of pipe in one continuous operation, no provision is made for opening the frame **10**, it being only necessary to insert the pipe at the beginning of the run and to let the machine run off at the end. The pipe **11** is supported close to the machine by cradles which are carried by side boom tractors or other conventional means, and these are moved along as the work progresses, after which the pipe is returned to its trench and covered. Rings **16** are welded to each side of one end of the frame **10** through which a bar is inserted by means of which the machine is balanced against rotation about the pipe by one or two men walking along with it.

The frame **10** has a base comprised of a pair of I beams **17** and a superstructure composed of steel angles **18** and pipe members **19** all welded into a rigid unit. A pair of spaced rectilinear steel plates **20** securely welded and braced perpendicularly within the frame **10** forms a mounting structure for the rotary cleaning unit hereinafter described. Circular openings **21** are provided in the centers of the plates **20** and have adjustable brackets **22** therearound, which brackets are held in place by cap screws **23**. The holes, not shown, in the plates through which the screws **23** are inserted are elongated so that the brackets **22** can be adjusted inwardly and outwardly. Support rollers **24**, mounted, one on each angularly extending bracket **22**, constitute means for receiving a pair of conical bearing surfaces **25** connected to each other by a sleeve **26** which is appreciably larger inside than the diameter of the largest pipe on which the machine is to run.

A pair of circular plates **27** are concentrically secured by means of bolts **28** running inside the sleeve **26** and support the conical bearings **25**. Each plate **27** includes a central opening **29** larger than the diameter of the largest pipe to be worked on. The circular plates **27** constitute a rotatable mounting for the pipe cleaning mechanism detailed in FIGURES 3, 4 and 5 and are driven by V belts **30** operating on pulleys **31** attached midway of the sleeve **26**. Power for the belts **30** is supplied by the engine **15** through a gear box and clutch **32** and thence through a drive pulley **33**. A clutch lever **32***a* for starting and stopping the pulley **33** extends to where it can be reached by the operator of the pipe wrapper **34** mounted on the rearward end of the frame **10**. The gear box, clutch and lever are conventional and are not, therefore, described in detail. The pipe wrapper **34**, schematically shown in FIGURE 1, is driven by a sprocket **35** connected to the engine **15** through a series of speed reducer clutch and variable speed drive, not shown, and which sprocket meshes with a roller chain wrapped around and bolted to the perimeter of the mounting plate of the wrapper **34**.

The pipe cleaning operation is performed by two sets of two or more brushes each of which revolves rapidly around the pipe **11** while spinning on its own axis. As shown in detail in FIGURES 3, 4 and 5, the brush heads **36** having stiff wire bristles **37**, are attached to brush shafts **38** which slidably rotate in bearings **39** mounted in pillow blocks **40** which are attached at angular intervals to the circular plates **27**. Riding on each shaft **38**, and slidably keyed to it by means of key-ways **41**, is a driving roller **42** with a friction tread **43** of polyurethane, rubber or the like.

The axes of the brush shafts **38** are radial to the pipe **11** and in order to bring the bristles **37** to bear adequately on the pipe **11** a thrust mechanism is provided to produce a strong and continuous axial force on the brush heads **36** in the direction of the pipe. A carriage **44** is

slidably based against the plate 27 by means of ways 45. Attached to this carriage 44 are perpendicular pins 46 carrying eccentrically weighted pinions 47. The counterweight 48 is attached to the pinion 47 by means of an arm 49 which normally extends at right angles to the shaft 38 in the plane of the plate 27. The pinion 47 meshes with a rack 50 attached to a thrust bearing 51 by way of a block 52 which is part of a second carriage 53 sliding in ways 54 mounted on the first carriage 44 and parallel to the first ways 45. A buttress block 55 is part of the first carriage 44 and supports the pin 46 and extends over the pinion 47 to hold it in place. A coil spring 56 around the pin 46 runs from the arm 49 to a screw 57 in the buttress block 55 by means of which its tension can be adjusted. The force of the spring 56 provides the required pressure of the bristles 37 against the pipe 11 by means of the pinion 47, meshed with the rack 50. However, while the brushes are revolving rapidly around the pipe centrifugal force acting on the brushes tends to overcome the pressure exerted by the springs 56. This tendency is balanced by the counterweights 48 which exert a centrifugal force through the pinions 47 in the opposite direction, thus amplifying the pressure of the springs 56. A lead screw 58 turning in a post 59 attached to the plate 27 is threaded into a block 60 supported on the carriage 44, which lead screw is used to adjust the spacing of the brushes 36 to the size of the pipe 11 by moving the carriage 44 in and out.

