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Anthem et al.

[11] **3,916,469**

[45] **Nov. 4, 1975**

[54] **FLOATING SELF-CENTERING CLEANING CYLINDER HEAD**

[76] Inventors: **Clyde W. Anthem; Theodore A. Anthem,** both of Box 1443, Liberal, Kans. 67901

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[52] **U.S. Cl.** ..... **15/88;** 15/104.04; 51/241 B; 144/208 E

[51] **Int. Cl.**[2] **B08B 9/02**

[58] **Field of Search** ..... 15/88, 104.04, 21 D, 21 B; 51/43, 90, 120, 241 B, 241 S; 118/72, DIG. 2; 144/208 E; 29/81 H

[56] **References Cited**

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Primary Examiner—Edward L. Roberts
Attorney, Agent, or Firm—Clarence A. O'Brien; Harvey B. Jacobson

[57] **ABSTRACT**

A floating self-centering head subassembly for rotational pipe and tube cleaning heads has a plurality of units, each unit including an arm mounted on a support portion of an associated head. A movement arm rotatably mounted on the retaining arm itself rotatably mounts a floating self-centering arm. Brushes provided on the arm are caused to seek the surface of a pipe or tube to be cleaned by a spring system associated with the self-centering arm.

16 Claims, 8 Drawing Figures

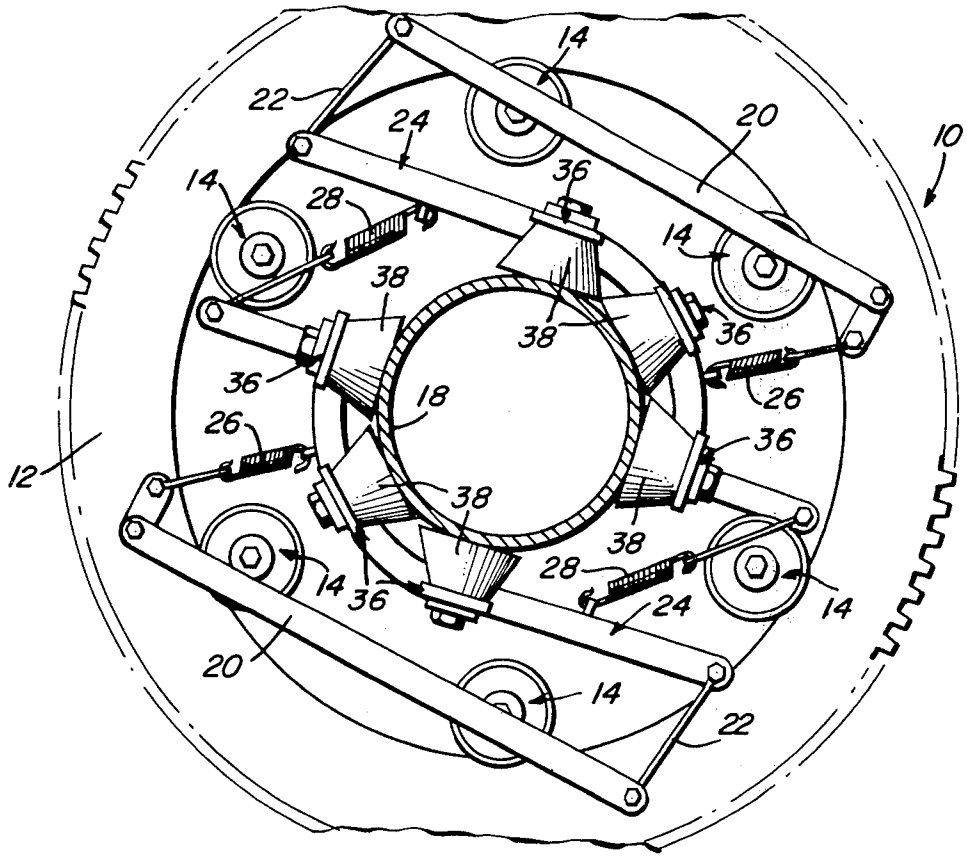


Fig. 1

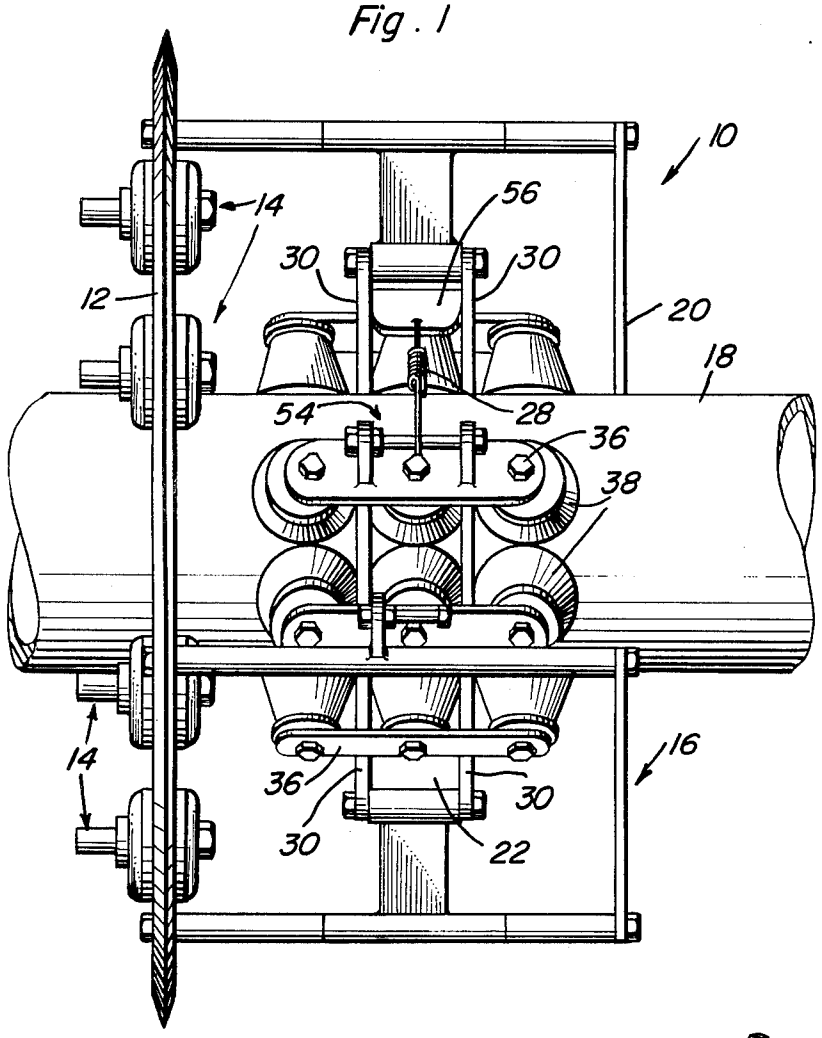

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Fig. 4

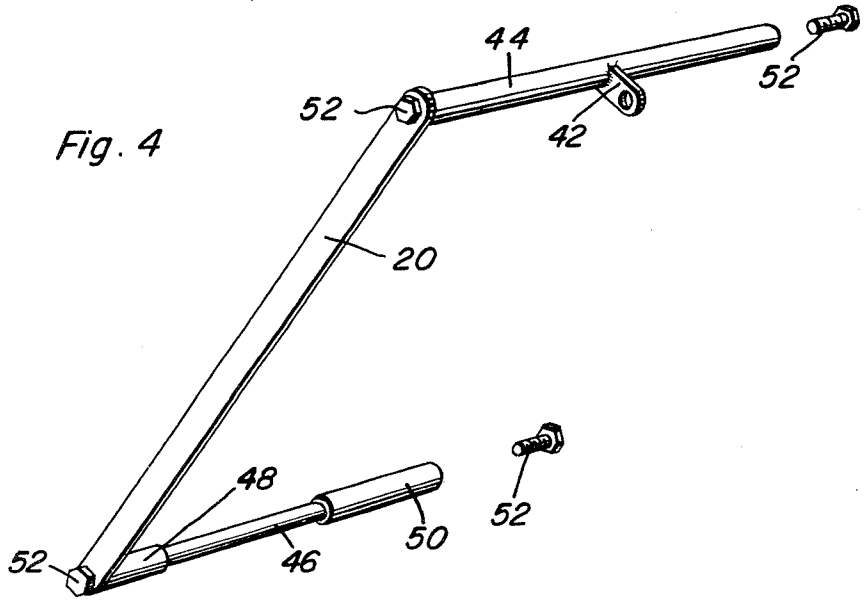

