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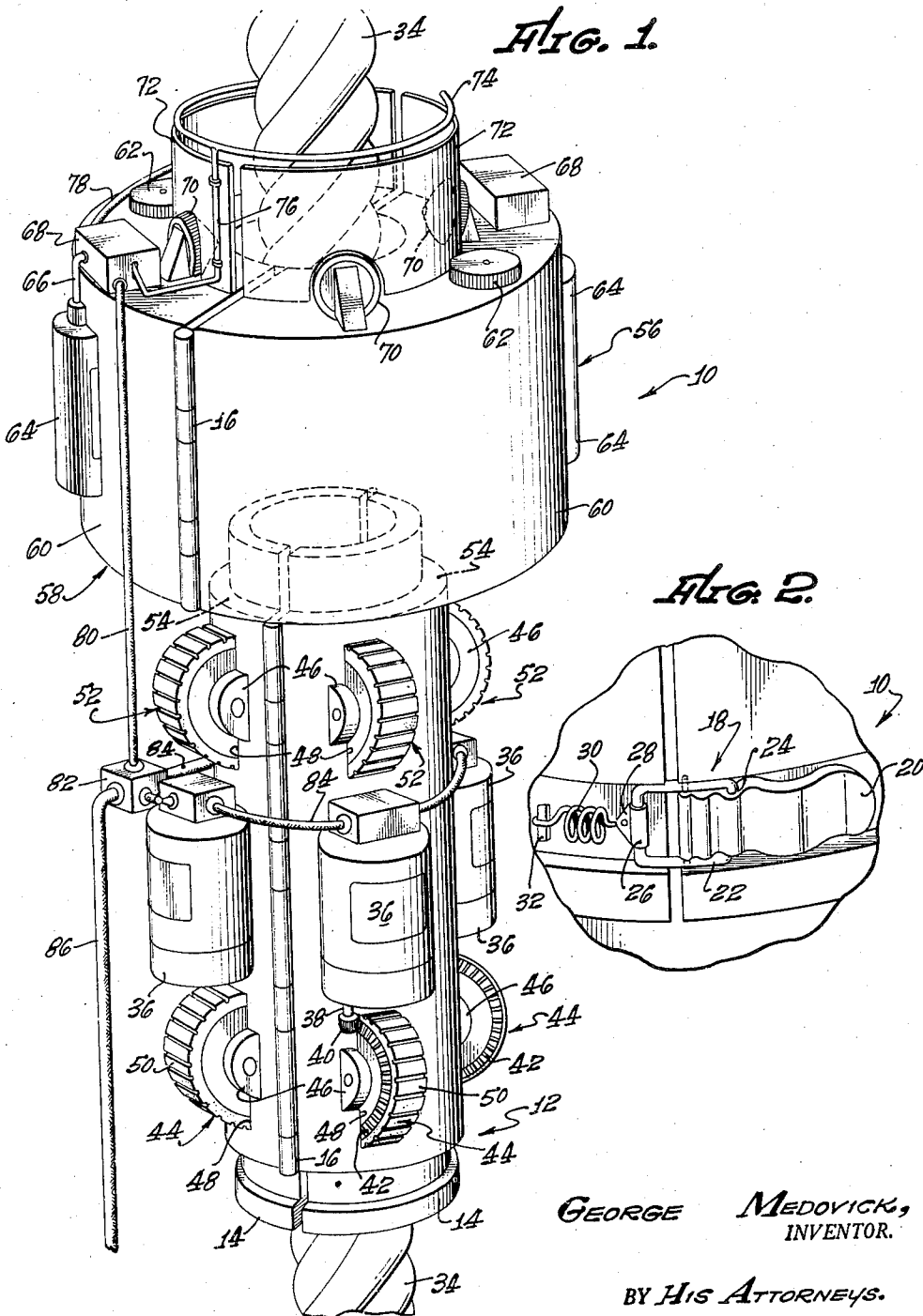
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2,858,555

SELF-PROPELLED CLEANING OR PAINTING DEVICE

Filed June 9, 1955

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 3.

