

[54] **CLEANING BRUSH ASSEMBLY FOR
CLEANING CYLINDRICAL SURFACES**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 785,529, Dec. 20, 1968, abandoned.

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[51] Int. Cl. B08b 1/00

[58] Field of Search 15/21 R, 35, 77, 88, 104.04, 15/97; 74/660

[56]

References Cited

UNITED STATES PATENTS

2,237,957 4/1941 Christensen et al. 74/660 UX

2,307,449	1/1943	Carpmail	15/88
2,353,125	7/1944	Carpmail	15/88
2,427,129	9/1947	Fields	15/88
2,436,099	2/1948	Cummings et al.	15/88

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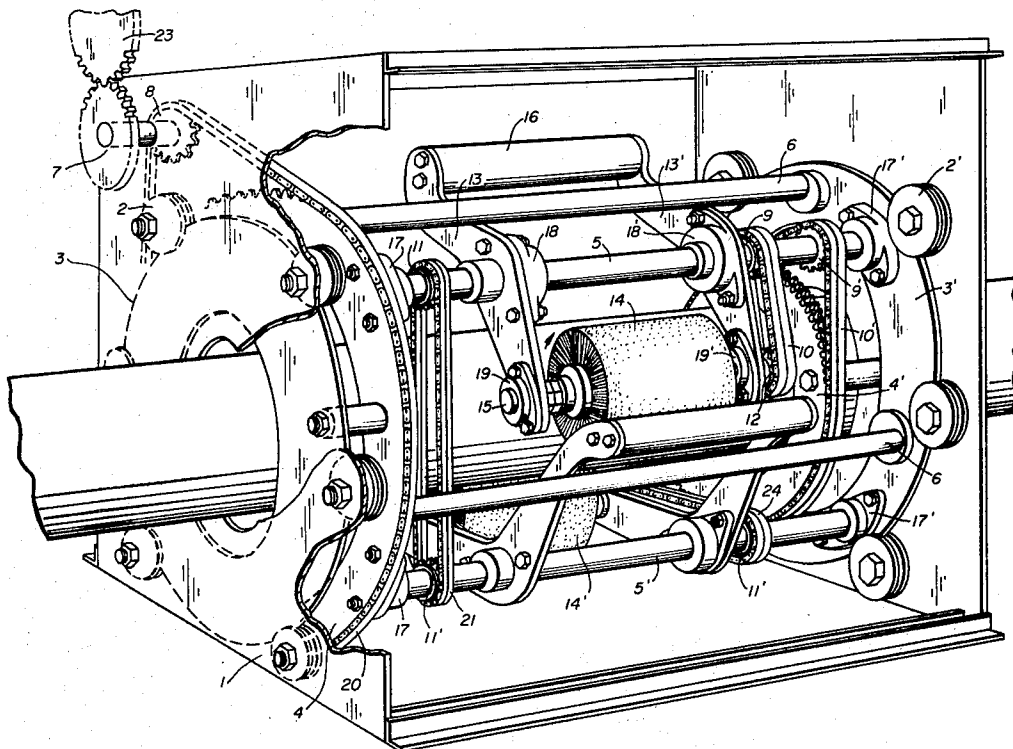
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[57]

ABSTRACT

A new and improved brush assembly for cleaning a cylindrical surface, the improvement being in the planetary system which includes in combination a chain and a large stationary sprocket mechanism attached to the body of the cleaning machine, the said chain extending over the large sprocket and a second smaller sprocket, the second sprocket in the planetary system being the power transmitting means to a system of cleaning brushes for cleaning cylindrical surfaces.