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Fig. 2

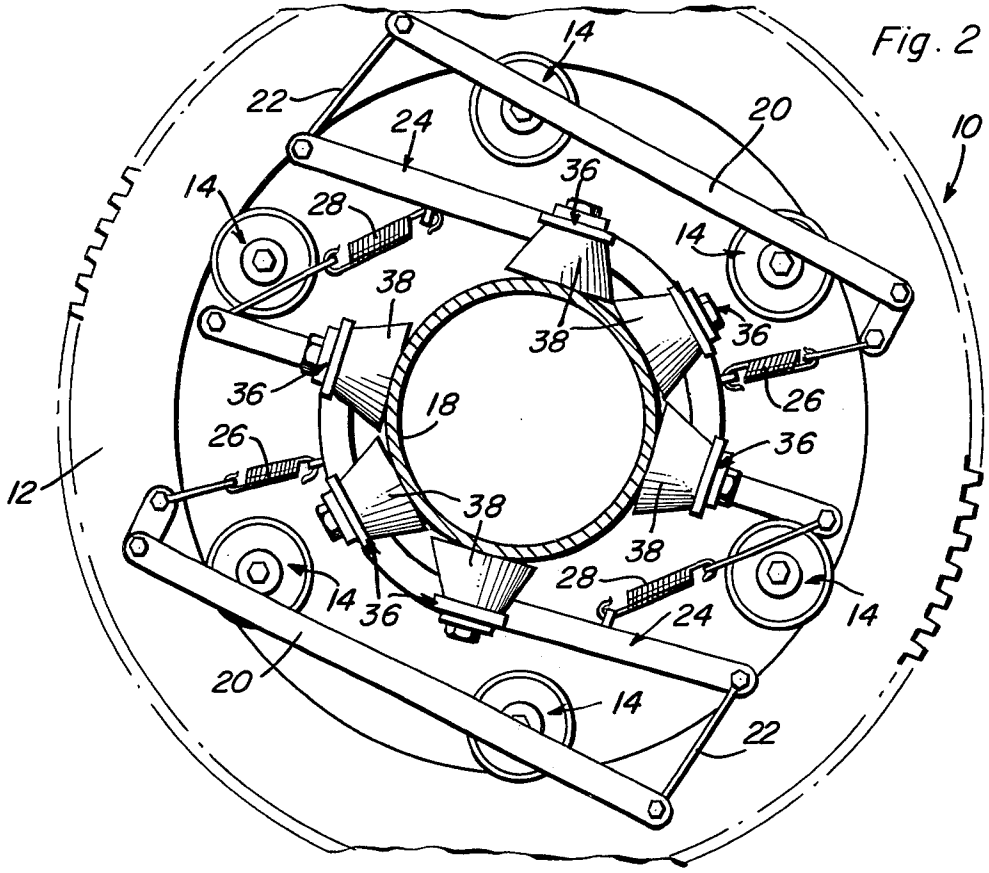

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Fig. 3

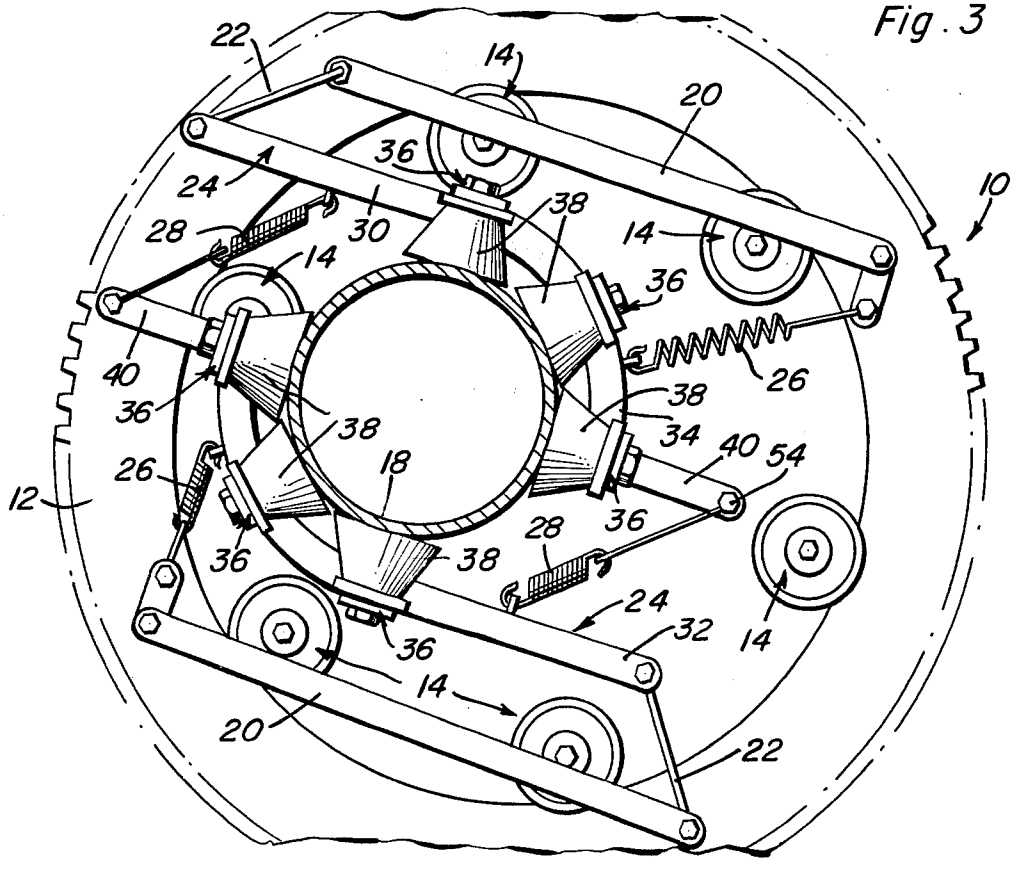

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Fig. 5

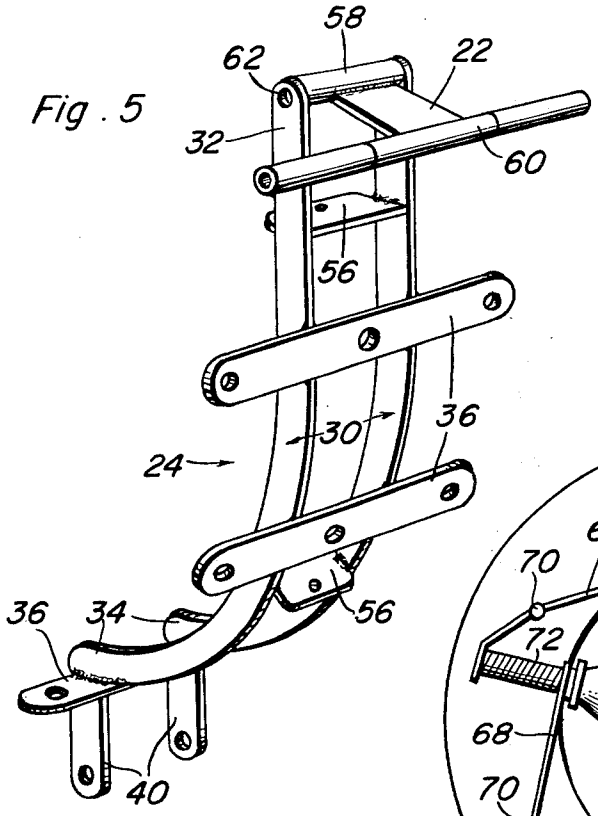


Fig. 6

PRIOR ART

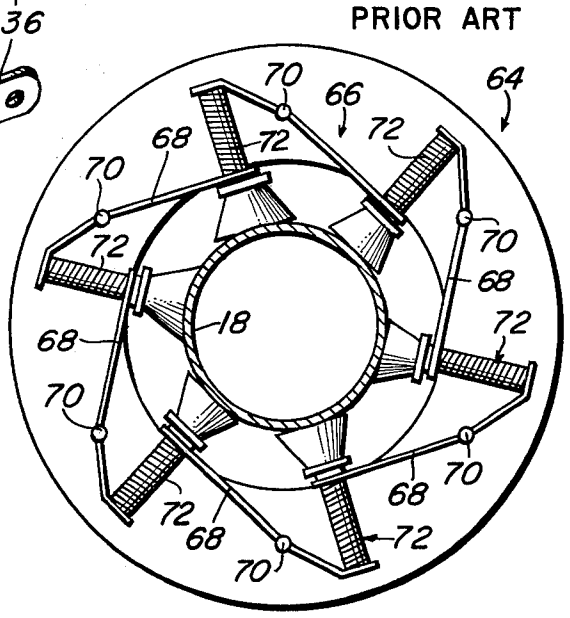


Fig. 7

PRIOR ART

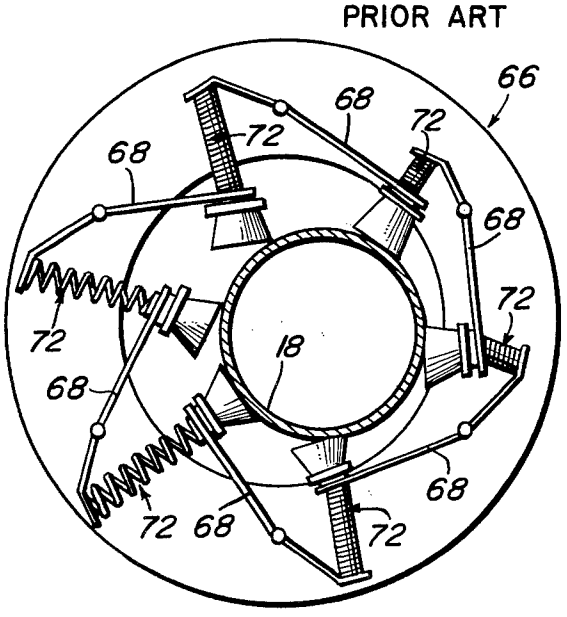
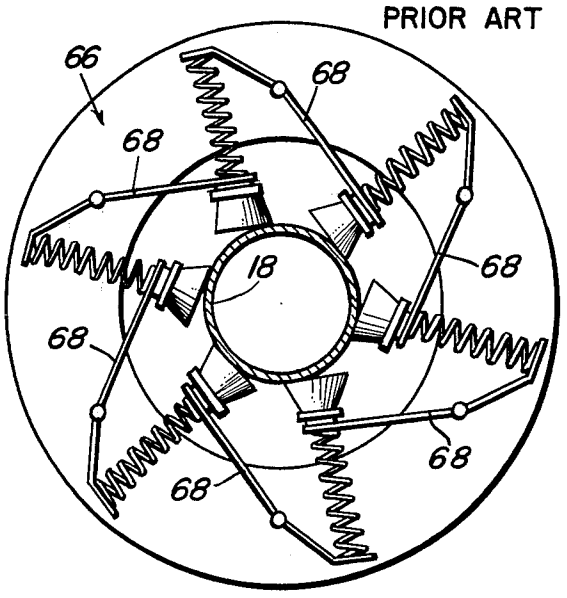


