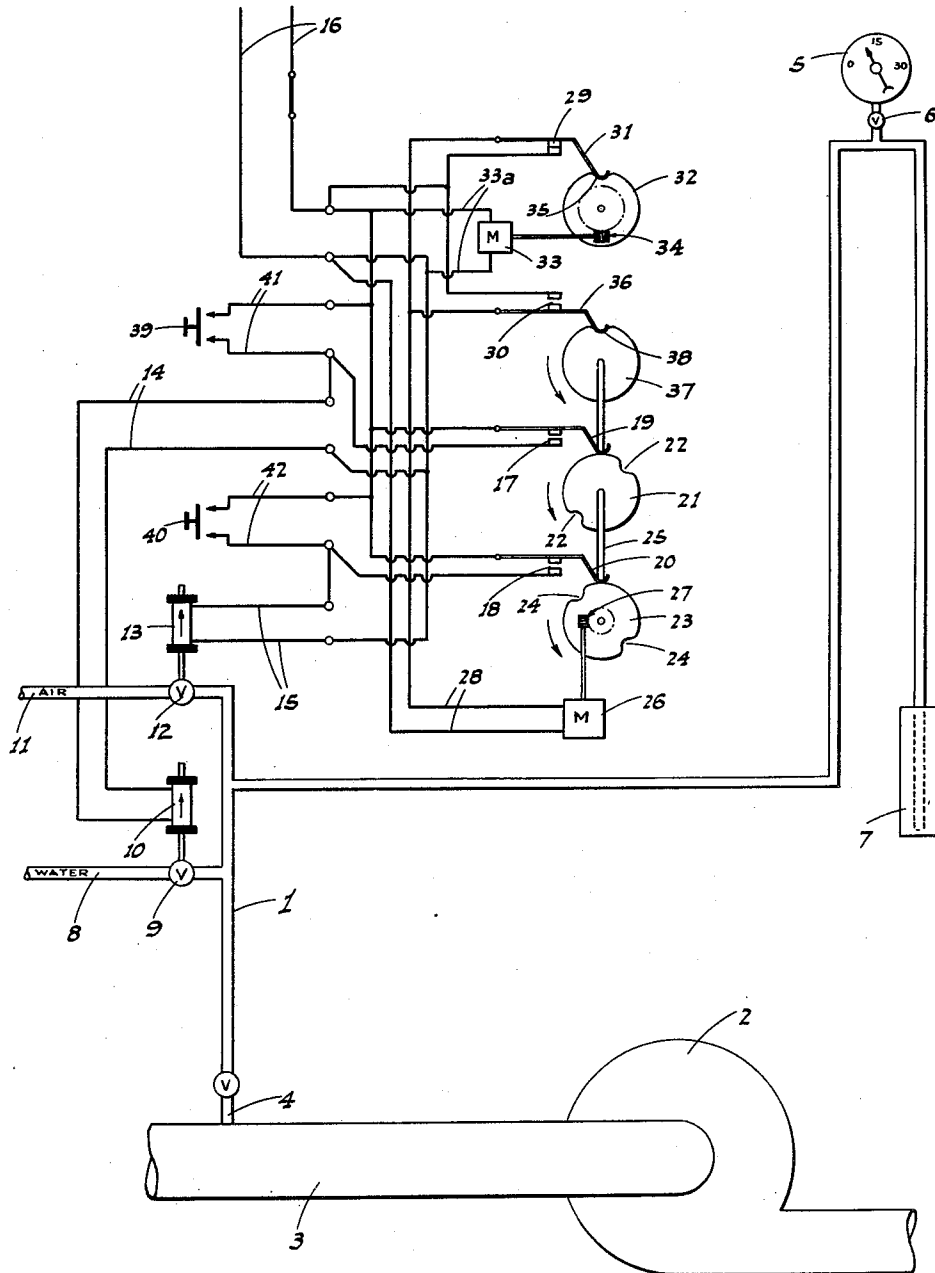


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AUTOMATIC FLUSHING SYSTEM FOR GAUGE
PIPES ON SUCTION DREDGES
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AUTOMATIC FLUSHING SYSTEM FOR
GAUGE PIPES ON SUCTION DREDGES

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This invention relates to, and it is an object to provide, a novel automatic system operative to periodically flush the vacuum gauge pipe on a suction dredge or the like.

The vacuum gauge pipe which leads from the suction pipe on a dredge tends to plug with sand, silt, or debris, due to a pumping action resulting from the fluctuation of the vacuum when the suction pump is working; such pumping action forcing the foreign matter into the vacuum gauge pipe, especially adjacent the dredge suction pipe, even though the former be above and mounted in an upstanding position.

It is therefore another object of the invention to flush such foreign matter out of the vacuum gauge pipe by introducing water, followed by air, into said pipe, at a point beyond that at which plugging tends to occur.

Another object of the invention is to provide a novel automatic control mechanism for the water and air supply valves which the system includes; such mechanism being electro-mechanical and periodically actuating said valves in predetermined timed order.

