Feb. 17, 1970 R. L. FORD 3,495,288

ROTATING HEAD SUBASSEMBLY FOR PIPE CLEANING MACHINES

Filed June 26, 1968 2 Sheets-Sheet 1

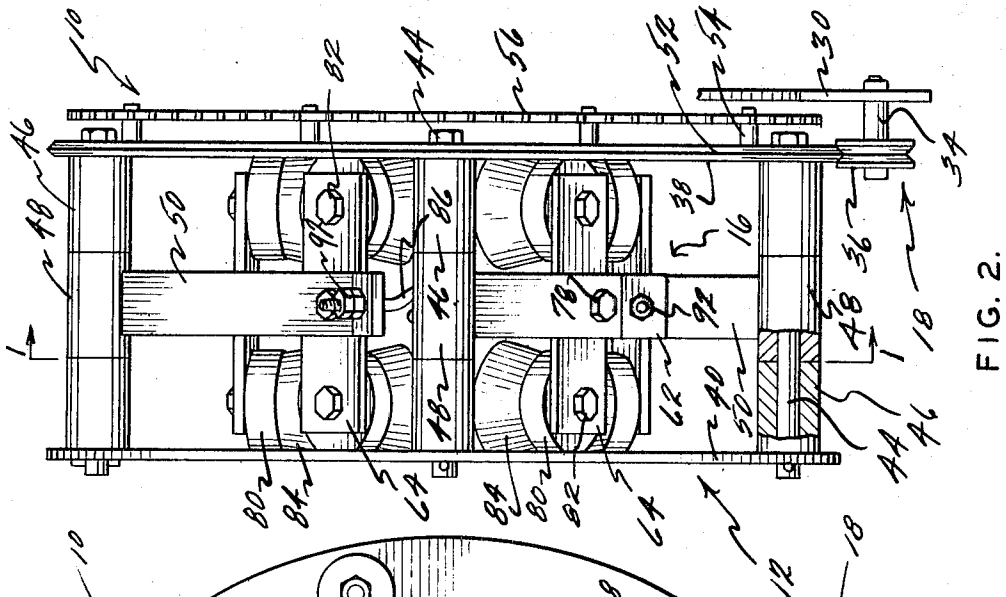


FIG. 2.

