

May 1, 1951

W. RIMANN
SEWAGE DISPOSAL SYSTEM

2,551,395

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Fig. 1.

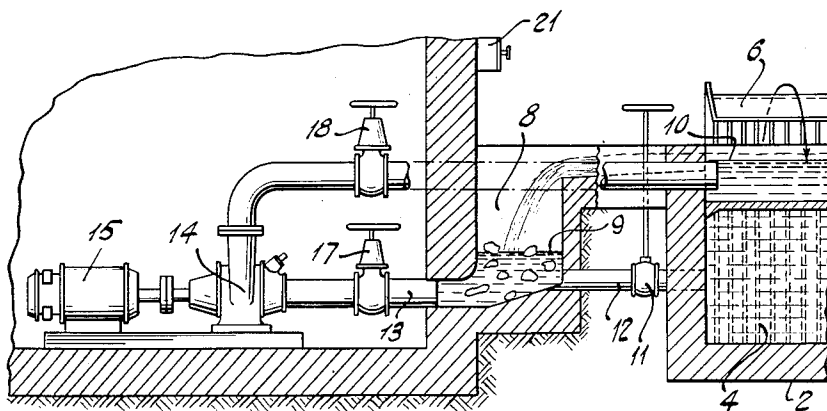
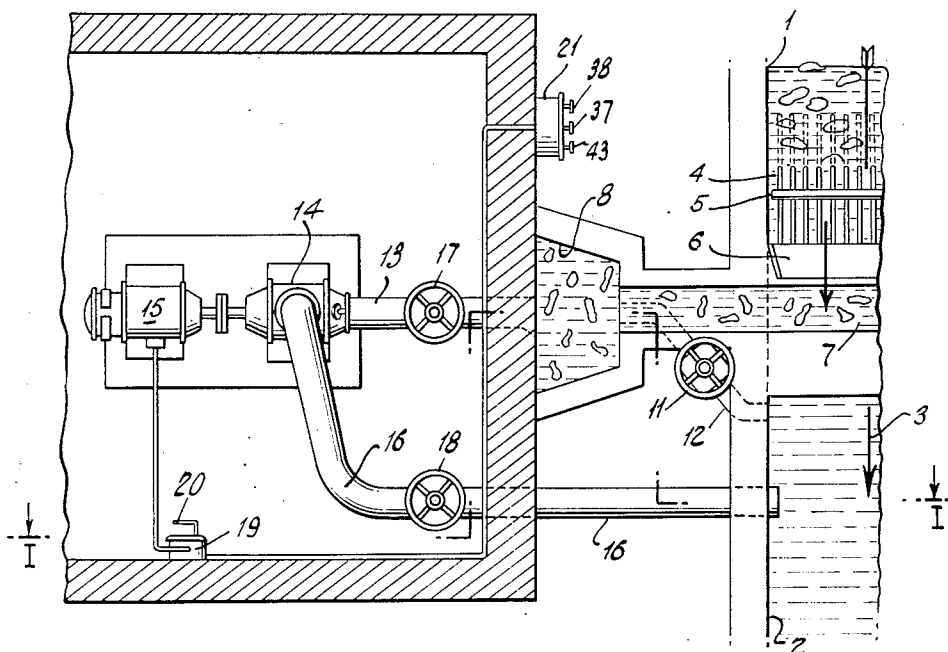


Fig. 2.