A further object of the invention is to provide an automatic flushing system, for the purpose described, wherein said control mechanism works through a cycle whose steps are in response to actuation of a plurality of switches; said switches being actuated in predetermined timed order by a novel assembly of motor driven cams.

An additional object of the invention is to provide the system with a novel control circuit which includes said switches.

It is also an object of the invention to provide an automatic flushing system designed for ease and economy of manufacture and installation; the system—when in use—functioning smoothly without manual attention.

Still another object of the invention is to provide a practical and reliable automatic flushing system for gauge pipes on suction dredges, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

The figure of the drawing is a diagrammatic representation of the system with the parts of the control mechanism in the positions occupied thereby at the moment of starting of a flushing cycle.

Referring now more particularly to the char-

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acters of reference on the drawings, the novel, automatic flushing system is here shown as arranged in connection with the vacuum gauge pipe 1 of a suction dredge which includes a pump 2 and a suction pipe 3; the intake end 4 of the vacuum gauge pipe 1 being connected in communication with said suction pipe 3.

At a point remote from the suction pipe 3 the vacuum gauge pipe 1 has a vacuum gauge 5 connected thereto with a hand valve 6 between said gauge and pipe. Additionally, in certain installations the vacuum gauge pipe 1 may lead to a mercury type contacting or switch manometer, indicated generally at 7, and which may be used to control a safety relief valve on the dredge, as in copending application Serial No. 783,738, filed November 3, 1947.

Even though the portion of the vacuum gauge pipe 1 adjacent the suction pipe 3 is above the latter and upstands therefrom, there is a tendency for sand, silt, and small particles of debris to enter such vacuum gauge pipe, tending to plug the same. This plugging is caused by pumping action, with respect to the vacuum pipe 1, resulting from fluctuation of vacuum in the suction pipe 3. Unless the material which will ultimately cause a plug is periodically flushed out of the pipe 1, an improper reading is had at the vacuum gauge 5, and also the safety relief valve mechanism which is responsive to the manometer 7 will not function properly.

In order to maintain the vacuum gauge pipe 1 free of plugging, and lively, the following automatic flushing system is employed:

A water pipe 8 is connected to the vacuum gauge pipe 1 some distance from the intake end 4 of the latter; the pipe 8 being adapted to supply water, from a source not shown, to the pipe 1.

A valve 9 of electrically actuated type, including a solenoid 10, is interposed in the water pipe 8; such valve 9 normally being closed.

An air supply pipe 11 connects with the vacuum gauge pipe 1 beyond the water supply pipe 8, i. e. in the direction opposite the intake end 4 of the vacuum gauge pipe 1; the pipe 11 having a valve 12 of electrically actuated type, including a solenoid 13, interposed therein, and the valve 12 is normally closed.

The solenoids 10 and 13 are each connected to an energizing circuit; said circuits being indicated at 14 and 15 respectively.

The energizing circuits 14 and 15 connect to a main current supply circuit 16, the circuits 14 and 15 each having a separate switch therein,

as at 17 and 18 respectively. The switches 17 and 18 are normally open but are adapted to be closed, in predetermined succession, by the following motor driven, switch actuating cam assembly.

The switches 17 and 18 are of spring closing type and include control fingers 19 and 20 respectively.

The control finger 19 runs on a rotary cam 21 having opposed peripheral notches 22; the switch 17 closing each time that the finger 19 falls into one of the notches 22.

Similarly, the finger 20 of the switch 18 runs on a rotary cam 23 having opposed notches 24; the switch 18 closing each time that the finger 20 falls into one of the notches 24.

The rotary cams 21 and 23 are fixed on a drive shaft 25 actuated from a motor 26 through suitable slow speed driving connections 27.

The motor 26 is connected to an energizing circuit 28; this energizing circuit 28 being closed, periodically, and for a certain length of time, in the manner hereinafter described.

The cams 21 and 23 are circumferentially staggered on shaft 25 so that when the motor 26 is in operation, the notches 22 of the cam 21 lead or run ahead of corresponding notches 24 of the cam 23. Consequently, with each half revolution of these cams the switch 17 is first closed, causing opening of the water valve 9 and water flow from the pipe 8 into the vacuum gauge pipe 1. The switch 17 remains closed only a few seconds and then opens, being followed, after a slight time lag, by closing of the switch 18.

When the switch 18 closes, as above, the valve 12 is opened so that air feeds from the pipe 11 into the vacuum gauge pipe 1 for a few seconds whereupon the switch 18 opens.

This sequence of operations occurs twice with each full revolution of the shaft 25 and the cams 21 and 23 thereon, with the introduction of air following the introduction of water during each operation.

The recurrent successive introduction of water and air into the pipe 1, periodically, assures that said pipe 1 remains open or clear for proper and effective operation of the vacuum gauge 5 and manometer 7.

In order to cause the desired periodical operation of the motor 26, the following motor driven timing switch assembly is employed in connection with the energizing circuit 28.

The energizing circuit 28 is connected to the main current supply circuit 16, and said circuit 28 includes a pair of switches interposed therein in parallel; said switches being indicated at 29 and 30.