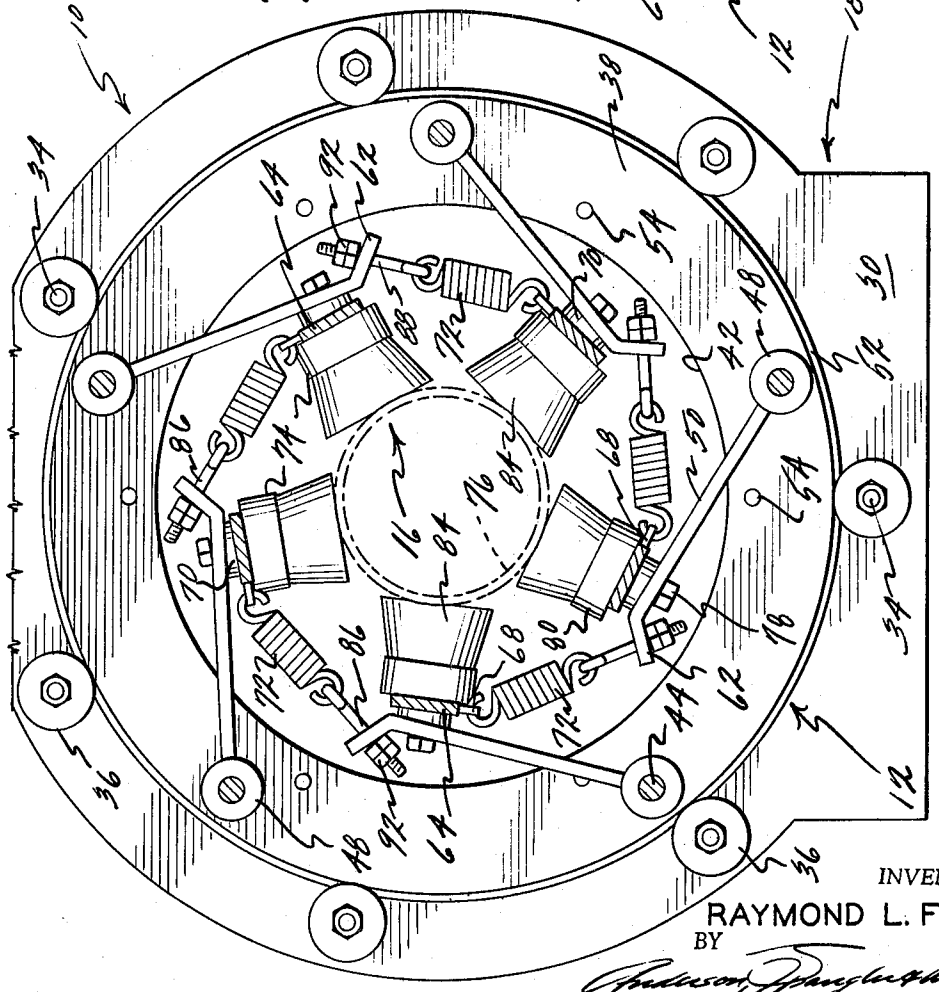


FIG. 1.

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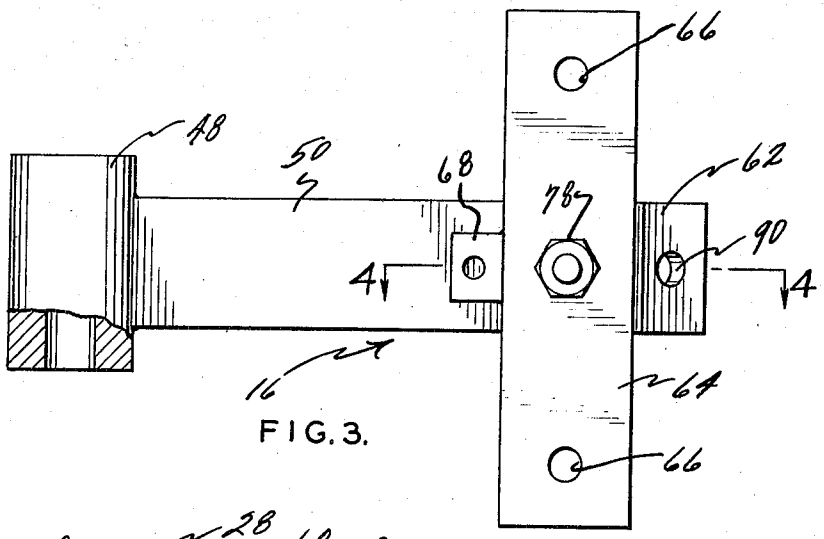


FIG. 3.

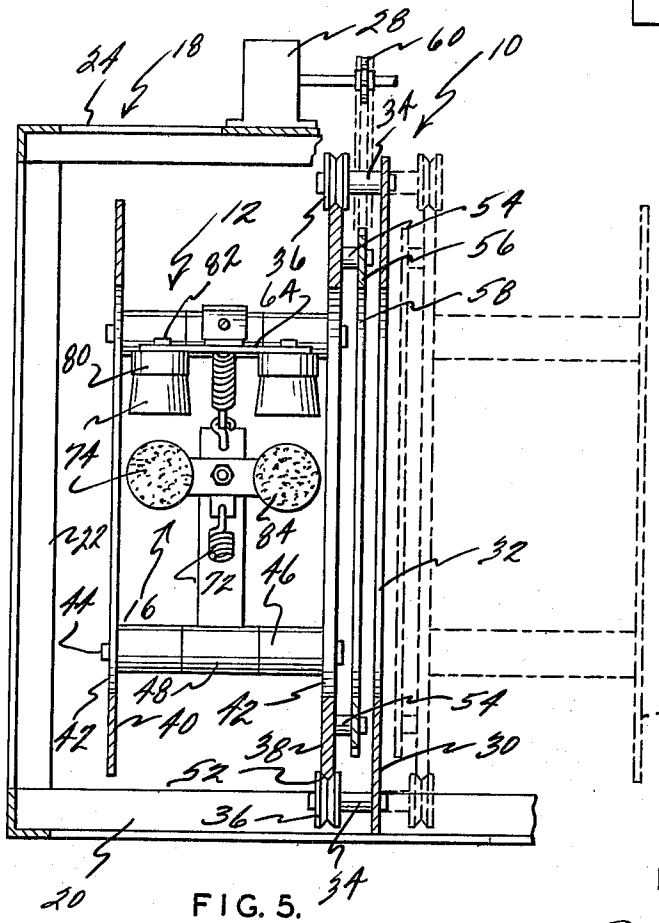


FIG. 5.

