United States Patent

[11] 3,612,487

[72] Inventors **William E. Raney**
511 Morewood Parkway, Rocky River, Ohio 44116;
Milan J. Siebert, 5617 Onaway Oval, Parma, Ohio 44130

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[54] **DEVICE FOR PUSHING AND PULLING IMPLEMENTS, INCLUDING CABLES, INTO AND FROM CONDUITS AND THE LIKE**
4 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **254/174 R,** 73/150, 254/134.3 FT, 15/104.3, 73/432
[51] **Int. Cl.** **B66d 1/48**
[50] **Field of Search** ..... 254/150, 186, 173–175, 134.3 FT; 15/104.3; 73/150

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Primary Examiner—Harvey C. Hornsby
Attorney—Oberlin, Maky, Donnelly & Renner

ABSTRACT: Device for pushing and pulling implements (e.g. pipe coating testers, pipe markers, pipe cleaners, pipe spray guns) along pipes or like elongated workpieces, said device having adjacent spools or reels with spirally coiled implement feeding and operating elements wound on the respective reels, the feeding element being operative to push and pull the implement into and from the pipe (or along the pipe) while the implement operating element is unwound from or rewound onto its reel.

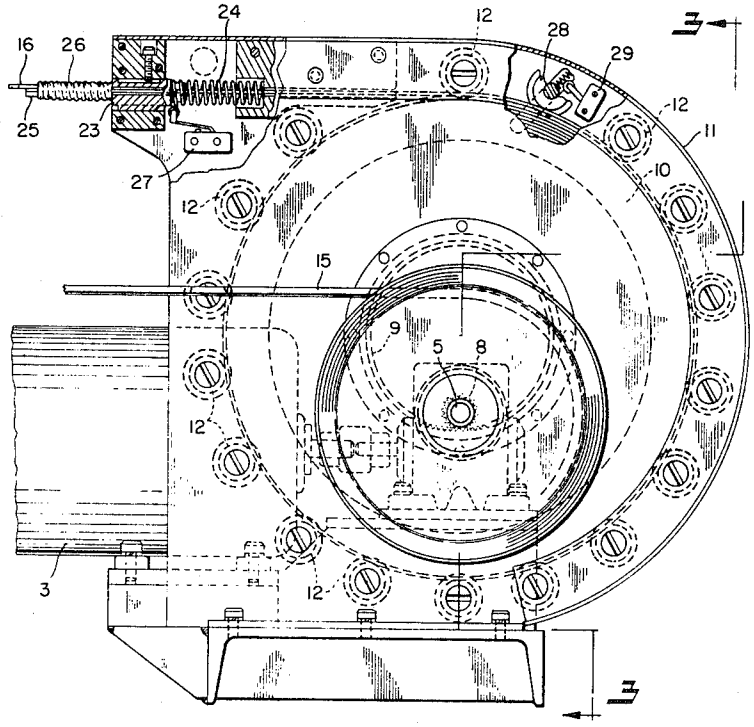
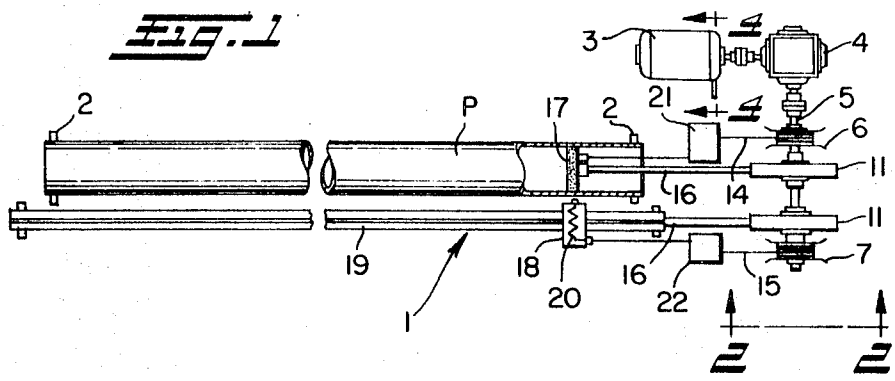