Fig. 8

PRIOR ART



FLOATING SELF-CENTERING CLEANING CYLINDER HEAD

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to rotational cleaning heads, and particularly to a floating self-centering subassembly for rotational cleaning heads.

2. Description of the Prior Art

External pipe cleaning machines have been utilized in the pipe line industry for over two decades, and these cleaning machines, or cleaning heads, are basically unchanged since the pioneer machines. These cleaning heads generally include a gear wheel to which is mounted a subassembly including cleaning brush holders operating through a fixed arc resulting from a fixed pivot point of arms associated with the brush holders. These known cleaning head subassemblies depend on springs to maintain the brushes in physical contact with a pipe.

The concept of a pipe or tube cleaning machine will not be discussed herein as these basic machines have been proven, field tested, and represent perhaps the best method or ideal of operably carrying rotational cleaning head subassemblies.

Rotating head subassemblies are shown in, for example, U.S. Pat. Nos. **3,495,288,** issued Feb. **17, 1970** to R. L. Ford; **2,299,523,** issued Oct. **20, 1942** to A. B. Carpmail; and **1,611,920,** issued Dec. **28, 1926** to F. Kinzbach. These known rotating head subassemblies generally employ conventional or individual pivot arm arrangements with fixed pivot points. These arrangements require the use of a plurality of cleaning machine or rotating head subassemblies to accommodate a wide range of pipe diameters. Full width brush contact with the pipe or tube to be buffed when using a fixed pivot point arrangement is possible with only one pipe diameter. Any deviation from that particular diameter realizes less than full width contact of the brush surface on the pipe.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a cleaning head subassembly which will seek the surface of a pipe or tube whose diameter falls within a wide range of diameters.

It is another object of the present invention to provide a floating self-centering head subassembly which may be used with conventional pipe or tube cleaning machines and cleaning heads.

These and other objects are achieved by providing a floating self-centering head subassembly for rotational pipe and tube cleaning heads which has: a retaining arm mounted on a support portion of a cleaning head; a movement arm rotatably mounted on the retaining arm; a floating self-centering arm rotatably mounted on the movement arm at a point thereon spaced from the retaining arm; and a spring arrangement connected to the self-centering arm for pulling same toward an article to be cleaned.

The floating self-centering arm preferably includes a longitudinal, curved, rotating arm having longitudinally spaced ends and rotatably mounted on the movement arm at one of the ends. At least one brush holder is connected to the rotating arm on an outermost arc of same, while a pull arm is affixed to the other of the ends of the rotating arm. This pull arm is arranged for connection to the spring arrangement.

The spring arrangement advantageously includes a pair of tension springs. A weaker of the springs is connected to the rotating arm adjacent the one of the ends, and a stronger of the springs is connected to the pull arm of the associated rotating arm.

It is to be understood that the retaining arm, movement arm, and selfcentering arm cooperate with a spring arrangement to form a unit. The subassembly includes at least two of these units cooperatively arranged surrounding a portion of an article to be cleaned.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary, elevational view showing a pipe being cleaned by a cleaning head provided with a self-centering head subassembly according to the present invention.

FIG. **2** is a fragmentary, partly schematic, sectional view taken generally along the line **2—2** of FIG. **1.**

FIG. **3** is a fragmentary, partly schematic, sectional view similar to FIG. **2,** but showing a changed relationship of various elements of the cleaning head subassembly.

FIG. **4** is an exploded perspective view showing certain elements of a self-centering cleaning head according to the persent invention.

FIG. **5** is a perspective view showing a portion of a self-centering cleaning head subassembly according to the present invention.