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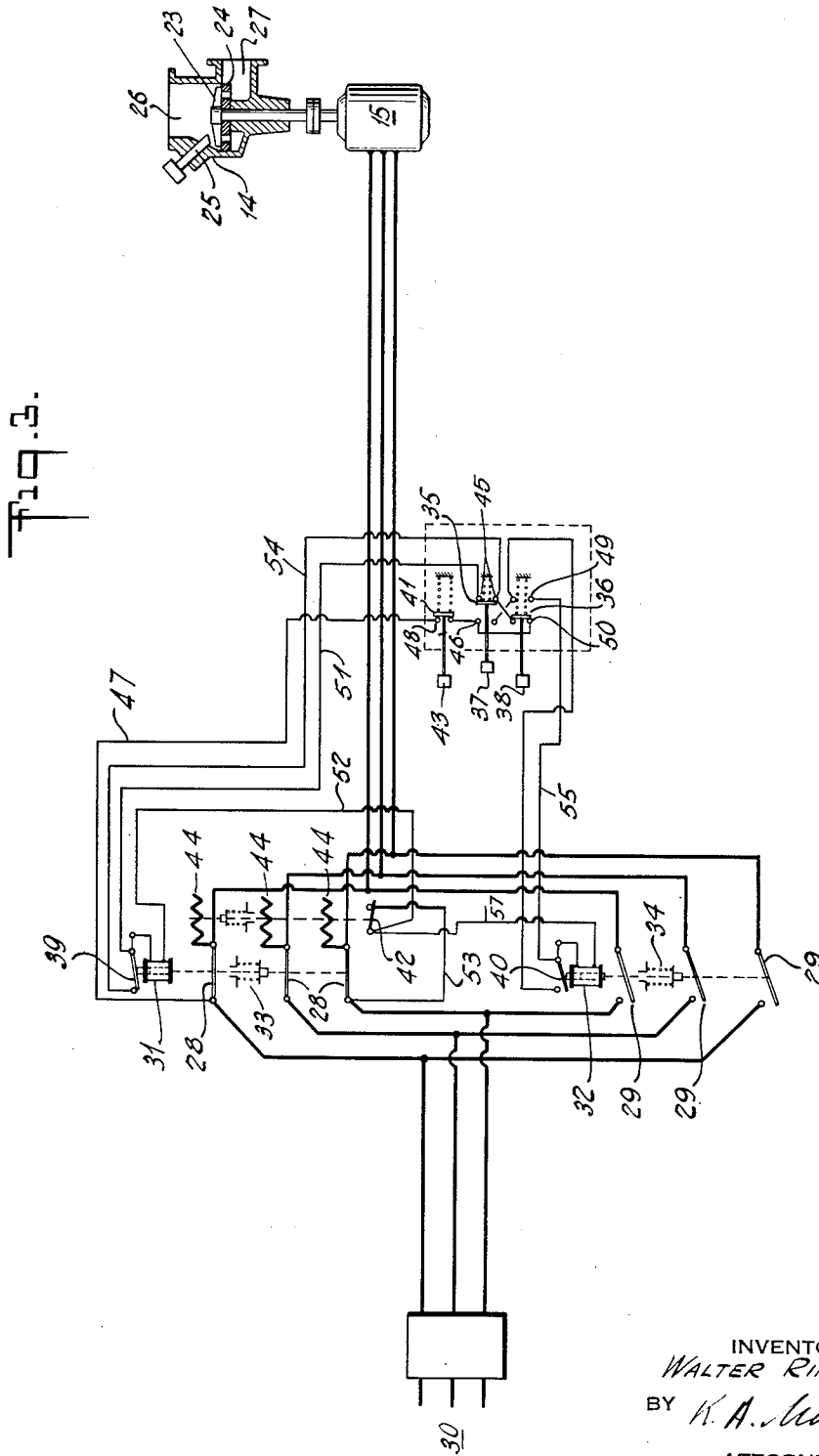
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Fig. 5.

