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PNEUMATIC CONTROL

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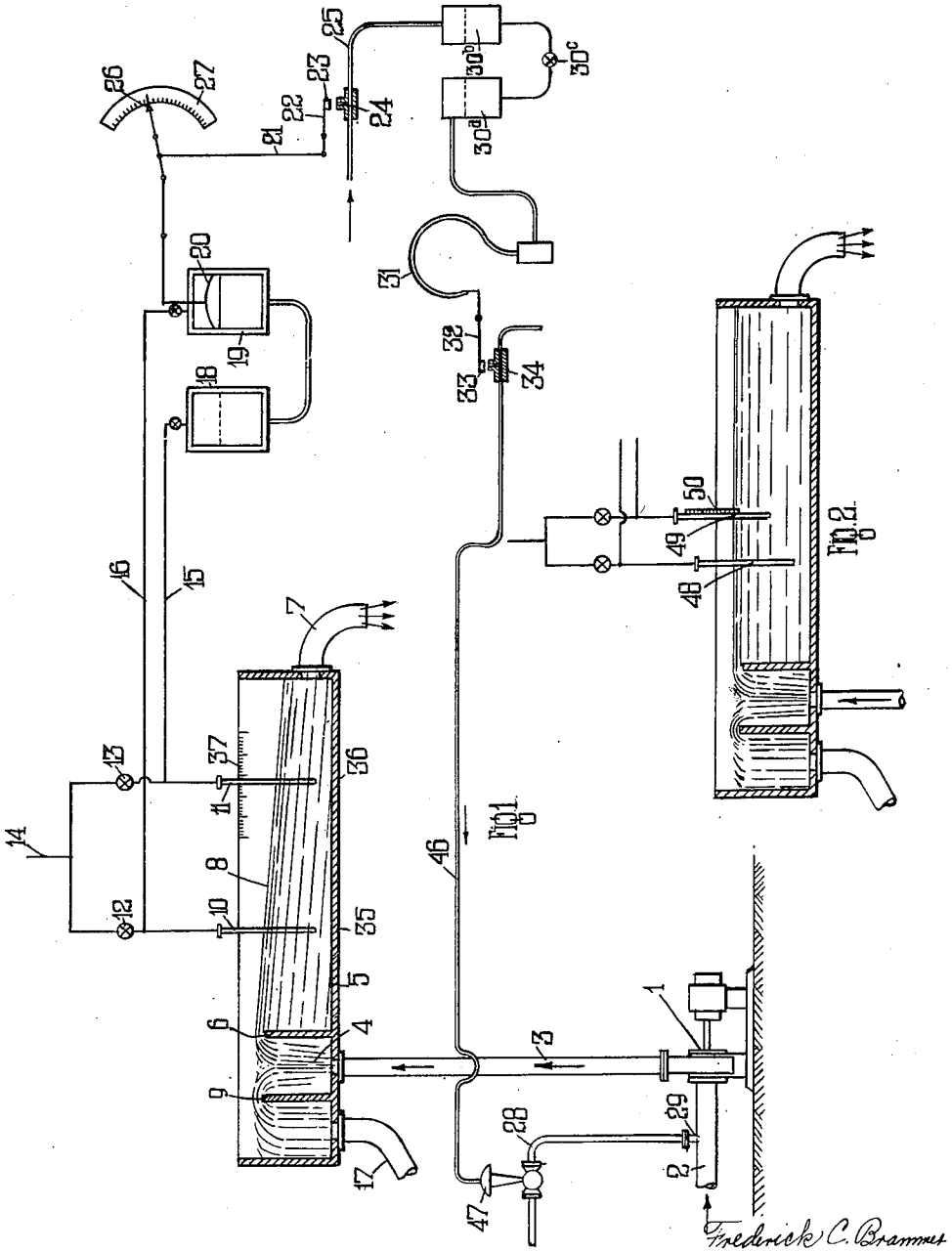


Fig. 1.

Fig. 2.

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PNEUMATIC CONTROL

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2 Claims. (Cl. 137—139)

The present invention relates to a pneumatic control for a pressure device which may be used in maintaining consistency of a viscous liquid, or semi-liquid, or density of a liquid, that is to say of liquids containing solid matter in solution or suspension.

In many industries it is particularly desirable to provide automatic means whereby the consistency of a liquid or semi-liquid under treatment in an industrial process can be maintained constant.

For instance, in the artificial silk industry it is desirable that the viscosity of the liquid passing through the spinning jets be maintained constant, and again in the paper industry it is highly desirable that the consistency of pulp in the manufacture of board or paper be maintained constant to avoid irregularity in strength or thickness of the board or paper web.