3 Claims, 3 Drawing Figures



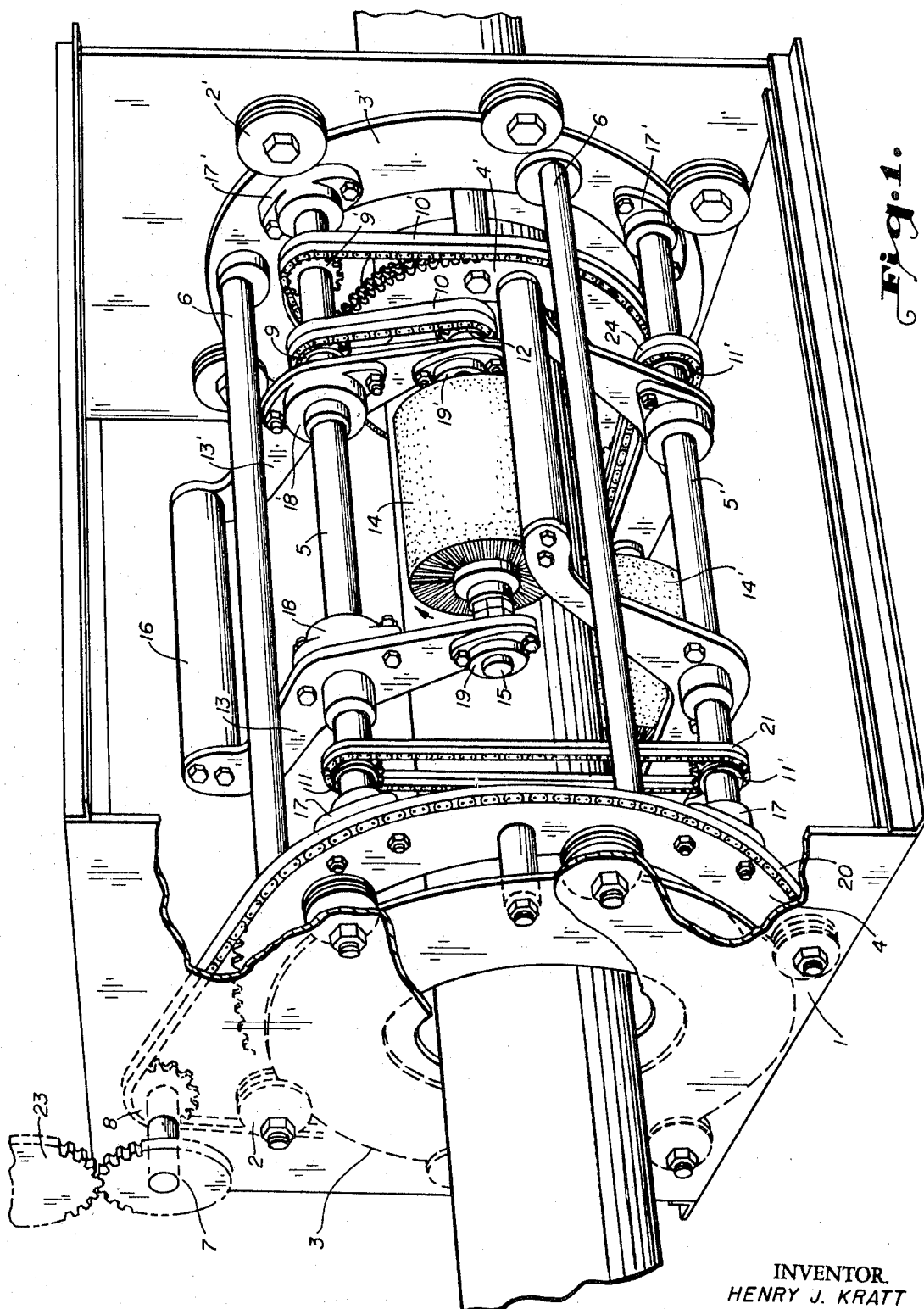


Fig. 1.

