SEWER CLEANING MACHINES

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3 Claims.

(CL. 15—104.3)

The invention relates generally to improvements in sewer cleaning machines and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The invention is more particularly concerned with sewer cleaning machines of the type which include a motor driven drum mounted for rotation in a suitable supporting frame. Machines of this type are generally used for relatively heavy work and for removing obstructions from sewer lines of the order of from three to ten inches in diameter and up to several hundred feet in length. In order to provide the necessary power to operate machines of this type, an electric motor is supplied, which, by means of a belt, serves to rotate the drum and through a suitable engaging means applies torque to the cable or sewer rods to which the usual cutting tools or blades are attached.

In order to provide a machine of this type which will be sufficiently rigid and powerful to perform the work for which it is designed, and to house in the drum the necessary long heavy cable, a machine of this type necessarily is rather heavy and awkward to handle. At the same time it is often necessary to move the machine up and down stairs; to turn it on landings of small dimensions; to move the machine to and from trucks which are to transport it from one place to another, and to place the machine in different positions when operating to clean the stoppage from the sewer lines or other conduits.

Machines of this general type, as heretofore constructed, due to the factors before mentioned, usually required more than one man to operate and move the same.

One of the objects of the present invention is to provide a machine of this type which can be moved by one man—thus eliminating the expense involved of having a helper.

Another object of the invention is to provide a sewer cleaning machine of the type mentioned which can be operated in various positions and by a single operator.

A further object of the invention is to provide a drum type sewer machine having a special wheel arrangement for facilitating movement of the machine up and down stairs.

Still another object of the invention is to provide a sewer cleaning machine of the type indicated, having transport wheels so positioned and arranged as to provide a low center of gravity and to present an arrangement in which one set of wheels serves somewhat as a brake when moving the machine up and down stairs.

A further and general object of the invention is to provide a sewer cleaning machine of the drum type which will be adequate to house or contain a long length of cable and in which the various parts shall be so designed as to result in a compact overall size, permitting movement through confined areas and enabling manipulation in close quarters.

The above mentioned objects of the invention, as well as others, together with the advantages thereof, will more fully appear as the specification proceeds.

In the drawings:

FIG. 1 is a perspective view of the machine when resting on its base.

FIG. 2 is a view in end elevation of the machine when viewed in the direction of the arrows 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view through the cable holding drum of the machine, as taken on the line 3—3 and on a scale enlarged over that of FIG. 2.

FIG. 4 is a perspective view of the machine as when being moved on its wheels upon the steps of a stairway.

FIG. 5 is a perspective view of the machine as when placed in position for overhead work of the tool end of the cable thereof.

FIG. 6 is a detail horizontal sectional view taken on the line 6—6 and on a scale enlarged over that of FIG. 2.

FIG. 7 is another horizontal sectional view as taken on the line 7—7 and on a scale enlarged with respect to FIG. 2.

FIG. 8 is a perspective view of a certain leg that is employed in connection with the machine to prevent rearward skidding movement of the machine on its base when feeding the cable back into its drum, and FIG. 9 is a diagrammatic view illustrating the action of the transport wheels when the machine is being moved up or down stairs, as illustrated in FIG. 4.

Referring now in detail to that embodiment of the invention illustrated in the accompanying drawings, the machine embodies an open frame structure preferably made of light tubing and which is indicated as a whole by the numeral 10. The frame comprises pairs of generally U-shaped main and auxiliary frame members 11 and 12 respectively at each side of the machine.

Each U-shaped member 11 comprises a longitudinal base portion 13 and upwardly inclined front and rear legs 14 and 15 respectively.

Each U-shaped member 12 comprises a longitudinal base portion 16 and upwardly inclined front and rear legs 17 and 18 respectively. The base portions of the frame members 11 and 12 are in contact and are joined into a rigid structure, as by welding.

As the base portion 16 of each member 12 is shorter than the base portion 13 of each member 11 the legs 17 and 18 are spaced inwardly from the legs 14 and 15. The upper ends of the legs 15 and 18 of both frame members 11 and 12 are operatively attached to a horizontally disposed shaft 19 arranged in a vertical plane midway between the base members of the frame.

The outer end of the shaft 19 is provided with a rubber bumper 23. On the inner end of the shaft 19 there is mounted, for rotation, a drum structure which is indicated as a whole by the reference numeral 28. The construction of the drum per se and its mounting on the shaft 19 form no particular part of this invention except that it illustrates a drum type structure adapted to house a substantial length of the coil or cable which is used for removing obstructions from sewer lines and other conduits. As shown, the drum 28 comprises an outer drum portion 29 and an inner drum portion 30, thereby defining an annular space 31 in which the coil 32 may be stored, when not in use, and withdrawn therefrom for use in a cleaning operation.