FIG. 1



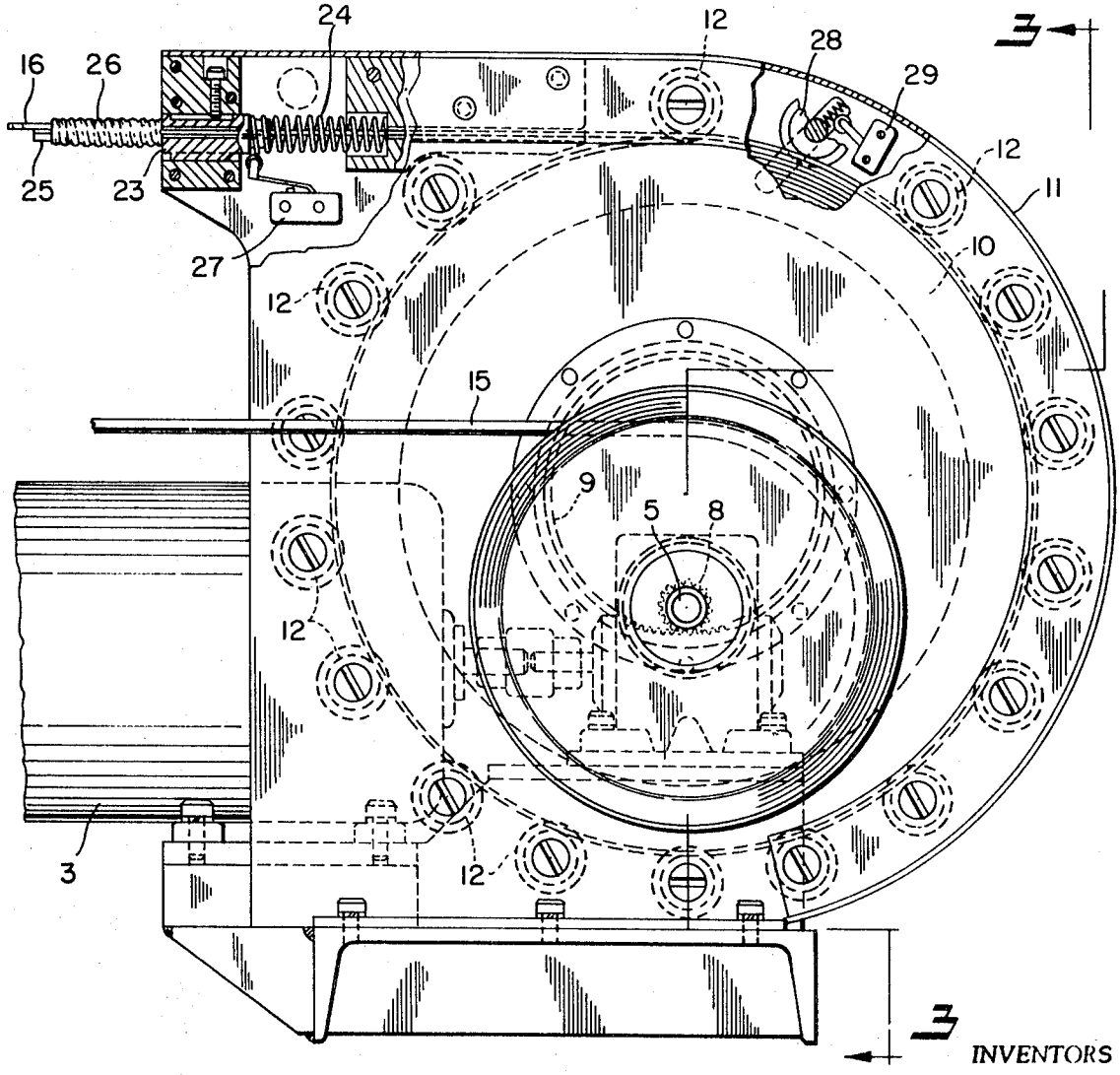