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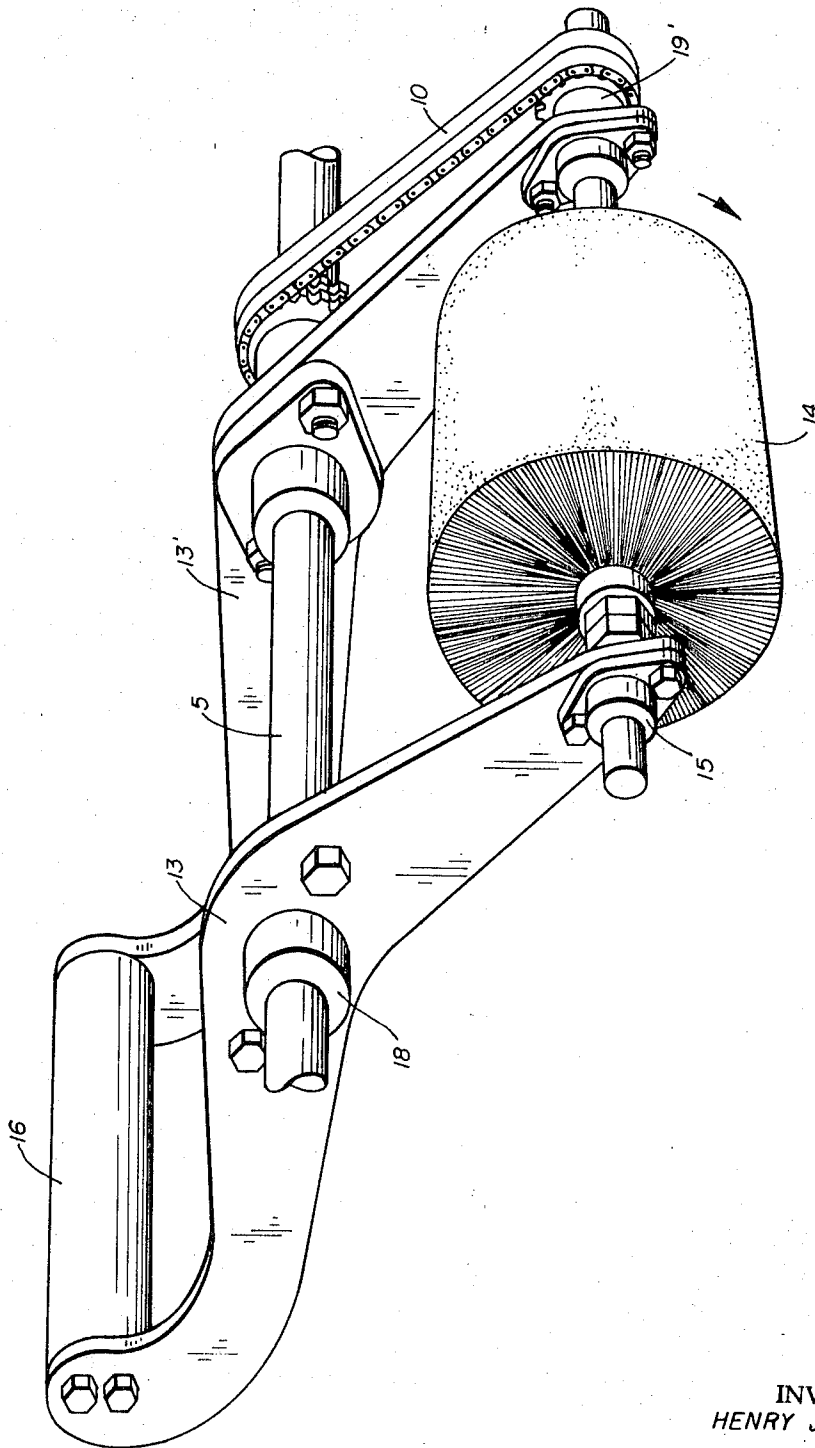


Fig. 2.