FIGS. **6** through **8** are partly schematic, sectional views showing, for purposes of comparison, a cleaning head subassembly having arms which pivot about a fixed point in the manner of prior art devices.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. **1** to **3** of the drawings show an external pipe cleaning head **10** provided with a gear wheel **12** on which a plurality of brush mounting subassemblies may be selectively arranged. Gear wheel **12** is of a conventional design, all manufacturers of cleaning machines use one form or another of such a gear wheel, and is supported by a plurality of conventional idlers **14.** A subassembly **16** according to the present invention is illustrated as mounted on wheel **12** so as to surround the periphery of a portion of a pipe **18** to be cleaned.

Subassembly **16** is formed by a plurality of essentially identical units mounted on gear wheel **12** so as to cooperatively surround pipe **18.** Each of these units includes a retaining arm **20** mounted directly on gear wheel **12,** a movement arm **22** rotatably mounted on retaining arm **20,** and a floating self-centering arm **24** rotatably mounted on movement arm **22** at a point thereon spaced from retaining arm **20.** An arrangement including a pair of springs **26** and **28** pulls self-centering arm **24** away from retaining arm **20** and toward pipe **18.** Springs **26** and **28** are advantageously the conventional coiled tension springs illustrated in the drawings. By making springs **26** weaker than spring **28,** the spring ar-

rangement will normally bias self-centering arm **24** toward pipe **18,** but will assist the surface of pipe **18** in withdrawing arm **24** when the surface of pipe **18** moves closer to retaining arm **20.** It has been found satisfactory if spring **28** is, for example, twice as strong as spring **26.**

Self-centering arm **24** includes a pair of longitudinal, curved, rotating arms **30** arranged in parallel relationship and having lonitudinally spaced ends **32** and **34.** Arms **30** are rotatably mounted on movement arm **22** at ends **32** thereof. At least one brush holder **36** is connected to rotating arms **30** on an outermost arc of same for receiving brushes **38.** In the illustrated embodiment, three brush holders **36** are provided, with three brushes **38** mounted on each holder **36.** It is to be understood, however, that the number of brush holders and brushes may vary as desired. Brushes **38** are of a conventional cup design, and are attached to holders **36** in a conventional manner, such as by the illustrated bolts. A pair of pull arms **40** are attached in a suitable manner, such as by welding, to a brush holder **36** itself welded, and the like, to the outermost ends of arms **30.** The purpose of pull arms **40** will become apparent below.

Referring now to FIG. **4** of the drawings, a spring holder **42,** which is also the location of a centering spring tension adjustment bolt, is attached as by welding to a cylindrical support arm **44** in a perpendicular position relative thereto slightly off-center of support arm **44.** A second support arm **46** has two spacers **48** and **50** to retain movement arm **22** in position. Both support arms **44** and **46** are drilled and tapped, and the like, to accept a, for example, cap screw **52** at each end. One screw **52** bolts support arms **44** and **46** to gear wheel **12** and other cap screws **52** to bolt the other ends of support arms **44** and **46** to the stabilizing rod or retaining arm **20.** As can be readily seen from FIG. **4,** support arms **44, 46** are arranged at spaced ends of retaining arm **20.**

Brush holders **36** are, for example, welded to rotating arms **30** on the outermost arc of same in a perpendicular direction to the direction of rotation of rotating arms and in a tangential position on rotating arms **30.** Pull arms **40** also may be welded perpendicularly to the outside surface of the brush holders **36** associated with arms **40,** and at the tip of the arc at the same distance apart as the rotating arms **30.** A pull spring tension adjustment bolt **54** is located on pull arms **40** so as to adjust the tension of spring **28,** one eye of which is connected to pull arms **40** by bolt **54.** Spring holders **56,** of which two are illustrated, are welded, and the like, between the two rotating arms **30** in different locations. One holder **56** is located between the tip brush holders **36** and the next adjacent brush holders **36,** and the other holder **56** is arranged between the end of the straight portion of the rotating arms **30** and the first brush holder **36.** FIG. **5** also shows the construction of movement arm **22,** which advantageously is fabricated from two cylinders **58** and **60.** Cylinder **60** is longer and of a larger size than cylinder **58,** and fits over support arm **46** between spacers **48** and **50.** The smaller and shorter cylinder **58** fits between the two rotating arms **30,** and is fastened thereto by means of a conventional bolt or pin **62.** Cylinders **58** and **60** are connected as by welding to a, for example, metal strap forming movement arm **22** at the mid-points of the two cylinders. Each cylinder **58, 60** is arranged parallel to the other cylinder **60, 58.**

As mentioned above, the present design criteria for rotating head subassemblies for pipe or tube cleaning machines are all based on a fixed pivot or rotational pivot point for the brush arm to maintain cleaning brush contact with the pipe or tube being buffed. As the pipe or tube is displaced from center because of pipe bends, and the like, the brush arms maintain contact with the pipe or tube by pivoting about their pivot points. As a result, the brushes do not remain in tangential contact with the pipe or tube surface, as can be seen in FIGS. **6** and **7** of the drawings.