The power for spinning the brushes 36 is provided by the rollers 42 whose treads 43 consisting of polyurethane, rubber or other high friction material and are in pressure contact with a pair of pressure plates 61 attached to the frame 10 outside of and parallel to the supporting plates 20. Each plate 61 is kept from turning by four rods 62 through holes in its corners which are mounted on the frame 10 parallel to the pipe 11 by means of brackets 63. Helical springs 64 on the rods 62 bear against the plates 61 forcing them against the rollers 42 with a pressure adjustable by nuts 65 fitting threads on one end of the rods 62.

A suitable propelling means is shown in FIGURES 13 and 14 wherein a gear box 76 and transmission 77 are connected with the prime mover 15 by a shaft 78. A sprocket 79 on the gear box 76 drives a chain 80 which, in turn, drives a sprocket 81 on an upper transverse shaft 82. Another sprocket 83, shown by means of dotted lines in FIGURE 13, is also mounted on the transverse shaft 82 and is connected with a sprocket 84 on a shaft 85 by chain 86. The last referred to shaft 85 is the same on which the upper forward crawler wheel 13 is mounted. The upper rear crawler 12 is driven by a sprocket 87 on shaft 82, a rear sprocket 88 on a transverse shaft 89 and chain 90 connected therebetween. An additional sprocket 91 on shaft 89 is connected with another sprocket 92 on transverse shaft 93 by a chain 94. The last referred to shaft 93 is the same on which the upper rear crawler wheel 12 is mounted.

The lower crawler wheel 14 must turn in the opposite direction. Accordingly, and as best shown in FIGURE 14, there is a sprocket 95 on the upper transverse shaft 82, a disc 96 therebeneath on a shaft 97 parallel with the last said shaft, a lower transverse shaft 98, a sprocket 99 thereon, and a chain 100 connecting the two sprockets. An additional sprocket 101 on the shaft 98 is connected, by a chain 102, with a sprocket 103 on transverse shaft 104, the latter being the same shaft on which the lower crawler wheel 14 is mounted. It is to be understood that the sprocket 95 on shaft 82 meshes with the chain 100 as the latter passes over the disc 96.

In operation, the lead screws 58 are adjusted to receive the pipe 11 with crawler wheels 12, 13 and lower crawler wheel 14 engaging the pipe. The lead screws 58 are then readjusted to cause the bristles 37 of the brush heads 36 to contact the pipe 11 under pressure. The prime mover 15, through belts 30, rotate the roller assembly which in turn rotates the brushes around the pipe. By reason of pressure contact of the friction roller 42 on the pressure plate 61 rotary motion is imparted to the brush heads 36. It is pointed out that the entire unit moves along by reason of the driven crawler wheels 12 and 13 and as it does so the pipe is wrapped in the usual manner by the pipe wrapper assembly 34.