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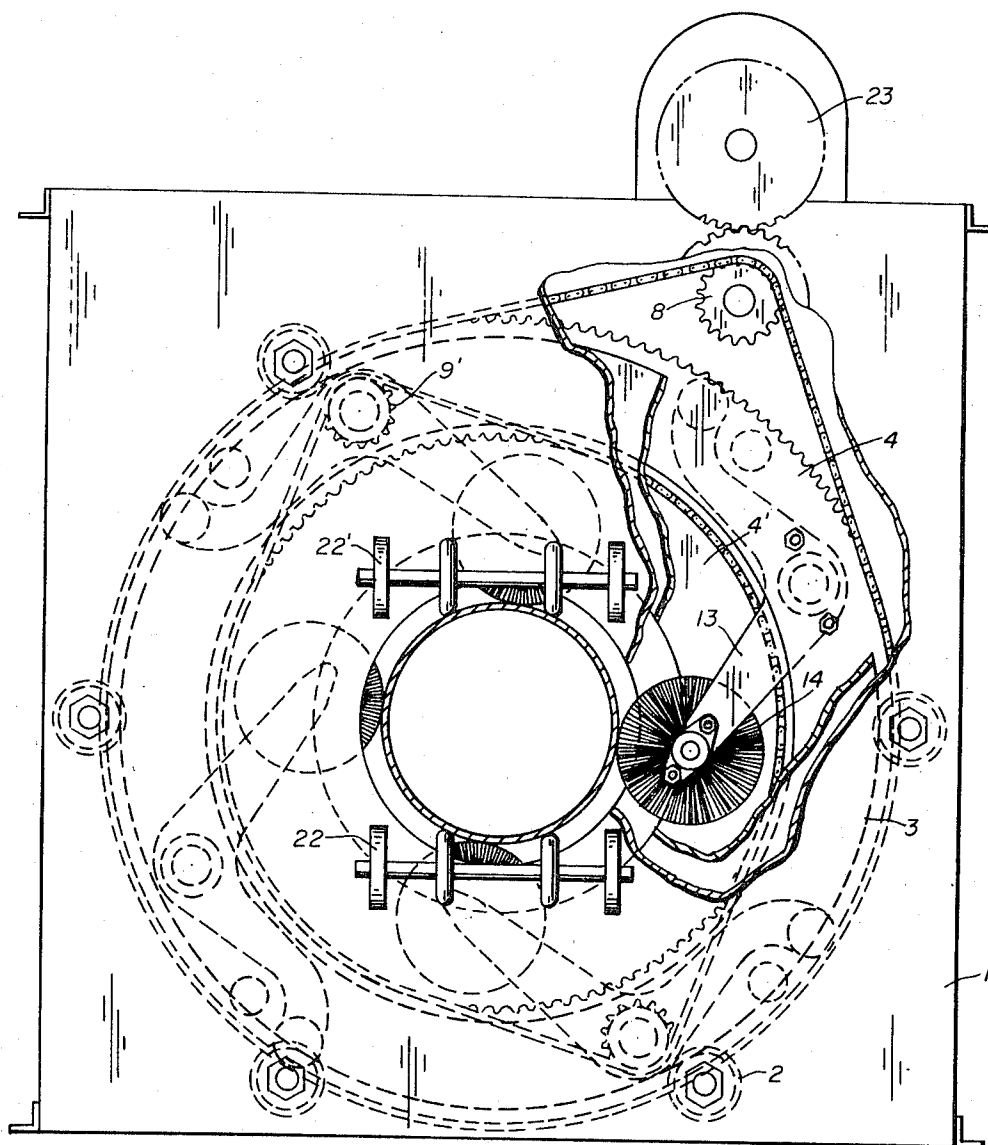


Fig. 3.

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CLEANING BRUSH ASSEMBLY FOR CLEANING CYLINDRICAL SURFACES

This is a continuation-in-part of our copending application, Ser. No. 785,529 filed Dec. 20, 1968, in the United States now abandoned entitled "Cleaning Brush Assembly For Cleaning Cylindrical Surfaces."