In the operation of the machine the outer drum is positively driven as by means of a motor 33, pulley 34 and belt 35, which is in operative engagement with the outer periphery of the outer drum 29.

The motor 33 is mounted upon a platform 36 adjustably supported from the framing structure of the machine by means of members 38 which telescope into tubular upstanding members 37 which are secured to the machine frame. Thumbcrews 39 serve to lock the parts in adjusted position.

The front end pairs of legs 14 and 17 of the frame are inclined inwardly toward the longitudinal central line of the machine, the top of the legs being attached to opposite sides of the sleeve 37.

FIG. 38 represents a cable or coil distributor which leads from the storage chamber 31 of the storage drum out through the sleeve 37 in which it is rotatably mounted.
3 The distributor includes a straight portion 39 which extends forwardly and a rearwardly and outwardly extending curved portion 40 which opens into the coil storage chamber of the drum. In accordance with conventional practice, one end of the coil is secured to the storage drum, the other end passing out through the distributor member 38. The outer or working end of the coil is provided with a tool 41 of desired construction for working in the sewer line or other conduit from which an obstruction is to be removed.

Sewer cleaning machines of the general construction so far described are known. As explained before, these so-called drum type machines have a substantial length of coil or cable, say on the order of a hundred feet, so that together with the framing, motor, controls and other parts, are of such weight that it has heretofore not been feasible for a single operator to move the machine from place to place and also to operate it.

Transport and other features

The particular features which make it possible for a single operator to transport the machine, to move it up and down stairs, to turn it as necessary on small stair landings, and to position it as necessary for the most convenient operation when cleaning obstructions, will now be described.

Secured to the inner side of the upstanding legs 15 of the base framing, is a transverse axle member 42, on the outer ends of which are journaled traction wheels 43–45. At a higher elevation and on the outer side of the upstanding legs 15–15 there is secured another transverse axle shaft 44, on the outer ends of which are journal traction wheels 45–45. It will be noted that the axle 44 is of smaller length than the axle 42 so as to dispose the traction wheels 45–45 inwardly and in partial overlapping relation with respect to the traction wheels 43–43 carried by the axle 42.

As before explained in a machine of this type, it is necessary to make the machine as compact as possible. In order to move the machine up and down stairs in the manner intended and later to be described in detail, assuming the stairs to be of the usual construction wherein the risers are of the order of 7½ inches and the treads of the order of 9 inches, traction wheels of the order of 6 to 8 inches in diameter have proven most satisfactory. Smaller wheels provide a lower center of gravity, which is desirable in a heavy machine of this type, whereas larger wheels provide a somewhat smoother movement when the machine is being moved up and down stairs. However, for practical purposes, it has been found that a wheel of 8 inches diameter will give a sufficiently low center of gravity and provide for a reasonably smooth movement up and down stairs of conventional tread and riser size. With wheels of the latter size positioned as necessary to provide the desired functioning when moving on the stairs, one pair of wheels overlaps peripheral parts of the other.

However, by making the cross shafts of different lengths, this overlapping of the wheels may occur without interference and without affecting the practical portability of the machine.

Mechanism and means for moving the machine

In order to facilitate movement of the machine by a single operator, a handle structure is provided. The handle structure shown comprises a pair of tubular members 50–50 which are adjustably held in place to permit placement of the handle structure, as shown in FIGS. 1 and 5 when the machine is positioned for operation and in the position illustrated in FIG. 4 when the machine is being transported. That is, to say the transverse handle portion 53 of the handle structure is relatively close to the motor 33 when the machine is set up for operation. In order to provide suitable leverage for moving the machine, the handle structure is extended to the position shown in FIG. 4. It will be understood that the handle structure may be locked in either of the described positions by means of the thumb screws 55–55 and also in intermediate positions, if so desired, better to position the handle for grasping by operators of different stature.