The switch 29 is of spring-closed type and includes a finger 31 which runs on a rotary timing cam 32 constantly driven from a motor 33 by means of driving connections 34. The timing motor 33 is energized by a circuit 33a connected to the main current supply circuit 16, as shown. The switch 29 closes when the finger 31 falls into a notch 35 in the cam 32; such cam being driven at a very slow speed, say one turn every thirty minutes. This determines the periods of operation of the flushing system.

When the switch 29 closes, the energizing circuit 28 is likewise closed, whereby the motor 26 begins one cycle of operation which includes one revolution of the shaft 25 and cams 21 and 23.

In order to prevent breaking of the energizing circuit 28 as the rotary timing cam 32 continues to travel and the finger 31 escapes the notch 35,

with resultant opening of the switch 29, the following holding arrangement is employed:

The switch 30 may be termed the holding switch, and it is of spring-opened type, including a finger 36 which rides a rotary cam 37, the latter including a notch 38. At the start of each cycle the finger 36 is engaged in the notch 38 whereby the switch 30 is open. The cam 37 is fixed on the shaft 25 so that soon after motor 26 begins to run, the finger 36 escapes the notch 38 and closes the switch 30, whereby the latter will remain closed for substantially a full revolution of said shaft 25 and the cams thereon. Thus, when the switch 29 is opened by the spring finger 31 riding out of the notch 35, the energizing circuit 28 nevertheless remains closed, for the reason that in the interim the holding switch 30 has closed and come into play.

After the shaft 25 and cams thereon make one revolution, with attendant cycle of the switches 17 and 18 as described, switch 30 opens by finger 36 dropping into notch 38 and the motor energizing circuit 28 is likewise opened and so remains until switch 29 closes after lapse of the predetermined period of time required for rotation of slow speed cam 32 through a full turn. During this lapse of time the cams 21 and 23 hold switches 17 and 18 open so that the flushing system is then inactive.

The above described flushing system provides a very practical and automatic arrangement for periodically and effectively flushing the vacuum gauge pipe 1 of a suction dredge or the like.

While the system is intended primarily for automatic operation, it may be desired—under certain working conditions—to manually cause the solenoids 10 or 13 to open the valves 9 or 12 respectively. To this end hand switches 39 and 40 are connected in parallel, as at 41 and 42, with the circuits 14 and 15, respectively. By manually closing the switch 39 or the switch 40, the water valve 9 or the air valve 12 may be caused to open. This opening may be in such timed succession as the operator may desire.

From the foregoing description it will be readily seen that there has been produced such a system as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the system, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. A flushing system for a gauge pipe or the like subjected to plugging with foreign material, comprising a water supply pipe connected to the gauge pipe, a valve in the water supply pipe, an air supply pipe connected to the gauge pipe, a separate valve in the air supply pipe, said valves being of electro-actuated type, an energizing circuit for each valve including a switch, a motor driven switch actuating cam assembly adapted to work said switches in timed order through a predetermined cycle, an energizing circuit for the motor of said switch actuating cam assembly, and a motor driven timing switch assembly operative to periodically close said motor circuit for a certain time; said motor driven timing switch assembly including a switch in said motor circuit operative to remain closed a lesser time than required for said cycle, another switch in parallel

to said last named switch, and means responsive to operation of the motor driven switch actuating cam assembly operative to hold said other switch closed to the end of said cycle.

2. A flushing system for a gauge pipe or the like subjected to plugging with foreign material, comprising a water supply pipe connected to the gauge pipe, a valve in the water supply pipe, an air supply pipe connected to the gauge pipe, a separate valve in the air supply pipe, said valves being of electro-actuated type, an energizing circuit for each valve including a switch, a rotary cam corresponding to and adapted to work each switch, a motor connected to said cams in driving relation thereto, an energizing circuit for the motor, said circuit including a pair of separate switches in parallel, a third cam operative to periodically close one of said separate switches but for a time lesser than required for said cycle, a second motor connected in driving relation with said third cam, and a fourth cam driven by said first named motor arranged to close the other of said separate switches simultaneously with driving of said first two cams and to hold said other separate switch closed to the end of the cycle.

3. In combination with a suction dredge which includes a pump, a suction pipe and a suction gauge pipe connected with the suction pipe; a means for periodically flushing the gauge pipe, such means comprising a water supply pipe connected with the gauge pipe, and an air supply pipe connected with the gauge pipe ahead of the water supply pipe, a normally closed valve in the

water supply pipe and the air supply pipe, respectively, and means to periodically first open the water supply pipe valve and then the air supply pipe valve in timed sequence with relation to each other.

4. A combination as in claim 3, in which the valve opening means includes a solenoid connected with each valve, an electric circuit, the solenoids being included in said circuit, a normally open switch in the circuit connected in operative relation with each solenoid, and cam controlled means effective to periodically close the switches in timed sequence with respect to each other.

5. A combination as in claim 4 in which the cam controlled means includes cams effective to operate the switches, a motor included in the circuit and connected in driving relation with the cams, and a separate cam controlled switch means included in the circuit and operative to periodically open and close the circuit to the motor.

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