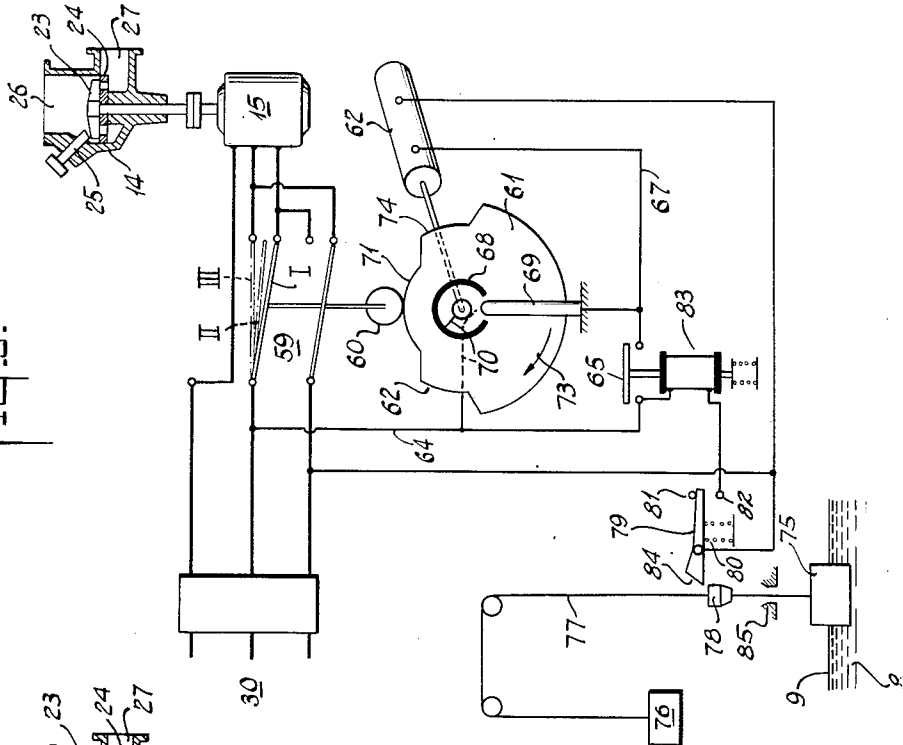
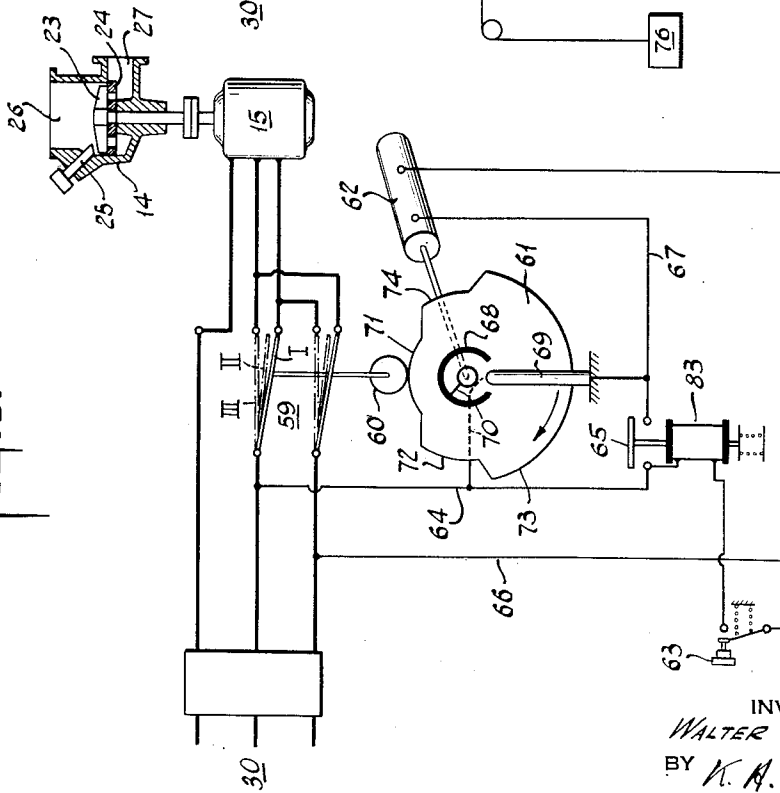


Fig. 4.