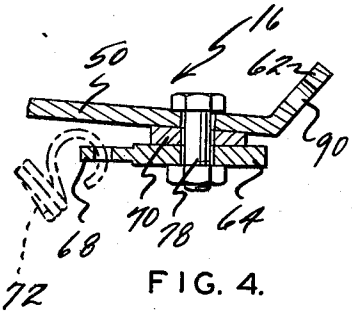


FIG. 4.

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ROTATING HEAD SUBASSEMBLY FOR PIPE CLEANING MACHINES

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Int. Cl. B08b 1/00
U.S. Cl. 15—88 10 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to an improved rotating head subassembly for use in self-propelled machines for cleaning the outside surface of large-diameter pipe. More particularly, said improvement relates to the improved brush-mounting and biasing mechanism wherein the brushes are mounted on rocker arms pivotally attached to the cleaning heads and pulled into contact with the exterior surface of the pipe by a novel system of tension springs and adjustable connectors that link the brushes and their arms together into a closed ring.

The exterior surface of large-diameter pipe, say 20–44 inches in diameter, is usually cleaned very thoroughly prior to being primed and laid in the trench. The cleaning machines for this purpose comprise large boom-drawn frames having heavy-duty gasoline or diesel engines mounted atop thereof that turn at least two hollow circular cleaning heads located therebeneath in opposite directions. Simple chain-and-sprocket type power transfer mechanisms connect the engine to the heads through a conventional speed reducer.

A pair of similar reducers take power from the engine and feed it through conventional power transfer mechanisms to two sets of frusto-conical friction wheels mounted to ride atop the pipe on opposite ends of the machine. These friction wheel sets are so located that they support the machine on the pipe and keep the rotating heads in essentially coaxial relation thereto. The prime purpose of these wheel sets is, of course, to propel the machine along the pipe while the counterrotating heads are buffing same. The frictional contact between the sixty or so wire brushes biased tightly against the surface of the pipe while being rotated relative thereto is such that a side-boom tractor running alongside the pipe and connected to the overhead forwardly-extending drawbar of the cleaning machine is customarily used to assist in pulling same and also to keep it upright.

The cleaning heads are simple, yet ingenious, as they consist of two or more coaxial metal rings arranged in longitudinally-spaced parallel relation to one another, in which position they are held by a plurality of angularly-spaced connectors and axles that parallel one another and the common axis of the rings in fixed-spaced radial relation to the latter. One of these rings carries sprocket teeth on its circumferential margin and thus functions as the drive gear for the head. Another of said rings has its peripheral edge shaped to ride within the grooved rollers of a circular pattern of trunnions mounted on one side of a non-rotatable ring forming a part of the frame.

All of the above-described structure is common to most, if not all, of the prior art-self-propelled traveling pipe cleaning machines of the type used on large-diameter pipe as are the wire brushes that buff the surface of the pipe and actually clean same; however, the mountings for the brushes and the means for biasing them into frictional contact with the surface to be cleaned are not alike and it is the latter improvement to which the present invention is directed. In the prior art machines of this type, each wire brush was mounted at the free end of one

leg of a rocker arm pivoted for movement about an axis intermediate its ends on an axle paralleling the common axes of the machine and pipe in radially-spaced parallel relation thereto. The other leg of the rocker arm had a hole through its free end which received a guide pin that reciprocated therein. This guide pin was loosely fastened to the shaft of one of the adjacent sets of brushes and a compression spring mounted thereon was supposed to bias the rocker arm and brush associated therewith against the outer surface of the pipe.

For all practical purposes, each brush was independent of all the others even though, in some designs, the guide pin was fastened to a clevis carried by a preceding rocker arm in a circular chain thereof. In other words, even though, strictly speaking, there was a mechanical connection linking several of the brushes together in a ring, such connection was so designed and located that each brush of the chain could move substantially independently of the others. Now, this would ordinarily be a worthwhile feature; however, in pipe cleaning machines, this is not the case. Probably the major difficulty arises in going around a bend. The design of the prior art machine is such that the outside of the bend is buffed bright and clean while the inside is barely touched at all by the brushes. This, of course, is a most undesirable feature because the inside of the bend must either be left dirty, in which case the primer is likely to not adhere thereto, or some other means must be employed to clean this area, such as buffing it with a hand tool.