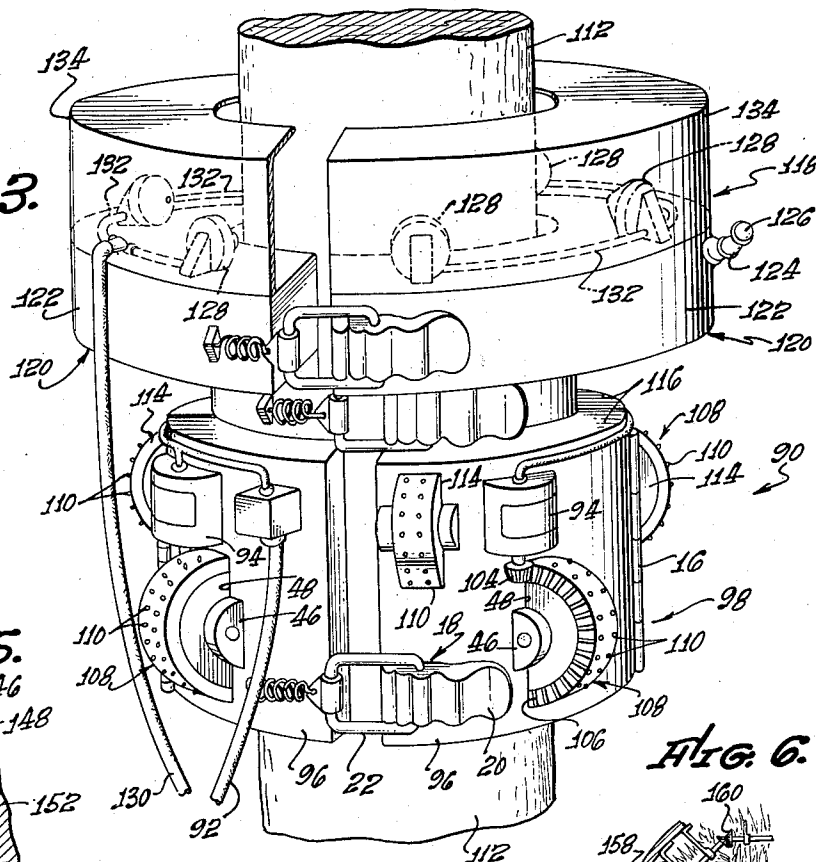


FIG. 5.

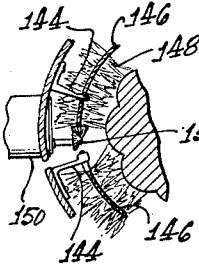


FIG. 6.

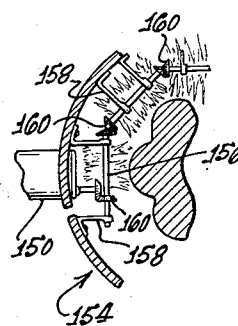
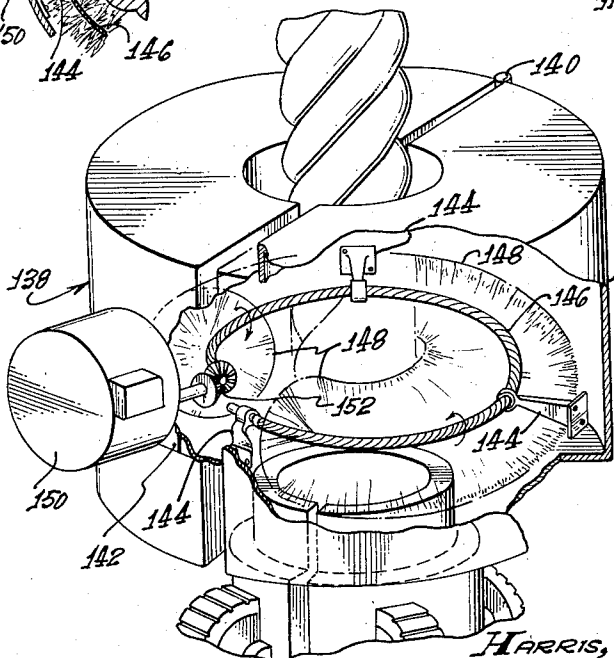


FIG. 4



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SELF-PROPELLED CLEANING OR PAINTING DEVICE

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3 Claims. (Cl. 15—88)

The present invention relates to self-propelled cleaning and painting devices which are primarily designed to be used in cleaning and painting comparatively long members supported at their extremities.

There exists at the present time a substantial problem as to how to effectively, and yet cheaply, clean and paint the suspension cables on various bridges, and how to effectively clean and treat various poles such as are commonly known as telephone poles, and various long suspended wires and cables in a number of diverse situations. With the present essentially hand-methods of cleaning and painting such long members which are supported at their extremities, it is very difficult for an individual to reach all portions of these members without using extensive scaffolding or various types of suspended chairs or like equipment.