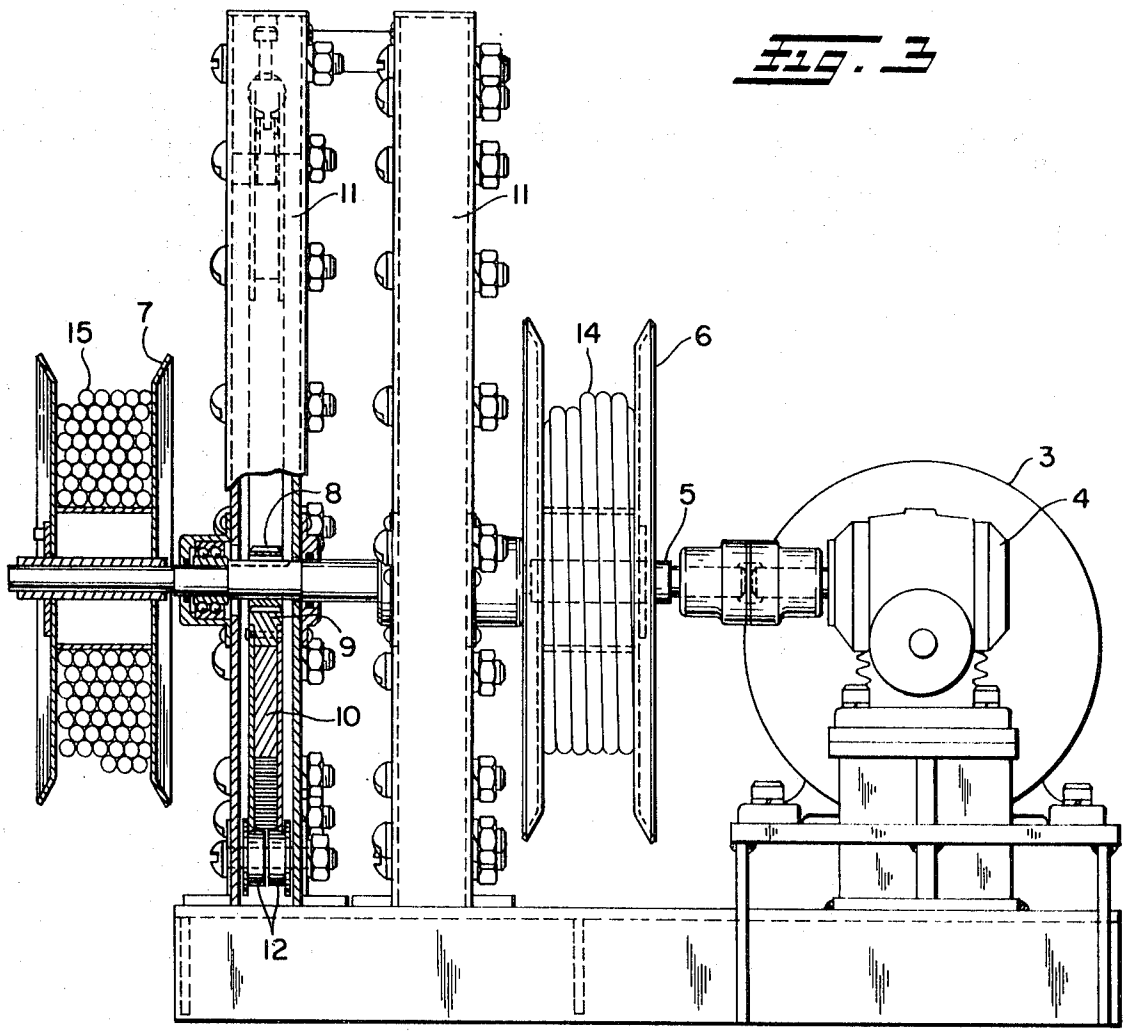