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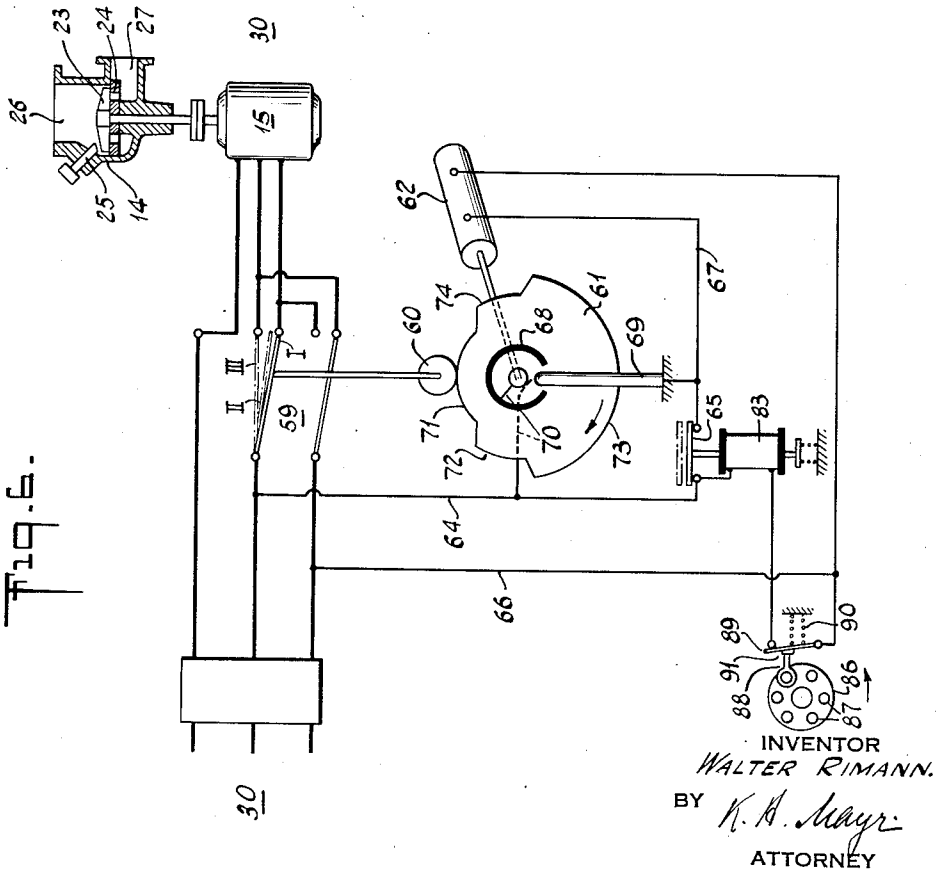
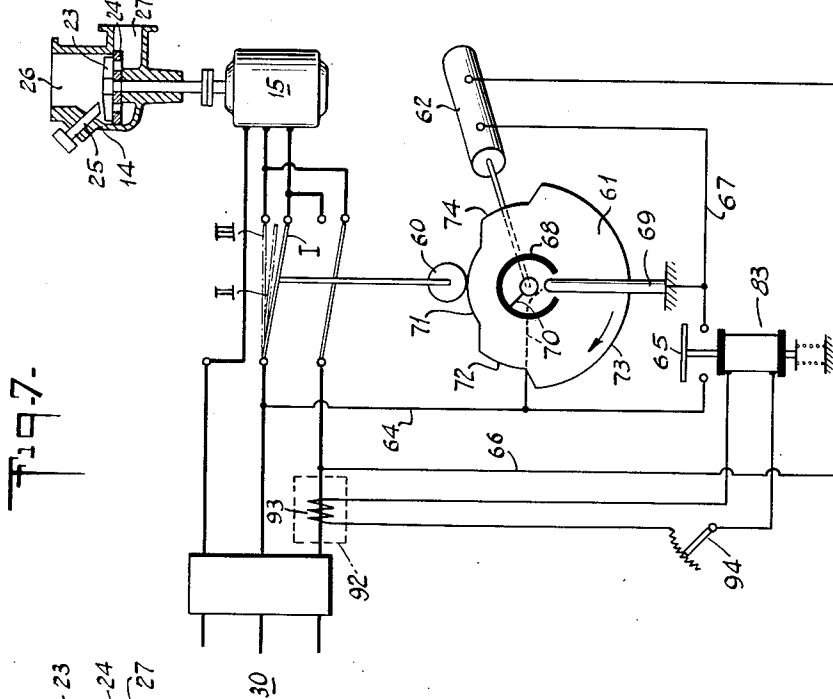
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SEWAGE DISPOSAL SYSTEM