It is a broad object of the instant invention to provide new and improved self-propelled devices which are exceedingly effectual in cleaning, painting, or otherwise treating such elongated members which are supported at their extremities. A related broad object of the invention is to provide constructions for this purpose which are exceedingly effectual in use, and yet which are comparatively small, easily manufactured, and comparatively cheap to both construct and operate. Further objectives of the invention, as well as many advantages of it, will be apparent from the remainder of this specification including the appended claims and the accompanying drawings, in which:

Fig. 1 is a perspective view of a device of the invention which is intended to be used in painting a substantially vertical cable such as is commonly found in suspension bridges;

Fig. 2 is an enlarged detail view showing the fastening device employed with the construction shown in Fig. 1;

Fig. 3 is a perspective view of a modified construction of the instant invention designed for treating telephone poles or like structures;

Fig. 4 is a partial perspective view in which part of the housing employed is broken away to illustrate operative means within a modified device of the invention designed to be employed in cleaning substantially vertical cables;

Fig. 5 is a detail view showing certain operative parts of the construction shown in Fig. 4; and

Fig. 6 is a detail view similar to Fig. 5 indicating a modified cleaning structure which may be employed with the invention.

In all figures of the drawings, like numerals have been employed to designate like parts.

The instant invention may be briefly summarized as required by Rule 73 of the Rules of Practice of the United States Patent Office, in patent cases, as being concerned with a self-propelled cleaning and painting device of the class described, which comprises a cylindrical propulsion unit upon which there are mounted propulsion wheels; means for turning these wheels; and a cylindrical treating unit attached to this propulsion unit so as to be

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aligned therewith. With the invention such a cylindrical treating unit may include either means for cleaning an elongated member, as previously indicated, or means for applying paint or other similar material to such elongated member. It is primarily intended that different types of treating units may be attached to a cylindrical propulsion unit so as to initially clean a member, and then to either apply a coat of paint or another similar material, such as a wood preservative, to this member.

This invention is best further explained directly by reference to the accompanying drawings. In Fig. 1 there is shown a complete device of the instant invention 10 which includes a generally cylindrically shaped propulsion unit 12. This propulsion unit is formed of two shell-like sections 14 which are joined together by means of a conventional hinge 16 and by means of a plurality of clamps 18 which are located on the edges of these sections 14 remote from the hinge 16. Thus, the clamps 18 employed with the propulsion unit 12 are located at the back of this unit as viewed in Fig. 1 of the drawings.

Each of the clamps consists of a handle 20 pivotally attached to one of the sections 14. To each handle 20, at a point on the handle removed from the point of attachment to a section 14, there is secured a generally box-shaped link 22 in such a manner that one side of this link projects through an opening 24 in the handle so as to be capable of movement with respect to the handle 20. On the side of each link 22 remote from the handle 20 is provided a sleeve 26 which is free to rotate with respect to the link 22, and which carries a small projection 28 designed to hold one end of a spring 30. The other end of the spring 30 is designed to hook into engagement with a projecting lug 32 formed upon the other section 14 of the propulsion unit 12.

The type of construction employed with the clamps 18 is in many respects conventional, and is merely designed to secure the sections 14 to one another easily and conveniently. Thus, with this construction the clamps 18 may be released by merely pulling the handles 20 from the position shown in Fig. 2, enabling the springs 30 to be readily disengaged by hand from the projecting lugs 32. When this is done, the sections 14 may be turned with respect to one another about the hinge 16 so as to remove the propulsion unit 12 from a cable 34 about which this unit has been disposed. The propulsion unit 12 may, by merely reversing the series of operations indicated, be clamped about another cable (not shown) with a minimum of difficulty. If desired, more than two sections 14 may be employed with the invention, and these sections may be secured to one another by hinges and various conventional clamping means. Such type of construction is not preferred with the invention inasmuch as two sections 14 are all that is necessary for use in a device 10 designed to be used on a comparatively small cable 34.

Mounted upon the sections 14 are at least two electric motors 36 from each of which there projects a shaft 38 carrying a small gear 40. Each of the gears 40 is designed to engage a gear member 42 formed upon a driving wheel 44 mounted between bearings 46 on one of the sections 14 so as to project through an opening 48 within the section and engage the cable 34. It is normally preferable to provide each of the driving wheels 44 with an external rubber tire 50 having a serrated outer surface. The use of such tire aids in obtaining traction between the driving wheels 44 and the cable 34, and enables the propulsion unit 12 to be employed even on comparatively slick cable surfaces.