FIG. 2

INVENTORS
WILLIAM E. RANEY
MILAN J. SIEBERT

BY
Oberlin, Maky, Donnelly & Renner
ATTORNEYS

Fig. 3



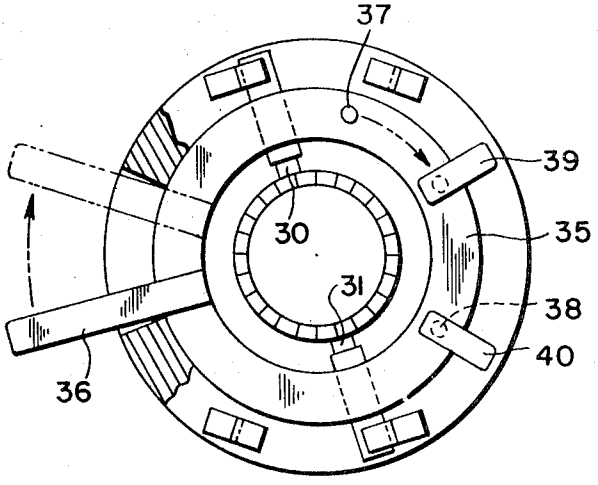


Fig. 4

INVENTORS
WILLIAM E. RANEY
MILAN J. SIEBERT

BY
Oberlin, Maky, Donnelly & Renner
ATTORNEYS

Fig. 5

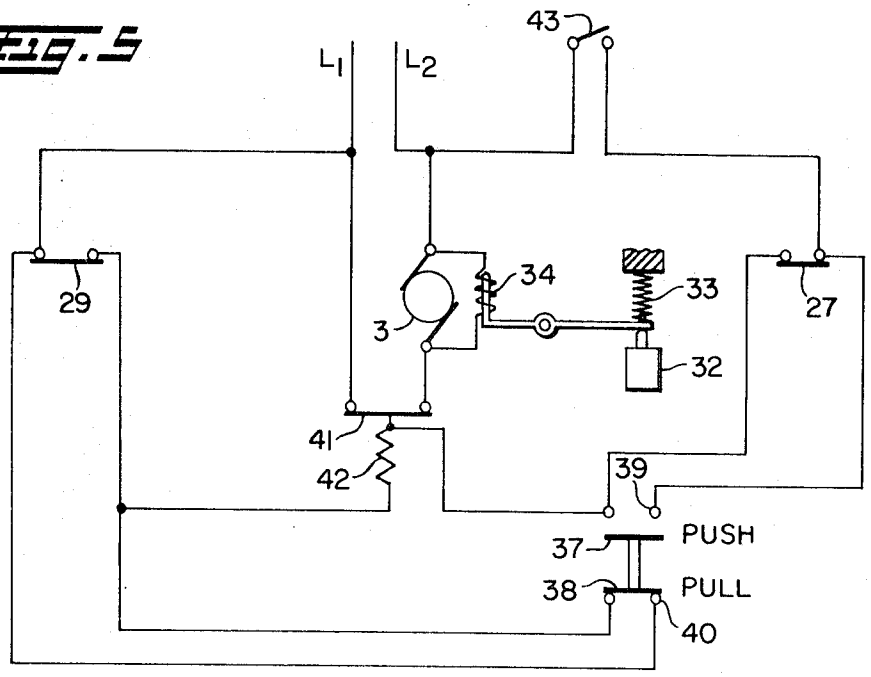
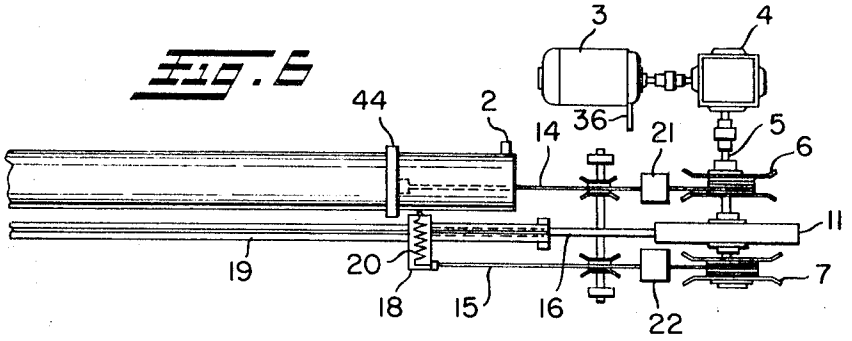


Fig. 6



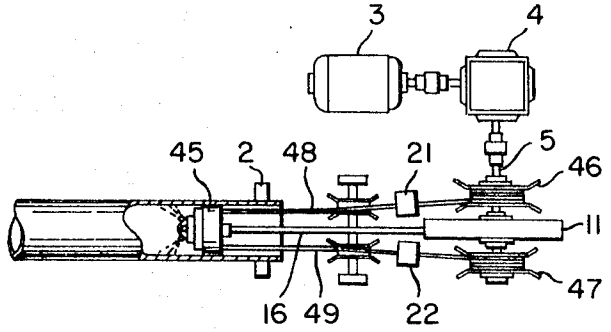


Fig. 7

INVENTORS
WILLIAM E. RANEY
MILAN J. SIEBERT

BY
Oberlin, Maky, Donnelly & Renner
ATTORNEYS

DEVICE FOR PUSHING AND PULLING IMPLEMENTS, INCLUDING CABLES, INTO AND FROM CONDUITS AND THE LIKE

BACKGROUND OF THE INVENTION

It is known for example, as disclosed in William E. Raney U.S. Pat. Nos. 2,556,484 and 2,718,376, to provide a cable puller which is operative first to push the free end of a spirally coiled fish tape through an electrical conduit from one end to the other and then to pull in the fish tape together with an electric cable attached thereto, thus to pull the cable into the conduit.