It has now been found in accordance with the teaching of the instant invention that the above-mentioned shortcoming of the prior art pipe cleaning machines, along with several others, can be completely eliminated by the simple, but unobvious, expedient of mounting the brushes in a novel interlocking circular chain such that a movement of any one brush brings about a compensating reaction in all of the other brushes of the same chain. More specifically, when cleaning a bend, the very action of the brushes on the outside of the curve being forced outward radially causes the brushes on the inside to be pulled in tightly against the shorter radius of curvature.

The brush-carrying arms are much simpler and less expensive than the prior art rocker arms and, in addition, they mount on the shaft at one end rather than intermediate the ends. The guide pins are done away with altogether as are the compression springs. Instead, simple double-hook tension springs and adjustable eyebolt subassemblies replace the latter and form operative couplings interconnecting the free end of one brush-carrying arm with the brush of the unit in front thereof until all are linked together in an uninterrupted chain thereof. The resulting assembly is much less complicated, cheaper and easier to service, in addition to its being a great deal better for the purpose of performing its intended function.

It is, therefore, the principal object of the present invention to provide a novel and improved cleaning machine for buffing the outside surface of large-diameter pipe.

A second objective of the invention herein disclosed and claimed is to provide apparatus of the character described that functions to clean the inside of a bend just as well as the outside.

Another object is to provide a brush-biasing subassembly for pipe cleaning machines wherein several brushes are operatively interlinked into a continuous chain thereof.

Still another objective of the invention herein disclosed and claimed is to provide a chain of pipe-buffing wire brushes in a pipe cleaning machine wherein movement of any one brush in the chain brings about a compensatory movement in all the other brushes linked thereto.

An additional object is to provide a brush subassembly of the type aforementioned which is adjustable to accom-

modate pipe of different diameters or to vary the buffing pressure exerted by the brushes on pipe of the same size.

A further object is to provide a brush-mounting and linking assembly for pipe cleaning machines that is simple, rugged, easy to install, less expensive than the prior art assemblies for the same purpose, more versatile, readily adaptable for use on existing pipe cleaning machines, and one that requires less power because of its more uniform brush loading.

Other objects will be in part apparent and in part pointed out specifically hereinafter in connection with the description of the drawings that follows, and in which:

FIGURE 1 is a section taken along line 1—1 of FIGURE 2 showing a self-propelled traveling pipe-cleaning machine equipped with the novel interconnecting brush mountings of the present invention, portions of the stationary frame carrying the rotating head having been broken off due to insufficient space;

FIGURE 2 is a fragmentary side elevation of the apparatus of FIGURE 1, portions thereof having been broken away and shown in section to better reveal the interior construction;

FIGURE 3 is a considerably enlarged detail showing a top plan view of the pivoted brush-mounting arm, portions of the sleeve on one end thereof having been broken away and shown in section to better reveal the internal construction;

FIGURE 4 is a fragmentary section taken along line 4—4 of FIGURE 3; and,

FIGURE 5 is a fragmentary side elevation similar to FIGURE 2, although to a slightly reduced scale, showing the basic elements of the drive for the rotating heads and the friction rollers used to move the machine along the pipe.

Referring now to the drawings for a detailed description of the present invention and, initially, to FIGURES 1 and 2 for this purpose, reference numeral **10** has been selected to refer to the self-propelled traveling pipe-cleaning machine in its entirety, while reference numeral **12** similarly designates the rotating cleaning heads thereof. Each of these heads, there being a minimum of two per machine, mount a plurality of brush subassemblies that have been referred to broadly by reference numeral **16** and which comprise the improvement to which the present invention is directed. However, before going into a detailed description of this novel brush-mounting arrangement, it would be better to first explain the general construction and operation of the machine upon which these brushes are mounted, and this can best be accomplished in connection with FIGURE 5, to which reference will now be made.

The particular style of machine illustrated is one having an open, generally box-like frame designated broadly by numeral **18** and which includes a base **20**, uprights **22** at the corners of the base, and an elevated horizontal platform **24** that carries the main prime mover (not shown) which takes the form of a large internal combustion engine. Platform **24** also supports the speed reducers, one of which has been shown and identified by reference numeral **28**. There are generally four such speed reducers connected to the main engine, two of which drive the cleaning heads **12** in opposite directions while the other two power the friction rollers (not shown) that ride atop the pipe being cleaned and propel the machine therealong.