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4 Claims. (Cl. 318-482)

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The invention relates to sewage disposal systems having a disintegrator with cutting device for reducing the size of the particles of the solid matter carried in the sewage and includes means for temporarily reversing the operation of the disintegrator to loosen periodically the substance adhering to the cutting device and thus prevent the disintegrator from becoming choked. An object of the invention consists in the provision of controlling means for the operation of the cutting device, through which a temporary backward motion of the cutting device is effected.

The system according to the invention comprises an open container communicating with the intake of the disintegrator and receiving lumpy, solid matter and liquid separated from the main stream of sewage. The disintegrator discharges into the sewage stream after the point where the solid matter and a portion of the liquid has been separated. If the disintegrator becomes clogged the liquid level in the container rises. The control means for temporarily reversing the operation of the disintegrator are either automatically operated in dependence on the liquid level in the container or, if manual operation is preferred, are placed in a position where the operator can see the liquid level in the container. Other modifications of the invention include automatic clockwork controlled means for reversing the rotation of the motor operating the disintegrator at regular, predetermined time intervals and for regular, predetermined periods, for operating the motor reversing means in dependence on the strength of the current flowing through the motor, and for semi-automatic operation of the reversing means whereby reversing of the motor is actuated by manual operation of a push button and is automatically continued for a predetermined period, whereafter the motor is automatically stopped and restarted to normal operation.

An object of the invention resides in the provision of a cam operated main switch of the motor for the disintegrator, whereby the cam is operated by an auxiliary electric motor and comprises a portion holding the main switch in position for normal operation, another portion for positioning the main switch for reversed operation of the motor, and intermediary portions for positioning the main switch for stopping the motor between normal and reversed operation.

On the drawing examples of arrangements according to the invention are illustrated diagrammatically.

Figs. 1 and 2 show a plant for reducing the

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size of solid matter contained in town sewage in part sectional elevation and plan view, respectively,

Fig. 3 shows a disintegrator in section, an electric motor therefore, and a wiring diagram for push button control of the plant,

Fig. 4 illustrates a hand operated switch gear with automatic reversing,

Fig. 5 illustrates an actuating mechanism for the switch gear in response to a certain liquid level,

Fig. 6 shows a switch gear actuated by a time switch, and

Fig. 7 a switch gear actuated according to the output.

Referring more particularly to Figs. 1 and 2, a channel serves for conducting the sewage from a municipal system of sewers to one or more settling tanks 2, from which the settled mud is withdrawn under water and led to closed fermentation chambers, not shown in the drawing. The sewage flows along the channel 1 in the direction of the arrow 3, the larger particles of solid matter carried in the water being held back by the grid 4, so that they can be removed later by the prongs of the cleaning rake 5, and brought through the chute 6 into the channel 7. From the channel 7 the solid particles are washed by means of a stream of rinsing water into the shaft or container 8, whose water level 9 is kept below the water level 10 of the channel 1. The flow from the channel 7 and, if necessary, an additional flow through the pipe 12, controlled by means of the throttle valve 11, are maintained in such a way that it corresponds to the quantity withdrawn from the shaft 8 through the suction pipe 13, with undisturbed working of the disintegrator.

In the case of simply designed sewage plants which have no fermenting chambers, or even allow the sewage to pass direct into the sea, the solid matter cut up by the size-reducing device is worked up into manure or allowed to pass away into the sea.

The disintegrator 14, driven by an electric motor 15, delivers the reduced solid substances together with the water through the delivery pipe 16 to the basin 2. For the pipes 13 and 16, stop valves 17 and 18 are provided. The motor 15 is switched on and off by means of the main switch in the switch box 19 by operating the switch handle 20. In the same way the push button remote control 21 at the shaft 8, which is connected to the switch box 19, serves for operating the main switch.