SUMMARY OF THE INVENTION

In the present invention, the fish tape of a cable puller is attached to an implement to move the latter in opposite directions within a pipe or therealong, and a spirally coiled operating element wound on a reel adjacent the fish tape reel is also connected to the implement to operate the latter. By way of illustrative examples, the implement may be a current leakage tester for determining flaws in pipe coatings, a marker having a solenoid operated marking pen for marking the locations of coating flaws indicated by the tester, a spray gun for coating a pipe, or a brush for cleaning a pipe; and in these respective cases, the operating elements may comprise electric supply cables for the tester and marker, paint and/or air-hoses for the spray gun, and a cleaning fluid supply hose and spray nozzle for the brush.

Accordingly, it is one object of this invention to provide a device of the character indicated wherein adjacent spools or reels have implement feeding means and implement operating means coiled therearound for moving the implement in opposite directions with respect to a longitudinally elongated workpiece such as a length of pipe or the like, and for operating the implement during either or both the feeding and return strokes of the implement.

It is another object of this invention to provide a device of the character indicated in which the drive motor is equipped with a disk brake or the like, the motor being deenergized and braked in response to predetermined pull-in of the feed element.

It is another object of this invention to provide a device of the character indicated which has means responsive to predetermined pushing load on the feed element to deenergize the drive motor and to apply the brake to arrest the feeding movement as when the implement attached to the feed element encounters an obstruction in the pipe or the like through which the implement is being fed.

It is another object of this invention to provide a device of the character indicated having a novel reversing mechanism to effect movement of the feeding and operating elements aforesaid in opposite directions with respect to an elongated workpiece such as a pipe or the like.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of a few of the various ways in which the principle of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a device for testing the internal coating of a pipe and for marking the pipe at the points where flaws are detected by the tester;

FIG. 2 is an elevation view, partly in cross section, as viewed along the line 2—2, FIG. 1;

FIG. 3 is a cross section view taken substantially along the line 3—3, FIG. 2;

FIG. 4 is a view of the drive motor reversing mechanism taken substantially along the line 4—4, FIG. 1;

FIG. 5 is a schematic wiring diagram of the embodiment of the invention shown in FIGS. 1 to 4;

FIG. 6 is a fragmentary top plan view similar to FIG. 1, except showing a device for testing the coating on the outside of a pipe while the marking device is operative also to mark the pipe whereat flaws are detected by the tester; and

FIG. 7 is a similar top plan view showing an air spray gun which is being pulled through a length of pipe, compressed air and paint supplied to the spray gun through hoses unwound from and rewound onto reels adjacent the coil of the feeding element to which the spray gun is attached.

DISCUSSION OF THE INVENTION

Referring now to FIGS. 1 to 5, the device 1 shown for purposes of illustration is a coating flaw detector and marker and comprises a support 2 for a length of pipe P having an internal coating of plastic or the like. Adjacent to one end of said support 2 is a reversible drive motor 3 which through the worm unit 4, drives a shaft 5 on which spools 6 and 7 are keyed, said shaft 5 having pinions 8 thereon each of which mesh with an internal gear 9 of a spool 10 journaled in a housing 11 as by rollers 12. Coiled around the spools 6 and 7 are implement operating means 14 and 15 and coiled around the gear-driven spools 10 are implement feeding means 16;16.

Each implement feeding means 16 comprises an elongated flexible element preferably of spring metal of rectangular cross section similar to the fish tapes employed in the cable pullers of the aforesaid Raney U.S. Pat. Nos. 2,556,484 and 2,718,376. The end of one element 16 is secured to a coating test unit 17 such as a contact brush movable lengthwise through the pipe P in contact with the plastic or like coating inside the pipe P. The other element 16 extends into a guide tube 19 and is secured to a marking device 18 which is guided along the guide tube 19 for movement longitudinally along the outside of the pipe P, said marking device 18 comprising, for example, a felt tip pen operated by solenoid 20 to place a mark on the pipe P whenever the contact brush 17 detects a flaw in the plastic coating inside the pipe P.