In practice it has been found that the eccentricity of the force applied by the single weight 48 and pinion 47 against the brush 37 in any one brush assembly is undesirable under some conditions, for example, if dirt or grit should get into one of the ways 45, and to overcome this a second embodiment having symmetrical counterweights on opposite sides of the brush shaft 38 can be substituted. As shown in FIGURES 10, 11 and 12, the brush 36 and shaft 38 are mounted in bearing blocks 40 as previously described, with the friction drive roller 42 slidably engaging the shaft 38. A thrust bearing 66 on the shaft 38 is arranged to transmit pressure to the brush from a bearing block 52*a*. The bearing block is supported on wings 67 which are designed to slide in slots 68 running parallel to the shaft 38 in a pair of projecting supports 69 attached to a carriage 44*a* slidably based against the plate 27 by means of ways 45*a*. Outwardly of the supports 69 a pair of studs 70, ending in pins 71, are attached to the carriage 44*a*. Counterweights 48*a* are suspended on arms 49*a* which are pivoted on pins 71 and extend at right angles from the shaft 38. The arms 49*a* have extensions 72 beyond the pins 71 and away from the counterweights which connect the arms 49*a* to the wings 67 of the bearing block 52*a* by means of pins 73 fitting in elongated holes 74 provided in the wings 67. By means of these connections a limited rotation of the arms 49*a* about the pins 71 is translated into longitudinal motion of the bearing block 52*a* parallel to the shaft 38. Coil springs 56*a* are provided to assure pressure of the brushes 37 against the pipe 11. These are slipped over studs 70 and have one end hooked into the arms 49*a* and the other end adjustably attached to the supports 69 by a screw 57*a* running into an angle plate 75 provided for that purpose. The counterweights 48*a* neutralize the centrifugal force which would tend to move the brushes 37 from the pipe 11 when the pipe cleaner is in operation. A lead screw 58*a* turning in a post 59*a* attached to the plate 27 is threaded into one of the studs 70 supported on the carriage 44*a* and is used to adjust the spacing of the brushes 36 to the size of the pipe 11 by moving the carriages 44*a* in and out.

The invention is not limited to the construction herein shown and described, but may be made in various ways within the scope of the appended claims.

What is claimed is:

1. In a pipe cleaning machine of the type which is movably supported on the pipe to be cleaned and wrapped, and wherein said machine includes a frame receiving said pipe therethrough and a prime mover mounted on said frame, at least one mounting plate transversely secured in said frame and having an opening therethrough, support rollers on said mounting plate around said opening, a rotor assembly extending through the opening in said mounting plate and rotatably supported by support rollers, means connecting said prime mover with and rotating said rotor assembly radially disposed brush shafts rotatably mounted on said rotor assembly, brushes on the inner ends of said shafts, friction tread rollers on said shafts, and a pressure plate carried by said frame and positioned to make contact with the treads of said friction tread rollers.

2. In a pipe cleaning machine as defined in claim 1, the construction wherein said brush shafts are mounted in thrust bearings, spring means moving said thrust bearings inwardly, counterweights pivotally mounted on said rotor assembly and means connecting said counterweights with said thrust bearings counteracting the centrifugal force of said brushes when revolving around said pipe.

3. In a pipe cleaning machine as defined in claim 2,

the construction wherein said spring means moving said thrust bearings include carriages slidably mounted on at least one end of said rotor, and wherein said means connecting said counterweights with said thrust bearings is comprised of a pinion rotatable with each said counterweight and a rack on each said carriage meshing with a said pinion.

4. In a pipe cleaning machine as defined in claim 1, the construction wherein said brush shafts are mounted in thrust bearings, spring and guide means slidably mounting and urging said thrust bearings on said rotor assembly in the direction of said pipe, counterweights pivotally mounted on said rotor assembly on opposite sides of each said brush shaft and means connecting said counterweights with said thrust bearings counteracting the centrifugal force of said brushes when revolving around said pipe.

5. In a pipe cleaning machine of the type which is movably supported on the pipe to be cleaned and wrapped, and wherein said machine includes a frame receiving said pipe therethrough and a prime mover mounted on

said frame, a pair of spaced parallel mounting plates transversely secured in said frame and having openings therethrough, support rollers on said mounting plates around said openings, a rotor assembly extending through the openings in said mounting plates and rotatably supported by said support rollers, radially disposed brush shafts rotatably mounted on the ends of said rotor assembly, brushes on the inner ends of said shafts, friction tread rollers on said shafts, pressure plates carried by said frame and positioned to make contact with treads of said friction tread rollers, and drive means connecting said prime mover with rotor assembly between said mounting plates.

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