Instead of the channel 7, a tipping truck service

may be provided, the tipping truck being loaded under the chute 6 with the solid substances, drawn to the shaft 8 and there emptied. Then water is introduced solely through the pipe 12 and regulated by means of the throttle valve 11.

The disintegrator 14, Fig. 3, with the cutting device, the rotating knife 23, the grid 24 and the stationary counter-knife 25, is connected through its intake 26 to the shaft 8, Figs. 1 and 2. The solid substances carried over in the rinsing water are reduced in size by the cutting device 23, 25, Fig. 3, and pass through the grid 24 into the delivery branch 27 and in the delivery pipe 16. The motor 15 drives the rotating knife 23.

With the different character of the substances carried in the water, there occurs not only great wear in the cutting device 23—25, but also a gradual choking which can be only partly prevented by the counter-knife 25, which keeps the upper side of the knife 23 clean. The choking may take place more or less quickly, and even quite suddenly. The choking occurs by substances sticking between the knives 23 and the grid 24 and being carried round with the knives 23, so that disintegration of further substances is more or less prevented.

As soon as choking of the disintegrator device 14 begins, this makes itself perceptible by a rise in the water level 9 in shaft 8, Figs. 1 and 2, and the man in charge, by means of the press button switch 21, causes the motor 15 and the cutting device to be reversed for a short time. Instead of, as hitherto, having to stop the disintegrator device, open it up and clean it by hand, the following simplified operation has been found much more effective: rotation of the knives 23 is not only interrupted at as regular intervals as possible, but also reversed. Thereby any substances stuck between the knives 23 and the grid 24 are loosened very easily and in a very short time. The more often this cleaning is done, the more effective it is, above all if it is done promptly when any choking starts. After running backwards for a short time, mostly for a few seconds, the device 23—25 becomes clean and can again be put into normal service.

As seen in Fig. 3 two main switches 28 and 29 are provided, which switch the motor 15 on to and off from the supply lines 30 and are fitted in the box 19, Fig. 2. With switch 28 closed, as shown in Fig. 3, the motor 15 and the disintegrating device 14 are rotating normally, whilst when switch 28 is opened and switch 29 closed, the device 14 is rotating backwards. The switch 28 is actuated by means of the relay 31 and the switch 29 by means of the relay 32, these relays closing the switches 28 and 29 against the force of compressed springs 33, 34 acting on the switch-bars. The switches 28 and 29 are operated by auxiliary switches 35 and 36 by hand, by means of the push buttons 37, 38. Further, the switches 35 and 36 are also provided with self-holding switches 39 and 40 respectively, and the switches 41 and 42 serve for stopping the motor 15. The switch 41 is actuated by means of the push button 43; the switch 42 is opened by the excess current bobbin 44 if the current exceeds a maximum.

The method of working is as follows:

With the plant at rest, the switches 28 and 29 are open. By pressing the knob 37 the auxiliary switch 35 closes the contacts 45 so that the electric wire 47 is connected through contacts 48 and the closed switch 41, and also through contacts 50 and the switch 36 with the electric wire 51 to the switch 31, and through its bobbin to the wire

52 and through the switch 42 to the wire 53 and thereby to another phase.

The coil of the relay 31 is thereby energized and closes the switch 28 for the motor 15 rotating normally, and at the same time closes also the self-holding switch 39, so that when push button 37 is released, and pressed back to the left by the compressed spring, the switch 35 opens the contacts 45 and closes the contacts 46, the relay 31 receives current through wire 54 and the closed switch 39 which is thereby held in closed position.

For changing the direction of rotation of the motor 15, button 38 is pushed. The switch 36 opens the contacts 50 and thus the wire 54 is disconnected from the wire 47 and the current to the relay 31 is interrupted, the switches 28 and 39 are opened and the motor 15 is without current, so that it comes to a standstill. Only when closing the contacts 49 in the end position of the switch 36, the coil of the relay 32 receives current through the wire 55 and closes the main switch 29 and the self-holding switch 40. In this way, the relay 32 is connected through the wire 56 to the wire 47 and remains closed when the press button 37 is released. The wire 57 connects the relay 32 through switch 42 to wire 53. The motor 15 and the knives 23 then rotate backwards in order to loosen the substances which have become stuck in the knives.