55 Part 51 is welded to uprights 36.

FIG. 6 shows a side elevation of the machine parts and the angular position of the machine when it is being moved up or down stairs. The functioning of the two pairs of wheels, when moving the machine up and down stairs, will be better understood by reference to the diagrammatic view FIG. 9. This view is intended to illustrate, in side elevation, a portion of a conventional stairway in which 70 is a tread portion and 71 a riser portion. As a general rule the tread portion is of the order of 9 inches and the riser of the order of 7½ inches. The wheel arrangement of the machine is designed especially for such a conventional stairway. Assume the machine to be positioned generally as shown in FIG. 4 and the riser 71 to be the first riser. Assume, also, the wheel shown in light full lines to be one of the pair of wheels mostly widely separated and the wheels shown in heavy full lines to be one of the other pair. Then, after a slight rolling action on the heavy line wheel the light line wheel will have been elevated slightly so that the heavy line wheel will find support upon the tread 70 of the stairway. In this position the whole weight of the machine will be supported on the tread 70. By pulling the machine upwardly along a path in which the handle members extend angularly with respect to the inclination of the stairway so that the included angle is of the order of 20 degrees, the light line wheel will roll over the corner 71° and on continued movement will pass to the position which the heavy full line wheel occupies in FIG. 9. At that time the heavy full line wheel of FIG. 9 will have reached the position shown in dotted lines, and movement on the handles of the machine will then move the dotted line wheel to the position shown by the dot and dash lines on the next adjacent tread. A similar action, in reverse, will of course obtain when the machine is being moved downwardly on the stairs.

The description above given is related to the construction, arrangement, size and disposition of the parts which to date has been found best. However, this description is intended to be by way of illustration but not by way of limitation, so long as the same principle of operation is employed. In this connection it has been found for best results in taking the machine upstairs, that the wheels should be of such size, the axes of rotation of the two sets of wheels so positioned and the angle of approach to the riser such that the axis of rotation for the upper set of wheels should be at least as high as the tread of the step next above and preferably slightly higher.

From the foregoing it will be seen that one pair of wheels is practically always in engagement with one of the treads of the stairs. Hence, this serves somewhat as a brake or a support for the load or weight of the machine. As soon as one pair of wheels leaves the tread portion of one stair the other pair of wheels will have engaged the tread portion of the adjacent stair tread, up or down, depending upon the direction in which the machine is being moved.

It will also be noted that the drum, with its load of coil or cable, the motor for driving the drum, the motor plat-
ing of limited size, as would be necessary where a change of direction is required.

While this particular feature has not been illustrated, it will be understood that the lower pair of wheels 43—43 may also be used for moving the machine up or down a ramp. The ramp may be either an inclined sheet structure or may comprise merely a pair of rails spaced apart a proper distance to accommodate the treads spacing of the wheels 43—43.

**Wheel size and spacing**

As before explained, the wheel arrangement and spacing has been designed on the assumption the machine will be moved from time to time up and down stairways in which the risers are of the order of 7½ inches and the treads are of the order of 9 inches. While wheel diameters of various sizes may be used, better results will be obtained if the maximum wheel size is 8 inches and the minimum is 6 inches. The best all around results are obtained with wheels having a diameter of 8 inches.

In a practical embodiment of the invention it has been found that satisfactory results obtain when the axis of rotation of the lowermost pair of 8 inch wheels is located approximately 4½ inches above the bottom of the base part of the frame and the axis of rotation of the upper pair of wheels is located approximately 10½ inches above the bottom of the base part of the machine and approximately 2 inches farther away from the face of the drum than is the axis of rotation of the other pair of wheels.

By offsetting one pair of wheels with respect to the other a close coupled arrangement of wheels is possible.

**Other machine features**

At times the outlet of the sewer line or other conduit, from which an obstruction is to be cleared, may be located at a relatively high level, as illustrated in FIG. 5, wherein 69 is the conduit outlet. In order to hold the machine in the desired position there is provided structure 61 which is part of the motor platform. The structure 61 is formed with angularly disposed sockets 63—63 adapted to receive tubular members 64—66 which are provided with rubber end portions 65—65 for engagement with the floor. The members 64—66 are removable secured by means of thumbscrews 62—62. It will be seen that this structural arrangement permits the positioning of the machine so that the coil projects upwardly, thus making it convenient for the operator to feed the coil manually inwardly and outwardly of the conduit 60, as torque is applied to the coil by means of the rotating drum and the distributor arm of the machine.

As further means of preventing movement of the machine two anktiskid leg members 66—66 are provided. Each member 66 comprises an end portion 67 through which the axle 44 passes and to which the member 66 may be locked in any desired position as by means of the thumbscrew 68. The other end of the member 66 terminates in a rubber foot 69.