Next, with reference to FIGURES 1, 2 and 5, it will be seen that a stationary partition wall **30** forms a part of the frame **18** and extends vertically from the base **20** to the underside of platform **24** between uprights **22**. This partition wall has a large-diameter circular opening **32** therein and it also carries a plurality of stubshafts **34** arranged in equiangularly-spaced relation around said opening that project perpendicularly from both faces thereof. These stubshafts carry grooved rollers **36** journaled for rotation on both ends. It is these rollers that

journal the heads for rotation on opposite sides of the partition.

The heads **12** each include inner and outer circular plates **28** and **40**, respectively, that each contain large circular openings **42** of essentially the same diameter as opening **32** in the partition wall and which are axially aligned therewith. The plates **38** and **40** are maintained in fixed-spaced parallel relation to one another by a plurality of rods **44** carrying spacers **46** on the ends thereof and the sleeve **48** of brush-carrying arm **50** therebetween. The inner disk or plate **38** has its circumferential margin **52** tapered to produce a V-shaped edge compatible with the grooves in rollers **36**.

The inside face of inner plate **38** carries several mounting posts **54** that mount a large-diameter head-drive sprocket **56** which also has a central pipe-receiving opening **58** therethrough axially aligned with the like openings in the plates and partition. This sprocket is operatively connected in driving relation to sprocket **60** of the reducer **28** mounted atop the platform. A similar reducer (not shown) is connected to the other of the two heads (broken lines in FIGURE 5) so as to turn same in the opposite direction. Other types of rotating heads forming no part of the present invention may, of course, be added to the unit such as, for example, spray heads and the like. As illustrated, however, the unit includes only two counter-rotating brush-carrying heads.

The attention is now directed to all five figures of the drawing for a detailed description of the brush subassemblies **16**. As previously mentioned, sleeves **48** on the outer ends of brush-carrying arms **50** are mounted upon rods **44** for pivotal movement relative thereto and are maintained more or less centered halfway between the inner and outer plates of the head by tubular spacers **46**. Arms **50**, in the particular form shown, comprise nothing more than elongate pieces of relatively heavy-gauge strap iron or the like having one end welded to sleeve **48** in perpendicular relation to the axis of pivotal movement of said brush subassembly. The free ends of these arms are bent up slightly to form a dogleg **62**. Adjacent dogleg **62** on the main portion of arm **50** is bolted or otherwise attached a crossbar **64** projecting laterally therefrom on both sides as shown most clearly in FIGURE 3. Brush-mounting apertures **66** are provided in both extremities of this crossbar. Centered intermediate the ends of crossbar **64** is an apertured ear **68** depending from the rear edge thereof, i.e. the edge adjacent sleeve **48**.

Now, as illustrated herein, a wedge-shaped spacer **70** is interposed between the crossbar **64** and arm **50** for the purpose of holding the apertured ear **68** in spaced relation to the latter so that the tension spring **72** can be fastened thereto and also to place the axes of the substantially right frusto-conical brushes **74** in essentially radial relation to the pipe being cleaned, the latter having been shown in broken lines in FIGURE 1 and identified by numeral **76**. Ordinary bolt-type fasteners **78** hold the wedge-shaped spacers **70**, crossbars **64** and arms **50** in assembled relation.

Brushes **74** are conventional and comprise a cup-shaped bristle-holder **80** having a centrally-located mounting stud **82** projecting therefrom, and a bundle of wire bristles **84** securely attached within said bristle-holder. Mounting stud **82** is fastened within the apertures **66** provided for this purpose in the extremities of the crossbar. Thus, in the particular form shown, each brush subassembly includes two brushes and is, therefore, simpler and less expensive than the prior art units which mount only one brush per rocker arm. Note here that a third brush could, if desired, be added to the subassembly between the two shown in place of fastener **78**. Also, in units where the spacing between the inner and outer plates of the head is greater, two or more brush subassemblies could be mounted side-by-side on the same rod **44** for independent pivotal movement.

Now, the most important feature of the unit is the means by which all of the several pivoted arm subassemblies in a given ring thereof are operatively linked together in a continuous chain and, at the same time, adjustably biased inwardly against the pipe. The foregoing is accomplished by a close-wound helical tension spring **72** having integrally-formed hooks at opposite ends thereof and an eyebolt **86** linked to the spring in end-to-end relation, the latter subassembly being connected between the dogleg portion **62** of one arm and the rearwardly extending crossbar ear **68** of the arm immediately ahead thereof. One hooked end of each tension spring fastens into the apertured ear **68** of each crossbar while the other end similarly attaches to the eye of eyebolt **86**. The threaded stem **88** of the eyebolt, on the other hand, passes through the aperture **90** in the dogleg portion of the arm where it is adjustably fastened by double-nut assembly **92**.