If the man in charge then actuates the push button 37, the motor and knives are again switched in to rotate in the manner described. The operator can stop the disintegrator 14 with the help of push button 43, since switch 41 interrupts the current for both relays 31 and 32. The excess-current coils open switch 42 if the current to motor 15 exceeds a predetermined maximum. This would occur if the demand for power of the device 14 became too great in consequence of sudden choking, and the motor would be overloaded. When opening the switch 42, the relays 31 and 32 descend and the main switch 28 is opened.

Instead of changing the direction of rotation by hand, a device as shown in Fig. 4 effects this change automatically. The motor 15 is supplied with current from the network 30 and a main switch 59 is provided in the conduits, which in the two positions I and III interchanges two phases with each other, whilst in the position II the current is interrupted. The switch 59 is controlled by the cam 61 through the roller 60, the cam being driven by the control motor 62 as soon as the man in charge operates the hand switch 63 and thus closes the electric circuit through the wire 64, the bobbin of the relay 65 and the wire 66. The relay 65 then connects wire 64 to wire 67. Relay 65 remains closed only as long as the hand switch 63 is closed and turns motor 62 until connection is made between conduits 64 and 67 through conduit 70, contact strip 68 and contact member 69.

By rotation of cam 61 by motor 62 in the direction of the arrow roller 60 leaves track 71, comes on to track 72 and turns switch 59 into the position II. Thus current to motor 15 is cut off, so that it can come to rest. When cam 61 is rotated further, the roller 60 is raised on to track 73 and the switch 59 comes into position III. In this way the connections of the motor 15 to the two phases are interchanged and motor 15 drives the knife 23 backwards. This continues until the cam track 73 has all rotated under the roller 60 and the latter comes on to track 74; the switch 59 then again stands in the position II and cur-

rent to the motor 15 is interrupted for a short time. The roller 60 then descends on to track 71, and the switch again comes into position I, and the cutting device 23 is driven in the normal direction of rotation. Since the cam 61 has then turned through 360°, the fixed contact 69 has left the contact strip 63 and motor 62 together with cam 61 come to rest. Consequently from that time motor 15 continues to run in the normal direction of rotation until the hand switch 63 is again operated.

In Fig. 5 the switching-in of the motor 62 is controlled automatically in accordance with the liquid level 9, for instance in the shaft 8, Fig. 1, which communicates with the intake of the disintegrating device 14. If the device becomes choked, and the delivery from it diminishes, the liquid level 9 rises, the float 75 also rises and the rope 77, loaded with the suspended weight 76, operates the switch lever 79 by means of the stop 78. The lever 79 is removed from the stop 81 against the force of the spring 80 and pressed on to the contact 82, so that coil 83 receives current and closes the relay 65. In this way the control motor 62 is switched on and, in the manner already described, causes the cam 61 to rotate through 360°, thus bringing switch 59 from position I into positions II and III and back into position I. Continued rise of the liquid level 9 causes stop 78 to pass lever 79.

By that time, however, the aforescribed operations are completed and the cleaned disintegrating device acts again with undiminished throughput. The liquid level 9 in shaft 8 again falls to its proper value, so that float 75 and the stop 78 descend. In consequence of the yielding of the rope 77, the stop 78 now slides along the sloping edge 84 of the lever 79 into the position shown in the drawing, which is defined by a guide 85 for the rope 77.