The implement operating means 14 and 15 herein comprise electric cables to supply electric power to the bristles of the contact brush 17 and to the solenoid 20 of the marking device 18.

Between the spools 6 and 7 and the respective implements 17 and 18 there are provided suitable accumulators or festoon units 21 and 22 to compensate for the changing diameters of the elements 14 and 15 as unwound from and rewound onto the spools 6 and 7.

In use, when the motor 3 is energized to drive the spools 6, 7, and 10 in a counterclockwise direction, as viewed in FIG. 2, the respective implements 17 and 18 will be moved lengthwise within and along the pipe P. When the contact brush 17 comes into an area of the pipe P where there is an aperture in the plastic coating, or where the coating is thinner than desired, there will be current leakage thereat into the metal of the pipe P and when that occurs, a relay or the like (not shown) will be actuated to conduct electric current through the marker operating element 15 to energize the solenoid 20 thereof to mark the location of the flaw. As evident, flaw detection and marking may be done in both directions of movement of the contact brush 17 and marking device 18.

One feature of the present invention is that the drive motor 3 is equipped with a disk brake 32 or the like operated by solenoid 34 (see FIG. 5), the brake 32 being applied when the element 16 is pulled to the right as viewed in FIG. 1 to a predetermined extent. The brake operator comprises a sleeve member 23 biased by spring 24 to the position shown in FIG. 2. The feeding element 16 is provided with an enlargement 25 adjacent its end, and when said enlargement 25 contacts the flexible extension 26 attached to the end of the sleeve member 23, the latter is moved to the right to open the limit switch 27 to deenergize the drive motor 3 and to deenergize the solenoid 34 whereby the spring 33 applies the motor brake 32 as

hereinafter explained in detail in connection with FIG. 5. The sleeve member 23 and flexible element 26 may move a substantial distance compressing the spring 24 thus to avoid shock loads on the element 16 at the end of the pull stroke.

In the event that the implement 17 encounters an obstruction in the pipe P there is provided between two guide rollers 12 in the housing a spring-loaded roller 28 which, upon predetermined arching of the element 16 opens the limit switch 29 to deenergize the motor 3 and to deenergize the solenoid 34 to apply the brake 32.

FIG. 4 illustrates a novel contact arrangement for achieving operation of the drive motor 3 in opposite directions to push and to pull the implements 17 and 18. This reversing control comprises brushes 30 and 31 on a brush holder 35 which may be swung by handle 36 between the solid line pull position and the dot-dash line push position. On the brush holder 35 are auxiliary contacts 37 and 38 which cooperate with stationary contacts 39 and 40 as shown in FIGS. 4 and 5.

Referring now in detail to FIG. 5, the circuit is shown in the PULL position (handle 36 in solid line position of FIG. 4) with the motor 3 energized through closed contactor 41 of the solenoid 42 to drive the spools 10 in clockwise direction (FIG. 2) to pull in the elements 16. When the limit switch 27 is opened by movement of sleeve member 23 as previously described, the solenoid 42 is deenergized to move the contactor 41 downwardly to open the motor circuit and to deenergize the brake solenoid thus to apply the motor brake 32 through spring 33. In this way, the pulling operation is discontinued before the sleeve member 23 reaches the limit of its rightward movement.

When it is desired to push the implements 17 and 18, the handle 36 of the brush holder 35 is shifted to the dot-dash PUSH position (FIG. 4) to open the contacts 38 and 40 and to close the contacts 37 and 39 whereby solenoid 42 is energized to move contactor 41 upwardly to close the motor and brake solenoid circuit. In the event that the implement 17 encounters an obstruction, the element 16 will arch at the spring-loaded roller 28 to open the limit switch 29 thus to deenergize the solenoid 42 to open the motor and brake solenoid circuit.

A remote control switch 43 may be provided as shown in FIG. 5 to stop the pushing or pulling of the elements 16 at any time.