Also mounted upon the sections 14 are guide wheels 52 of substantially the same structure as the driving wheels 44. Thus, these guide wheels 52 include tires 50 and are mounted so as to be supported upon bearings

46 so as to project through openings 48 within the sections 14 and engage the cable 34 in a similar manner to the driving wheels 44.

Normally, the dimensions of the wheels 44 and 52 are such that when the sections 14 are located about the cable 34 through the use of the clamps 18, these wheels firmly engage the cable 34 so that there is no chance of slippage between these wheels and the cable. The location of the wheels 44 and 52 with respect to the cable 34 is quite important with the invention. It is readily seen in Fig. 1 of the drawings that the propulsion unit 12 is essentially cylindrical in shape. These wheels 44 and 52 are symmetrically disposed about the axis of what may be considered a complete cylinder formed by the sections 14 when these sections are secured together in an operative position. Further, the driving wheels 44 and the guide wheels 52 are preferably located in different planes perpendicular to the axis of the cylinder defined by the sections 14 of the propulsion unit 12. This axis may be termed the axis of the complete propulsion unit 12. It is not necessary that all of the driving wheels 44 or the guide wheels 52 be located in the same plane. It is, however, important that these wheels be disposed within the sections 14 so as to engage the cable 34 in such a manner that the propulsion unit is held in a position in which sidewise movement of this propulsion unit with respect to the cable 34 is prevented. In Fig. 1 of the drawings, only three driving wheels 44 and only three guide wheels 52 are shown. It is to be understood, however, that the number of these wheels may be multiplied to any desired extent, the minimum number of driving and guide wheels being three for either type of wheel for what is considered to be a commercially feasible propulsion unit.

In the embodiment of the invention shown in Fig. 1 of the drawings, two of the driving wheels 44 and two of the guide wheels 52 are disposed upon each of sections 14. The number of wheels on any section may be varied so long as a substantially symmetrical construction capable of holding the propulsion unit against sidewise movement with respect to the cable 34 is obtained.

Each of the sections 14 is formed so as to include a top shoulder 54 which is designed to carry a treating unit 56. In Fig. 1 of the drawings, a treating unit is shown which is designed to be employed in applying a coat of paint to the cable 34. For this purpose, the treating unit 56 is formed in two shell-like sections 58 which are secured together by means of a hinge 16 and clamps 18, of the type previously described, so as to define a cylinder, the axis of which is aligned with the axis of the propulsion unit 12. Within each of the sections 58 there is formed an enlarged paint reservoir 60 which is intended to be filled with paint through an opening (not shown) normally covered by a conventional cap 62. Mounted upon the sides of these sections 58 are cylinders 64 for compressed gas, such as, for example, carbon dioxide. These cylinders are connected through pipe means 66 to control boxes 68 which are employed to govern the emission of gas from these cylinders 64 to paint spray nozzles 70 mounted upon the top surfaces of the sections 58. The means connecting these nozzles 70 with the control boxes 68, and the paint reservoirs 60 are not shown in Fig. 1 of the drawings, but are exceedingly conventional in the art and are of the broad category normally employed in any paint spraying equipment. The control boxes 68 thus serve in part as valves and contain valve means (not shown) for governing the removal of gas from the cylinders 64. An air line may be extended from the ground if desired.

Immediately adjacent the nozzles 70 there are mounted semicylindrical shields 72 which are designed to be used in preventing paint emitted from the nozzles 70 from being blown away from the cable 34 during operation of the complete device 10.

A ring-shaped contact 74 is mounted within guide 75

means 76 attached to one of the shields 72 so as to be connected to one of the control boxes 68. Both of the control boxes are connected by means of an appropriate electric cable 78. Further, the control box connected to the ring-shaped contact 74 is connected by means of another electric cable 80 to a switchbox 82 mounted upon one of the sections 14. This switchbox is connected to each of the motors 36 by the use of electric cables 84, and is connected to an appropriate source of electric current by means of another electric cable 86.