In the particular form shown in FIGURE 1, the pipe **76** is about the smallest diameter that can be handled by the machine as the tension springs have been illustrated as almost completely relaxed and the adjustable eyebolts are screwed all the way into the lock-nuts **92**. Obviously, any larger diameter pipe will cause the springs to stretch and the tension developed therein holds the brushes in tight frictional engagement with the pipe surface. If the pipe is close to the maximum diameter capable of being handled by the machine, the frictional resistance may be such that the heads become difficult to turn and, if so, the spring-eyebolt subassemblies can be lengthened to lessen the resistance. Note that the latter subassembly always lies inside the axis of pivotal movement of the adjacent arm so as to prevent said arm from ever swinging out so far as to reach a tangent position. In so doing, the pull exerted thereon by the spring-eyebolt subassembly connected thereto is such as to always bias the brush in against the pipe to some degree.

It is quite important to note that all of the brushes in the chain respond to a significant degree because of their operatively interlinked relation whenever the pipe tends to be displaced from its coaxial relation to the head such as normally occurs when going around a bend. Assume in FIGURE 1, for example, that the pipe bends to the right. When the head reaches such a bend, the pipe will be displaced to the left causing the single brush on the outside of the curve to move farther to the left also. As it does so, however, the brushes engaging the top and bottom of the pipe which are directly linked to the one on the left will move so as to pull the brushes on the right to the left against the inside of the curve. Thus, displacement of any one of the brushes of the chain produces a compensating motion in all of the others so as to hold all in frictional contact with a cylindrical surface passing therethrough.

What is claimed is:

1. In the rotatable hollow cylindrical buffing heads of the type used in self-propelled pipe-cleaning machines, the improved brush subassemblies which comprise: at least three elongate rigid arms connected at one end within the head for essentially coplanar pivotal movement above axes paralleling one another in substantially equiangularly-spaced relation at a uniform radial distance from the axis of head rotation, at least one brush connected to each arm adjacent the free end thereof in position to engage

and buff the outside surface of a pipe passed therebetween, and biasing means including a tension spring connected between the free end of each arm and the arm immediately ahead thereof at a point remote from its pivot so as to define a continuous chain thereof normally biasing the brushes inwardly.

2. The improved brush subassembly as set forth in claim **1** in which: a crossbar is attached to each arm adjacent the free end thereof so as to project laterally therefrom on both sides in spaced substantially parallel relation to its axis of pivotal movement, and in which at least two brushes are mounted on each arm, one on each end of said crossbar.

3. The improved brush subassembly as set forth in claim **1** in which: the straight line interconnecting the points of attachment of the biasing means and adjacent arm always passes inside the axis of pivotal movement of the lead arm of said pair.

4. The improved brush subassembly as set forth in claim **1** in which: the biasing means also includes an adjustable rigid connector adjustably connected to one of the arms and interposed between it and the tension spring.

5. The improved brush subassembly as set forth in claim **1** in which: the free end of each arm is outturned to form a dogleg, and in which the biasing means is connected to the trailing arm of any adjacent pair thereof at said dogleg.

6. The improved brush subassembly as set forth in claim **1** in which: the brushes bear an obtuse angular relation to their respective supporting arms, said obtuse angle being selected such that an area including the center of each brush lies in essentially tangent relation to the cylindrical surface being cleaned when the arm supporting said brush occupies an acute angular relation to a radial line passing through its axis of pivotal movement.

7. The improved brush subassembly as set forth in claim **1** in which: the biasing means lies essentially normal to the plane defined by the axis of head rotation and the axis of pivotal movement of the lead arm of the pair interconnected by said biasing means.

8. The improved brush subassembly as set forth in claim **3** in which: the point of attachment of the biasing means with the head brush of an adjacent pair thereof always lies a lesser radial distance from the axis of head rotation than the axis of pivotal movement of said lead arm.

9. The improved brush subassembly as set forth in claim **4** in which: the adjustable rigid connector comprises an eyebolt.

10. The improved brush subassembly as set forth in claim **4** in which: the free end of each arm is outturned to form a dogleg, and in which the adjustable rigid connector of the biasing means is connected to the trailing arm of any adjacent pair thereof at said dogleg.

References Cited

UNITED STATES PATENTS

1,611,920	12/1926	Kinzbach.	
2,299,523	10/1942	Carpmail	15—104.04
2,899,994	8/1959	Yeadon et al.	144—208.5

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