The floating self-centering concept according to the present invention does not depend on a fixed pivot to remain centered. The floating self-centering cleaning head will follow a pipe, within limits of the center hole of the power gear wheel **12,** irregardless of the displacement of the pipe or tube from the center of the machine. The floating self-centering concept allows the fixed cleaning brushes to remain in tangential contact with the pipe or tube surface at all times as shown in FIGS. **2** and **3** of the drawings. The tangential contact of the brushes with the pipe or tube surface is the most efficient arrangement for brush operation, as the maximum diameter of the brush is utilized with this arrangement.

The floating self-centering concept according to the present invention may be designed for a predetermined pipe diameter, but can be used on the next smaller size pipe or tube efficiently by use of spacers between the brush and brush holders. The utilization of spacers allows the full width brush surface to remain in tangential contact with the pipe or tube due to the design of the brush holder being on a radial line from the center of the pipe or tube. The construction of the floating self-centering head is such that the changing of heads from one size to another is quicker and more efficient than adjustment of tension or compression springs.

The fixed pivot prior art machines require adjustment of each individual brush and the tension or compression adjustments should be within minimal tolerances of each other so each brush will in turn so its fair share of buffing. This means four or five adjustments for the smaller rotating heads to many adjustments for the larger machines. This is difficult and time consuming field operations. The floating self-centering construction according to the present invention has one tension adjustment per arm, or two, three, or four per floating self-centering head, to provide brush rush frictional force perpendicular to the pipe and to provide uniform brush contact on the unique one-piece construction of the floating self-centering rotating cleaning head.

The construction of the fixed pivot point for the individual brush arms and springs on the prior art rotating head subassemblies create a problem when physically moving from one section of pipe to another due to the action of the brushes and springs when unrestrained by removal of the pipe from the cleaning head. The brushes on the prior art devices are all forced by the tension or compression springs thereof toward the cavity left by the pipe and difficulty arises when the machine is to be installed on the next section of pipe or tube in view of the square cut ends of the pipe or tube. A tapered pull plug (not shown) is necessary to insert the pipe or tube into the rotating cleaning machine head when the pivot arms are allowed to become unrestrained. The floating self-centering rotation head con-

struction according to the present invention relaxes the tension springs by a circular movement of the entire head when the cleaning head is removed from one section of pipe or tube, thereby eliminating collapsing together of the arms when same are unrestrained. The arms are instantly under perpendicular pressure when power is applied to rotate the cleaning head for the pipe or tube buffing.

Contrary to the present construction of the majority of known rotating and head subassemblies which allow the centrifugal force generated by the individual masses of the arms to overcome the radial tensions or compressions of the springs, whichever the case may be, and thereby lessen to a degree the effectiveness of the springs, the floating self-centering head construction according to the present invention moves in a rotational direction by rotation of the power gear restrained by a spring in a tangential direction of the pipe at the outermost point of the rotating arms. Therefore. the spring requires much less tension due to a larger movement arm to maintain brush contact at the leading end of the arm. The spring attached from the leading arm of the adjacent arm is also in a tangential direction to the pipe and is a restraining force on the opposite side of the pipe. The action of the movement arm **22** is similar to a wedge and rotation of gear wheel **12** causes the movement arm **22** to force the floating self-centering arm **24** toward the pipe **18** at the trailing end of the self-centering arm.

FIG. **8** of the drawings shows te difficulty encountered with prior art machines when same are used to clean pipe **18** having a smaller diameter than that for which the machine is designed. As can be readily seen, the brushes engage the pipe only in the periphery of the brushes, and not in the full width brush surface manner realized by the present invention. As can be readily understood from FIGS. **6** to **8** of the drawings, the prior art devices generally consist of a head **64** provided with a subassembly **66** having a plurality of individually pinned arms **68** pivotal about fixed pivot points **70.** Springs **72,** which are illustrated as compression springs, are employed to bias the brushprovided ends of arms **68.** Thus, a comparison of FIGS. **2** and **3,** and FIGS. **6** through **8,** reveals the advantages of a floating self-centering cleaning head subassembly construction according to the present invention.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. A floating self-centering head subassembly for rotational pipe and tube cleaning heads, comprising, in combination:

a. a retaining arm mountable on a support portion of a cleaning head;

b. a movement arm rotatably mounted on the retaining arm;

c. a floating self-centering arm rotatably mounted on the movement arm; and

d. biasing means for pulling the floating self-centering arm against an article to be cleaned, the floating self-centering arm including, in combination:

i. a longitudinal rotating arm having longitudinally spaced ends and rotatably mounted on the movement arm at a one of the ends;

ii. at least one brush holder connected to the rotating arm between the spaced ends of the arm; and

iii. a pull arm affixed to the other of the ends of the rotating arm and connected to the biasing means.