The operation of the complete device 10 shown in Fig. 1 of the drawings is essentially very simple. In use, the complete device is assembled about a cable, such as, for example, a suspension bridge cable adjacent the lower end thereof, the paint reservoirs 60 are filled with an appropriate paint, and the cylinders 64 are filled with a compressed gas, such as, for example, carbon dioxide. Power is supplied through the cable 86 and the other cables shown so as to cause the motors 36 to operate turning the driving wheels 44, causing the complete device 10 to move along the cable 34 until such time as the contact 74 hits against the member (not shown) from which the cable 34 is suspended. As this happens, the contact 74 is moved, causing an appropriate switch (not shown) within the control box 68 to be actuated. The actuation of this switch causes the motors 36 to reverse their direction of rotation, reversing the direction of movement of the complete device 10. Simultaneously with the reversal of the motors 36, valve means (not shown) within the control box 68 are actuated, allowing gas from within the cylinders 64 to escape, forcing paint through the nozzle 70 against the cable 34. This painting operation continues until such time as the complete device 10 reaches the point from which its movement commenced. At this time, it may be discontinued by shutting off the power supplied to the cable 86.

It is obvious that in place of the precise electric arrangement indicated in Fig. 1 of the drawings, other means may be provided so that the operation of the entire device 10 may be governed by an operator stationed upon the ground or a bridge, who merely throws switches governing the operation of the device 10 at the appropriate times. This method of actuation of the complete device 10 is not preferred for very long cables, however, inasmuch as it is exceedingly difficult for an operator to determine precisely when the device hits against the top or adjacent member from which the cable 34 may be suspended. After a complete painting operation as described in this discussion has been made, the complete device 10 may be taken apart by releasing the clamps 18 and may be reassembled upon another cable.

A modified complete device of the instant invention 90 is shown in Fig. 3. This modified device is essentially very similar to that shown in Figs. 1 and 2 of the drawings, but is intended to be used in applying preservative or paint to wooden poles such as are commonly termed "telephone poles." With this construction it is entirely satisfactory to operate the complete device 90 from the ground by supplying current through a cable 92 so as to actuate a plurality of small motors 94 mounted upon sections 96 of a propulsion unit. Because of the comparatively large diameter of the usual telephone pole, it is preferred with this modification of the invention to utilize at least three sections, all of which are secured together by means of hinges 16 and/or by clamps 18 of the type described in the preceding discussion.

The motors 94 are each connected so as to drive small gears 104. These small gears 104 are intended to engage gear means 106 formed on driving wheels 108 located between bearings 48. The driving wheels 108 employed with this

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modification of the invention preferably differ from the driving wheels 44 in that they are provided with a comparatively rigid exterior surface from which there project a number of small, generally pointed lugs 110 which are intended to bite into the wood forming a complete telephone pole 112 so as to engage this telephone pole in a manner in which slippage of the complete device 90 is impossible. The sections 96 also carry guide wheels 114 of a similar construction to the wheels 108 so that these guide wheels 114 are mounted between bearings 46 in order to project through other openings 48 within the sections 96. In the modification of the invention indicated in Fig. 3 of the drawings, both the guide wheels 114 and the driving wheels 108 are spaced generally symmetrically about the telephone pole 112 in different planes perpendicular to the axis of the telephone pole 112 so as to engage different portions of this telephone pole in the manner calculated to prevent undesired movement of the propulsion unit 98 from one side of the telephone pole 112 to another while in use.

The sections 96 are provided with upper flange-like constructions 116 which are designed to carry a treating unit 118 comprising at least two sections 120 secured together by a hinge 16. Within the bottom of each section 120 there is formed a paint tank 122, each paint tank being designed to be filled through an appropriate filling tube 124. These tubes are normally provided with conventional caps 126 for the obvious purpose. Immediately above the tanks 122 of the sections 120 are a plurality of spray nozzles 128 which are directed towards the telephone pole 112. These spray nozzles are connected to the paint tanks 122 in the conventional manner (by means not shown), and are also connected through an air line 130 and pipe means 132 so that when air is supplied to the treating unit 118 through the air line 130 all of these nozzles 128 are simultaneously actuated. Hood-like baffle means 134 are secured to the tanks 122 so as to prevent the undesired dissemination of paint or other treating fluid by wind striking the complete device 90.