The pipeline industry presently has a need for an improved pipeline cleaning machine which will thoroughly remove scale and rust from metal pipe transmission lines located in place in the field installation. To review progress in this area, the first significant move in the direction of providing equipment for removal of the rust and scale was the apparatus shown in the U.S. Pat. to Betzel, No. 3,050,759 issued Aug. 28, 1962, now assigned to Remco Manufacturing Co., Tulsa, Oklahoma, assignee of this patent application. The Betzel patent discloses a pipe-cleaning machine with a support cradle for the pipe-cleaning apparatus which traverses a pipeline. The cleaning assembly which is disclosed in the Betzel patent includes one or more rotating brushes attached individually to brush shafts at an angle positioned radially to the curved surface of the pipe structure. The driving means for the brush shaft consists of a belt-driven rotating drum upon which the brush shafts are mounted. A stationary circular friction surface is mounted in close contact with the mounted shaft driving means by means of spring supports to cause the brush shafts to rotate on the cylindrical surface when the belt-driven drum is placed in motion. The deficiency in this apparatus is that the cleaning brushes, due to the slippage of their friction driving means, do not properly remove the heavy rust and scale which is found on the cylindrical surfaces of pipeline installations. Similarly, the U.S. Pat. issued to A. B. Carpmail, No. 2,299,523 dated Oct. 20, 1942 and the U.S. Pat. to A. B. Carpmail, No. 2,307,449 dated Jan. 5, 1943, and the U.S. Pat. issued to J. E. Hauser, No. 2,631,315 dated Mar. 17, 1953 all suggest pipe cleaning means; however, the improved pipe-cleaning assembly which I shall disclose includes features which far surpass the features found in the pipe-cleaning machines shown in these patents.

The object of this invention is to provide a brush assembly with positive traction and efficient action for cleaning cylindrical surfaces.

Another object of this invention is to provide a brush assembly in which the degree of cleaning can be regulated by adjusting the speed of the rotation of the cleaning machine.

Still another object of this invention is to provide a system of chain and sprocket drive in combination with a source of power to give positive drive to centrifugal brush assemblies in a pipe-cleaning machine for cleaning cylindrical surfaces.

And still another object of this invention is to provide a balanced counterweight in a brush assembly so that when the cleaning machine is in operation, the movement of the counterweight outwardly will create and transfer contact pressure through the supporting structure for the counterweight and through the brushes to the cylindrical surface being cleaned.

And yet another object of this invention is to provide transmitting means in a planetary system which will offer long life and high efficiency in a brush-cleaning machine. FIG. 1 is a perspective drawing showing that part of the cleaning machine containing the improvements, namely, the brush assembly and the planetary sprocket and chain power driving means with supporting structure.

FIG. 2 is a perspective drawing showing precisely in detail the structure of the brush assembly and the power shaft along with the sprocket and chain drive.

FIG. 3 is an end view of the brush assembly showing the relationship of a four brush assembly with a source of power and means of transmission of the power to the cleaning brush assembly.

Reference is made to FIG. 1. To properly coordinate the operation of the planetary chain sprocket drive with the brush assembly in the pipe-cleaning machine, it will be necessary to explain briefly the operation of this cleaning machine. The chain sprocket and brush assembly, which is partially shown in FIG. 1 is supported in a frame 1. The complete assembled cleaning machine which consists of the framing support, the

planetary sprocket system and brush-cleaning assembly is suspended in space by the boom of a side boom tractor, the cleaning section being positioned completely around the cylindrical surface to be cleaned as shown in FIG. 1. The complete machine is guided on the pipeline by roller support guides 22 and 22', FIG. 3. The framing 1 also sometimes called a cradle is the support structure for the planetary chain sprocket and brush assembly. This, plus the power supply (not shown), forms the complete cleaning machine. The framing 1 in the form of a rigid box includes means (not shown) to suspend the structure from a boom. The planetary sprocket and brush assembly is placed within the framing. Directly inside the framing mounted on head rollers 2 and 2' are head rings 3 and 3'. The head rings and brace supports 6 and 6' and additional bracing (not shown) which is assembled in a manner similar to bracing 6 and 6', form a circular squirrel cage in which bolted with spacers to the inner face of the head ring 3 is head ring sprocket 4. Head ring sprocket 4' which remains stationary at all times is bolted with spacers to frame 1 on the opposite side. The brace supports shown as 6 and 6' are adequate structurally to place the chain and sprocket planetary brush assembly within the squirrel cage structure. In alternate position between the bracing 6 and 6' are positioned the brush power shafts 5 and 5'. The power shafts 5 and 5' which extend parallel to the supports are mounted in bearings 17 and 17' respectively on the head ring sprocket 4 and the head ring 3'. Assembled on the power shaft are chain sprockets 9 and 9' on one side and chain sprocket 11 on the other side of the power shaft 5. Located between chain sprocket 9 and chain sprocket 11 on power shaft 5 is the brush assembly comprising rocker arm supports 13 and 13' mounted on shaft 5 in bearings 18 and 18'. On one end between the approximately parallel rocker arm supports is the cleaning brush 14 on shaft 15 in bearings 19 and 19'. Suspended between the opposite, or other, end of the rocker arm supports 13 and 13' is a counterweight 16.