In the arrangement according to Fig. 6 the motor 62 is actuated in dependence on a time switch whose disc 86 is driven by a clockwork (not shown) and makes a complete revolution within a certain time, for instance in 15 minutes. The disc 86 rotates in the direction of the arrow; in one of the holes 87 a pin 88 is inserted which, in the position shown in the drawing, keeps the switch 89 closed against the force of the spring 90. Because of this, the relay 65 closes the circuit and current is supplied to the motor 62. Consequently the cam 61 turns once through 360° in the manner described, whereby the motor 15 is caused to run backwards for a short time, whilst it runs in the normal direction for the rest of the time. As soon as the pin 88 is rotated past the cam 91, switch 89 is again opened by the spring 90.

If the disc 86 is driven by means of a reduction gear from the shaft of the motor 15 instead of from a time switch, the switching takes place in dependence on a certain number of turns of the cutting knife 23.

In the system shown in Fig. 7 the switching is effected when the torque of the motor 15 rises beyond a definite value, since the power required by the cutting knife 23 has increased in consequence of the choking. For this purpose a power meter 92 is fitted into one phase, its coil 93 being excited proportionally with the current passing through that phase to the motor 15. At a certain value of this excitation, which may be altered by means of the adjusting resistance 94, the coil 83 of the relay 65 is so strongly excited that the relay 65 closes, motor 62 receives current and the cam 61 is rotated. When the motor 15 is

switched off by switch 59, the coil 93 is without current and the relay 65 opens. Meanwhile however, the contact member 69 has been connected to wire 64 through the strip 62.

The invention is not confined only to municipal or other waste water or sewage plants, but may be adopted wherever the substances carried over in a liquid must for any reason be reduced in size.

I claim:

1. A control system for the electric motor driving a sewage disintegrator, said system comprising an electric wiring system including a main switch having three operating positions: one in which the motor is rotated in normal operating direction, one in which no current is supplied to the motor, and one in which the motor is rotated oppositely to normal operating direction, a mechanism connected to and actuating said main switch, an auxiliary motor operating said mechanism, electric wiring connected with said auxiliary motor and including a momentary switch for starting said auxiliary motor and a rotating contact switch connected to and operated by said auxiliary motor and continuing supply of current to said auxiliary motor when said momentary switch is reopened, said rotating switch comprising disconnecting means for interrupting current supply to said auxiliary motor when said main switch is in normal main motor operating position said mechanism comprising a cam roller connected with said main switch, and a cam member engaging said roller and being connected to and rotated by said auxiliary motor, the rotating part of said contact switch being mounted on said cam member.

2. A control system as defined in claim 1, said cam member comprising a cam portion for holding said roller and main switch in position for normal operation of said main motor, and comprising another cam portion disposed substantially diametrically opposite said first cam portion for holding said roller and main switch in position for reverse operation of said motor.

3. A control system as defined in claim 2, said cam member comprising two additional cam portions interposed between said first and said other cam portion for holding said roller and main switch in position where no current is supplied to the motor of said disintegrator.

4. A control system for the electric motor driving a sewage disintegrator, said system comprising an electric wiring system including a main switch having three operating positions: one in which the motor is rotated in normal operating direction, one in which no current is supplied to the motor, and one in which the motor is rotated oppositely to normal operating direction, a mechanism connected to and actuating said main switch, an auxiliary motor operating said mechanism, electric wiring connected with said auxiliary motor and including a momentary switch for starting said auxiliary motor and a rotating contact switch connected to and operated by said auxiliary motor and continuing supply of current to said auxiliary motor when said momentary switch is re-opened, said mechanism comprising a cam roller connected with said main switch, and a cam member engaging said roller and being connected to and rotated by said auxiliary motor and comprising a cam portion for holding said roller and main switch in position for normal operation of said main motor, said rotating switch comprising disconnecting means so connected with said cam member as to inter-

rupt current supply to said auxiliary motor when said roller is on said cam portion.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,648,680	Given	Nov. 8, 1927
1,919,525	Nogosek	July 25, 1933
2,156,075	Alexay	Apr. 25, 1939
2,232,545	Lum	Feb. 18, 1941
2,270,696	Brentz	Jan. 20, 1942
2,295,391	Durdin	Sept. 8, 1942
2,343,951	Blodgett	Mar. 14, 1944