The operation of the modified construction shown in Fig. 3 of the drawings is essentially identical with the operation of the complete device illustrated in Fig. 1 in that mounting and demounting of this complete device 90 about one or more telephone poles follow the same series of steps outlined in the preceding discussion. The type of construction illustrated in the modified device 90 is particularly advantageous for use on wood poles where the lugs 110 may readily bite into the wood in the manner in which the spikes of the conventional equipment of a telephone lineman bite into the same supporting structure. Inasmuch as telephone poles are not as a rule exceedingly high, the device of the instant invention may be readily controlled in the desired manner by an operator standing on the ground adjacent the telephone pole. The springs 30 employed with the clamps 18, upon both the treating unit 118 and the propulsion unit 98, serve a very effectual purpose in adjusting the effective diameter of both the propulsion unit 98 and the treating unit 118 during the operation of the device so that at all times the effective diameter of this device is that of a telephone pole. Thus, means are provided with this modification of the invention for compensating for any taper found on a telephone pole.

In Fig. 4 of the drawings, a second modified construction of the invention is shown. Here, the construction comprises a treating unit 136 which is designed to be used in cleaning by brushing a cable 34 such as is described in connection with Fig. 1 of the drawings. This treating unit 136 is intended to be mounted upon the propulsion unit 12 previously described, although, obviously, it can also be mounted upon the propulsion unit 98. It consists primarily of two shell-like sections 138 which are secured together by means of a hinge 140 and clamping means 142. These sections when secured

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together in the manner shown in Fig. 4 form what is substantially a cylinder, within which there is mounted a plurality of brackets 144 designed to act as bearings in holding an elongated flexible cable 146 to which there is secured in a conventional manner bristles 148 constituting a part of a brush. During the operation of the construction shown in Fig. 4, this flexible cable 146 is turned by operating a motor 150, this motor 150 being connected to the cable 146 by means of conventional beveled gear means 152. This type of construction of the treating unit 136 is best understood with reference to Fig. 5 of the drawings in which details of the construction are illustrated.

Another modified treating unit 154 of the invention is explained by the detailed sectional view shown in Fig. 6 of the drawings. This sectional view is substantially similar to the sectional view of Fig. 5. In Fig. 6 a construction is illustrated in which the motor 150 is employed through gear means 152 so as to turn shafts 156 mounted within bearing brackets 158. Thus, with this construction a plurality of these shafts 156 is employed and the shafts are connected together by means of adjacent beveled gears 160. All of these shafts 156 are formed so as to hold bristles 148 forming a part of a complete brushing device.

Those skilled in the art will realize from the foregoing discussion the advantages of the instant invention indicated in the initial portion of this specification. They will also realize that the instant invention is not to be strictly construed as being drawn to only those constructions illustrated in the drawings. The broad concept of the invention is intended to be applied to other constructions embodying the basic principles shown and described in this application. While the term "cylindrical" has been used to describe all of the treating units and propulsion units of the instant invention illustrated herein, it is to be understood that the structure of the invention may take various forms of the broad category indicated which are designed to be disposed about and encircle any elongated member supported at its ends. The instant invention is not to be considered as being restricted to use with structures such as poles, cables, or wires of cylindrical cross section; it can also be used with structures such as long I-beams. This invention is to be limited only by the accompanying claims forming a part of this specification.

I claim as my invention:

1. In a self-propelled device for use in treatment of vertically disposed elongated members which are supported at their extremities, such as bridge suspension cables, the combination of: a housing unit comprising at least two sections for encircling a portion of a vertically disposed elongated member, said housing unit including resilient clamps for joining said sections about the member; a plurality of wheels carried in said sections of said housing unit, the axes of rotation of said wheels lying in horizontal planes, with said wheels projecting inward from said sections and with said resilient clamps urging said wheels into engagement with the encircled member; electric motor means carried on said housing unit; means coupling said motor means to said wheels in driving relationship for propelling the device up and down the member; a treating unit for encircling a portion of the member above said housing unit, said treating unit being mounted on and driven by said housing unit; a control for reversing said motor means to change the direction of motion of the device from upward to downward and for simultaneously energizing said treating unit; and a control actuating lever projecting above said treating unit for actuating said control when the device reaches the upper limit of its travel.

2. A device as defined in claim 1 in which said treating unit includes: rotary brush means mounted in a horizontal plane and encircling and engaging the member; a drive motor for driving said brush means in rotation;

and means for coupling said control to said drive motor in controlling relationship.

3. A device as defined in claim 1 in which said treating unit includes: a plurality of paint spray units disposed symmetrically about the member for directing the paint onto the member; a paint reservoir coupled to each of said spray units; a source of power for spraying; a valve for coupling said source of power to said spray units; and means for coupling said control to said valve in controlling relationship.

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