2. A floating self-centering head subassembly for rotational pipe and tube cleaning heads, comprising, in combination:

a. a retaining arm mountable on a support portion of a cleaning head;

b. a movement arm rotatably mounted on the retaining arm;

c. a floating self-centering arm rotatably mounted on the movement arm; and

d. biasing means for pulling the floating self-centering arm against an article to be cleaned, the floating self-centering arm including, in combination:

i. a longitudinal, curved, rotating arm having longitudinally spaced ends and rotatably mounted on the movement arm at a one of the ends;

ii. at least one brush holder connected to the rotating arm; and

iii. a pull arm affixed to the other of the ends of the rotating arm and arranged for connection to the biasing means.

3. A structure as defined in claim **2,** wherein the biasing means includes a pair of tension springs, a weaker one of the springs being connected to the rotating arm adjacent the one of the ends thereof, and a stronger one of the springs connected to the pull arm.

4. A structure as defined in claim **3,** wherein the floating self-centering head subassembly includes a plurality of units each comprising a retaining arm, movement arm, floating self-centering arm, and biasing means, the units mounted on the support portion of the head and arranged for cooperatively surrounding a portion of an article to be cleaned.

5. A structure as defined in claim **4,** wherein the stronger spring of a biasing means associated with a self-centering arm of one unit is also connected to the pull arm of the floating self-centering arm of another unit, and the weaker spring associated with the one unit is connected to the retaining arm associated with the one unit.

6. A structure as defined in claim **3,** wherein the weaker spring is also connected to the retaining arm.

7. A structure as defined in claim **2,** wherein the floating self-centering head subassembly includes a plurality of units each comprising a retaining arm, movement arm, floating self-centering arm, and biasing means, the units mounted on the support portion of the head and arranged for cooperatively surrounding a portion of an article to be cleaned.

8. A floating self-centering head subassembly for rotational pipe and tube cleaning heads, comprising, in combination:

a. a retaining arm mountable on a support portion of a cleaning head;

b. a movement arm rotatably mounted on the retaining arm;

c. a floating self-centering arm rotatably mounted on the movement arm; and

d. biasing means for pulling the floating self-centering arm against an article to be cleaned, the biasing means including a pair of springs, a weaker one of the springs being connected to the self-centering arm adjacent a point thereof where the self-centering arm is rotatably connected to the movement arm, and a stronger one of the springs being connected to an outer, free end of the self-centering arm.

9. A structure as defined in claim **8,** wherein the weaker spring is also connected to the retaining arm.

10. A structure as defined in claim **8,** wherein the floating self-centering head subassembly includes a plurality of units each comprising a retaining arm, movement arm, floating self-centering arm, and biasing means, the units mounted on the support portion of the head and arranged for cooperatively surrounding a portion of an article to be cleaned, the stronger spring of a biasing means associated with a self-centering arm of one unit also being connected to the pull arm of the floating self-centering arm of another unit, and the weaker spring associated with the one unit being connected to the retaining arm associated with the one unit.

11. In an external pipe cleaning head comprising a gear wheel and a plurality of brush mounting subassemblies mounted on the gear wheel, wherein the improvement comprises the subassembly including, in combination, a plurality of units cooperatively mounted on the gear wheel, each unit comprising:

a. a retaining arm mountable on a support portion of a cleaning head;

b. a movement arm rotatably mounted on the retaining arm;

c. a floating self-centering arm rotatably mounted on the movement arm; and

d. biasing means for pulling the floating self-centering arm against an article to be cleaned.

12. A structure as defined in claim **11,** wherein the floating self-centering arm includes, in combination:

i. a longitudinal, curved, rotating arm having longitudinally spaced ends and rotatably mounted on the movement arm at a one of the ends;

ii. at least one brush holder connected to the rotating arm; and

iii. a pull arm affixed to the other of the ends of the rotating arm and arranged for connection to the biasing means.

13. A structure as defined in claim **12,** wherein the biasing means includes a pair of tension springs, a weaker one of the springs being connected to the rotating arm adjacent the one of the ends thereof, and a stronger one of the springs connected to the pull arm.

14. A structure as defined in claim **13,** wherein the stronger spring of a biasing means associated with a self-centering arm of one unit is also connected to the pull arm of the floating self-centering arm of another unit, and the weaker spring associated with the one unit is connected to the retaining arm associated with the one unit.

15. A structure as defined in claim **11,** wherein the biasing means includes a pair of springs, a weaker one of the springs being connected to the self-centering arm adjacent a point thereof where the self-centering arm is rotatably connected to the movement arm, and a stronger one of the springs being connected to an outer, free end of the self-centering arm.

16. A structure as defined in claim **15,** wherein the weaker spring is also connected to the retaining arm.

* * * * *