With reference to FIG. 6, this shows a single feeding element 16 and adjacent implement and marker operating cables 14 and 15 for testing the coating on an exteriorly coated pipe P and marking the exterior to denote the location of a flaw or flaws in the coating. In this case, the high-voltage testing element 42 is in the form of a ring contact brush around the externally coated pipe making contact with the coating and being fed along with the marker by the single feeding elements 16. Connected to the testing element 44 is the high-voltage cable 14 which is unwound and rewound onto the spool 6. The marking device 18 is also connected to element 16, the cable 15 on spool 7 supplying electric current for energizing the solenoid 20 for the marking pen. In use, if the current leaks through the coating to the metal of the pipe due to insufficient thickness of the plastic coating or to an aperture in the coating, the current leakage will effect actuation of the marker 18 whereby the felt tip marker pen or the line will place a mark on the pipe P. If the tester 17 and marker 18 are offset as shown, the flaw will be a specified distance to the left of the mark placed on the pipe P. If desired, a time delay dashpot or the like may be provided in the marker solenoid 20 calibrated according to the lineal speed of the testing device so that the mark will be placed at substantially the location of the flaw in the pipe coating.

Referring now to FIG. 7, the implement there shown is a compressed air spray gun 45 which is connected to element 16 and which is fed thereby longitudinally into and from a length of pipe P which it is desired to interiorly coat. Connected to the spray gun 45 and to the respective spools 46 and 47 are air supply and paint supply hoses 48 and 49. The painting operation is preferably effected during the pull stroke of the feeding element 16. It is to be understood that instead of an air spray gun 45, the spray gun may be the airless spray type in which case, no air supply hose is needed. Likewise, if the spray gun has its own paint supply reservoir only the air supply hose need be connected to the gun. Furthermore, if the spray gun is of the electric type and contains its own paint reservoir and pump, the operating element may be an electric conductor to actuate the electric motor or vibrator contained within the spray gun. Similarly, it will be apparent to those skilled in the art that electrostatic painting means may be provided if desired wherein the pipe wall is charged to attract paint particles from the spray gun.

It is also to be understood that the implement attached to flexible element 16 may be a pipe cleaning or scraping element and in that case the operating element may be an electric cable or a hose for washing fluid as desired, the electric cable being operative to control a motor or the like associated with the cleaning or scraping element.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

We therefore, particularly point out and distinctly claim as our invention:

1. In combination, spool means having an elongated element spirally coiled therearound; a housing journaling said spool means and rotatably embracing the outer convolution of said element and having a passage through which said element is adapted to be payed out and to be pulled in responsive to rotation of said spool means in opposite directions in said housing; a reversible electric drive motor operatively connected to said spool means thus to rotate said spool means in opposite directions in said housing; movable means mounted at the passage of said housing, being urged in the direction of payout of said element and adapted to be moved inwardly with said element upon engagement with an enlargement thereon; normally closed switch means operatively located in the path of movement of said movable means and adapted to be opened upon predetermined pulling in of said element to open the drive motor circuit; a member mounted in said housing, being urged against the outer convolution of said element and adapted to be moved away therefrom upon arching of said element away from said spool means due to resistance to payout; another normally closed switch means operatively located in the path of movement of said member and adapted to be opened upon predetermined arching of said element to open the drive motor circuit; and reversing switch means controlling the direction of operation of said motor having auxiliary push and pull contacts operative with the setting of said reversing switch means to permit closing of said motor circuit only in the push position when said normally closed switch means are open and only in the pull position when said another normally closed switch means are opened, as aforesaid.

2. The combination of claim 1 wherein said reversing switch comprises a brush shifting device for altering the energization of said drive motor, said push and pull contacts being integral with said brush shifting device and operative therewith to open and closed conditions.

3. The combination of claim 2 wherein said brush shifting device comprises a pair of concentric relatively rotatable members and said push and pull contacts comprise pairs of contacts mounted on said rotatable members, being adapted for overlapping engagement to establish electrical continuity.

4. The combination of claim 3 wherein said relatively rotatable members comprise first and second concentric rings, said first ring supporting contact devices for engagement with brushholders and for engagement with movable contacts, and said second ring supporting said brushholders and said movable contacts for cooperation respectively with the commutator of said reversible motor and said contact devices on said first ring, whereby repositioning of said second ring causes completion of the motor circuit in one of the push and pull directions.