When the machine is operating in a normal horizontal position, as indicated in FIG. 1, the leg members 66 are swung downward so that the rubber foot portions 69 engage the floor and assist in preventing the machine from skidding or moving whilst in operation. When the machine is being transported or when operating as in FIG. 5 the leg members 66 are swung to a vertical position, as indicated in FIG. 2.

**Further remarks**

It will be seen from the foregoing that the structure described provides an extremely compact arrangement of the parts, which is important in a machine of this type. Compactness facilitates movement of the machine up and down stairs, enables swinging of the machine on stair landings of small dimensions and also enables the use of the machine in confined quarters. Because of the novel arrangement of the two pairs of wheels, even the relatively heavy machine with its full load of cable or coil may be moved up and down stairs and otherwise easily manipulated by a single operator. The size of the wheels also is such that a relatively low center of gravity results whilst at the same time there is little perpendicular vertical movement of the machine as a whole in moving from step to step. That is to say the arrangement described enables a rather smooth inclined path to be taken by the machine when being moved up and down stairs rather than a series of sharp ups and downs from step tread to step tread. Furthermore, the novel arrangement of the wheel structure is such that one set of wheels is practically always in engagement with one of the treads so that a sort of braking effect results, which gives the operator effective control of the machine.

It is believed that the many advantages inherent in the structure of the present invention will be understood by those skilled in the art, without further description.

I claim:

1. A sewer cleaning machine embodying therein a frame having a base portion adapted to rest on a floor, a coil storage drum, means upstanding from the base portion of the frame mounting the coil storage drum for rotation about an axis of rotation generally parallel to the base portion, transport means for said machine comprising a first pair of laterally spaced wheels, means carried by the frame mounting said wheels for rotation upon a transverse axis of rotation adjacent one end of the machine with the periphery thereof adjacent but slightly above the bottom of said base portion so that such wheels are elevated above a floor upon which said base is rested, a second pair of laterally spaced wheels, means carried by the frame mounting said last mentioned wheels on a transverse axis of rotation higher than that of the first pair of wheels but at the same end of the machine, and means comprising a handle structure for manipulating the machine, said handle structure being positioned at the same end of the machine as said two pairs of wheels and extending substantially normal to the axis of rotation of the storage drum, whereby said frame may be pivoted by means of said handle to place the full weight of said frame upon said first pair of wheels for rolling transport.

2. A sewer cleaning machine embodying therein a frame having a base portion, a coil storage drum, means upstanding from the base portion of the frame mounting the coil storage drum for rotation upon an axis of rotation generally parallel to the base portion, transport means for said machine comprising a pair of laterally spaced wheels, means carried by the frame mounting said wheels for rotation upon a transverse axis of rotation adjacent one end of the machine with the periphery thereof adjacent the bottom of the frame base, a second pair of laterally spaced wheels, means carried by the frame mounting said last mentioned wheels upon a transverse axis of rotation higher than that of the first pair of wheels but at the same end of the machine, means located at the same end of the machine as said transport means, extending substantially normal to the axis of rotation of the coil storage drum, and comprising a handle structure for manipulating the machine so that both pairs of wheels engage the floor, means spaced from the wheels and functioning when the base is in an upstanding position proppingly to support that part of the machine which comprises the upper part of the machine when the base is horizontally disposed, and additional means for resisting shifting movement of the machine responsive to thrust forces developed during operation.

3. A sewer cleaning machine embodying therein a frame having a base portion, a coil storage drum, means upstanding from the base portion of the frame, mounting the coil storage drum for rotation upon an axis of rotation generally parallel to the base portion, transport means for said machine comprising a pair of laterally spaced wheels, means carried by the frame mounting said wheels for rotation upon a transverse axis of rotation adjacent one end of the machine with the periphery thereof adjac-
cent the bottom of the frame base, a second pair of laterally spaced wheels, means carried by the frame mounting said last mentioned wheels upon a transverse axis of rotation higher than that of the first pair of wheels but at the same end of the machine, means located at the same end of the machine as said transport means, extending substantially normal to the axis of rotation of the coil storage drum, and comprising handle structure for manipulating the machine so that both pairs of wheels engage the floor, means spaced from the wheels and functioning when the base is in an upstanding position propingly to support that part of the machine which comprises the upper part of the machine when the base is horizontally disposed, and additional means for resisting shifting movement of the machine responsive to thrust forces developed during operation, said additional means being mounted for swinging movement on a horizontal axis of rotation and including means for securing it in a plurality of different positions.

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