The planetary chain sprocket drive for operating the brush assembly consisting of a chain drive 20 rotating in the periphery of the head sprocket 4 and the periphery of a small sprocket 8 attached to a shaft 7. This sprocket 8 transfers the power required from a motor to drive the complete brush assembly. The sprocket 8 is positioned directly above and is engaged with the head ring sprocket 4 by chain drive 20 in such a manner so as to rotate the complete cleaning assembly in a counterclockwise direction. As the head ring sprocket 4 is rotated, the head rings 3 and 3' move in the same direction on head rollers shown as 2 and 2' respectively. Bolted to frame 1 is stationary sprocket 4' with a sprocket 9' engaged with the stationary sprocket 4'. Around the head sprocket 4' and the sprocket 9' is a chain 10', the sprocket 9' being mounted with a keyway on power shaft 5. Also mounted on power shaft 5 is a second chain sprocket 9 between the first sprocket 9' and the rocker arm support bearing 18'. Directly below chain sprocket 9 is another chain sprocket 12 fitted into the extremity of shaft 15. Fitted around chain sprocket 9 and 12 is a continuous chain drive 10. Likewise, mounted on shaft 5 between the rocker arm support bearing 18 and the supporting bearing 17 is chain sprocket 11, directly below chain sprocket 11 is chain sprocket 11' with a continuous drive chain 21 connected around chain sprocket 11 and 11'. Chain sprocket 11' is mounted on power shaft 5' in a manner similar to chain sprocket 11. The power to the cleaning brush 14 is transferred from shaft 5 by sprocket chain drive 10 mounted on power shaft 5. In a similar manner, power is transferred from power shaft 5' by sprocket chain drive 24 to cleaning brush 14'. Likewise, power can be transferred from a power shaft similar to the power shaft 5 as shown on the drawing to any number of brush assemblies not shown but which would be arranged in horizontal parallel arrangement similar to the arrangement shown in FIG. 1. The preferred embodiment of this invention contains two power shaft with brush assemblies which are arranged in the manner as illustrated in FIG. 3; however, if the size of the pipe being cleaned is larger in diameter and

requires more brushes to properly clean the surface, more brush assemblies can be added by arranging in a manner similar to the manner described above. Such additional brush assemblies as illustrated in FIG. 1 are considered to be in the purview of this invention.

Reference is made to FIG. 2, illustrating a brush assembly mounted on a power shaft 5. As was previously stated in the above paragraph, the brush 14 is rotating in a clockwise direction around a cylindrical surface, the direction of rotation being clockwise or opposite to the movement of the whole cleaning brush assembly moving in the frame between head rings 3 and 3' in FIG. 1. The brush assembly consists of two rocker arm supports 13 and 13' rotating on the power shaft 5 and supporting the cleaning brush 14 on one end and a counterweight 16 on the other end. The size of this counterweight 16 is determined by the amount of centrifugal force which is developed as the whole assembly moves in a counter-clockwise circular direction about the cylindrical object to be cleaned. Increasing the weight of the counterweight will increase the amount of pressure being exerted by the cleaning brushes on the cylindrical surface to be cleaned. Likewise, decreasing the weight of the counterweight also decreases the pressure being exerted by the cleaning brushes on the cylindrical surface.

As the complete assembly moves in a circular direction, the movement of the cleaning brush is in a direction opposite to the movement of the squirrel cage assembly. The centrifugal force created by this movement acts radially on the surface through the cleaning brushes to thoroughly remove the scale and rust from the surface in preparation for painting or covering. The speed at which the power shaft 5 turns is not critical and can be regulated at the power source. However, the speed necessary can be adjusted according to the condition of the surface to be cleaned. Increasing the speed will effectively cause the cleaning brushes to abrade deeper and properly when the degree of rust and scale is heavy. Conversely, decreasing the speed of the rotation will cause the cleaning brush to abrade more lightly.

Reference is to FIG. 2 which portrays the cleaning brush assembly. As was previously stated above, the cleaning brush mounted in bearings 19 and 19' moves in a clockwise direction on shaft 15, the power being supplied through a chain drive 10 FIG. 1. Shaft 15 which supports brush 14 is mounted between a pair of approximately parallel rocker arm supports 13 and 13' which support counterweight 16 on the other end. The rocker arm supports 13 and 13' are precisely balanced on power shaft 5 so that the amount of radial pressure due to the centrifugal force of the rotation will be sufficient to give the desired effect of the cleaning brushes 14.

Reference is made to FIG. 3 which shows the arrangement and relationship of the brush assemblies in the squirrel cage support. As was stated previously, the cleaning machine frame 1 is supported in space and guiding supports 22 and 22' are furnished to guide the cleaning machine on the cylindrical surface being cleaned. FIG. 3 portrays the cleaning machine with a cutaway view of the arrangement of the cleaning brush assembly which includes the cleaning brush 14, rocker arm support 13, the head ring 3 on head ring roller 2, the head ring sprocket 4, stationary sprocket 4', along with a source of power 23. The source of power is usually a gasoline motor geared through a sprocket and a chain drive to head ring sprocket 4 which places the machine in motion. Then, through the unique planetary mechanism described under FIG. 1, the

cleaning assembly is put in rotating movement to remove the rust and scale as the cleaning machine traverses the pipeline or cylindrical surface to be cleaned.

In summation, the brush and The planetary chain sprocket assembly disclosed will effectively, and with rapidity, clean surfaces of cylindrical structures in a manner heretofore not known.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted herein otherwise than necessitated by the disclosure.

I claim:

1. A cylindrical surface-cleaning machine comprising at least two brush assemblies, the said brush assemblies being powered by a planetary chain sprocket mechanism, the said brush assemblies moving in circular direction about the axis center of the said cleaning machine, a first and a second rotatable shaft, the said first and second rotatable shaft being mounted between the interface of a first head ring sprocket mounted on a first head ring and the interface of a second head ring, the said first and second head rings being properly braced and approximately parallel to each other, each of the said head rings being mounted on head ring rollers assembled on a frame, a stationary second sprocket attached to the said frame and a third sprocket mounted on the said first rotatable shaft, the said stationary second sprocket and the said third sprocket being circumscribed by a first continuous chain, a fourth sprocket on the said first rotatable shaft, positioned on the said first rotatable shaft between the said interface of the second head ring and a pair of approximately parallel rocker arm supports rotatably mounted on the said first rotatable shaft, the said rocker arm supports holding a third shaft with a cleaning brush mounted thereon, the said third shaft extending to support a fifth sprocket, the said fifth sprocket and the said fourth sprocket being circumscribed by a second continuous chain drive, a sixth sprocket, the said sixth sprocket being mounted on the first rotatable shaft between the said pair of rocker arm supports and the said interface of the first head ring sprocket, a seventh sprocket mounted on the said second rotating shaft between a second pair of rocker arms mounted on the said second rotating shaft and the said first head ring sprocket, a third continuous chain drive circumscribing the said sixth and seventh sprockets, an eighth sprocket positioned on the said second rotating shaft between the said second pair of support arms and the said second head ring, a fourth rotatable shaft, the said fourth rotatable shaft being positioned between the extremities of the said second rocker arm supports and extended to support a ninth sprocket, the said eighth and ninth sprockets being circumscribed by a continuous chain drive, the said fourth rotatable shaft supporting a cleaning brush thereon.

2. The cylindrical surface cleaning machine as described in claim 1 where the said first and second rocker arm supports are extended to support a counterweight on the extremities opposite from the extremities supporting the said third and fourth shafts with cleaning brushes mounted thereon.

3. The cylindrical surface cleaning machine described in claim 1 where the said first and second rotatable shafts are ball bearing journaled in the said first head ring sprocket and the second said head ring and the said first and second pair of rocker arm supports are bearing mounted on the said first and second rotatable shafts respectively.

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