It is known to maintain constancy of consistency by adding or reducing the amount of fluid forming the medium of solution or of the fluid carrying the suspension of solid matter, or in other cases by increasing or decreasing the temperature of the fluid stream, according to the flow gradient of said liquid between two spaced points in an open vessel.

An object of the present invention is to provide a pneumatic control for controlling and damping of such arrangements and effects for preventing sudden changes in the consistency or density of the fluid stream.

According to the present invention the pneumatic control operated by an alteration in difference of flow gradient or density between two spaced points in the fluid stream does not operate means for adding a variable amount of liquid to said fluid stream directly but indirectly through damping means so that the quantity of liquid being added per unit time can only be varied at a slow rate.

The invention will be more particularly described with reference to the accompanying drawing, in which:

Figure 1 shows the application of the invention to the control of consistency of paper pulp in the manufacture of board or paper.

Figure 2 shows a modified arrangement suitable for control of the consistency of a solution.

In the drawing, the invention is illustrated in connection with apparatus for controlling the density of paper pulp.

Paper pulp, taken by way of example, is circulated by means of a pump 1 from an inlet pipe 2 to an outlet pipe 3 leading to a sump 4 in a flow box 5, the material passing over a weir 6 and flowing out from the outlet 7 on the flow box remotely situated to the weir 6, the level of the liquid due to its viscosity or density taking up a flow gradient such as 8. Excess liquid flows away from the flow box 5 through an outlet 17 as it passes over the weir 9, which is usually slightly higher than the weir 6. At two spaced points along the flow gradient 8 and conveniently carried upon the sides of the flow box 5 are mounted a pair of standpipes 10, 11, provided with controlling cocks 12, 13, respectively, and coupled to a common air pressure lead 14. Compressed air fed to the line 14 will therefore bubble out from the lower ends of the standpipes 10 and 11 and, as the static head of stuff or pulp immediately outside these standpipes 10, 11, will differ, the pressure in these standpipes 10, 11, will also differ, this difference of pressure being communicated by pipe line connections 15, 16, to a differential controller formed of intercommunicating vessels 18, 19, containing liquid; a movable element 20 in one vessel being connected by linkage 21 to a lever 22 operating a throttle valve 23 on an air bleed port 24 of an air line 25. The link 21 may also be connected to visual indicator 26, moving over a scale 27, so that the degree of consistency, being a factor of the flow gradient 8, can be read off thereon.

As there will be a time lag equivalent to the time taken by pulp to pass from the inlet point 29 where it receives free liquid from the pipe 28 to the time when it reaches the standpipe 11, hunting would occur if the pipe 25 was directly coupled to the diaphragm chamber 47. To avoid this the bleed valve 23, 24, is not connected directly to the pipe 46 but indirectly through a damping device which may conveniently be in the form of a pair of interconnected vessels 30^a, 30^b, the pipe connecting them being provided with a throttle valve 30^c. The valve 24 is connected by pipe 25 with one vessel 30^b whilst the other 30^a is connected to a Bourdon pressure tube 31 operating a lever 32 carrying a throttle valve 33 co-operating with a bleed valve 34 on the air pressure line 46.

It will be preferred to provide means to adjust the position of one or both of the standpipes 10, 11 along the flow box, for instance by providing a graduated scale 37 on the side of the flow box, so that the device can be adjusted to suit various grades of material, such as paper pulp to be controlled, and at the same time maintain them at a constant consistency as indicated upon the scale 27 or on a graph recorder. Once this setting is adjusted to a required condition of the material

consistency can then be controlled and any variations will be evident upon the scale 27 or on the graph recorder. Should the device be required to operate on a wholly different material an adjustment of the setting of scale 27 may be necessary.

In the modified arrangement of Figure 2 more particularly suitable to the control of density of a liquid medium having matter in solution, the pressure line is connected to a pair of standpipes 48, 49, one of which is displaceable vertically as compared with horizontally in the case of Figure 1, when it is desired to adjust the set value of the density it is desired to maintain constant. An adjustment of one pipe vertically relatively to the other on the scale 50 provides for an adjustment to a new value of density which it is desired to maintain constant. It will be seen that as the density of the fluid increases, so will the difference in the static head measured by the pipes 48, 49.

I claim as my invention:

1. In a pneumatic control system for operating a pressure responsive device, a control-pressure conduit, means for establishing a control pressure in said conduit which varies in accordance with a variable condition, means responsive to the control pressure for establishing a relay pressure proportional to the control pressure, means for retarding the application of the control pressure to the relay pressure establishing means comprising a pair of vessels having their upper ends respectively connected with the control conduit in a manner to transmit pressure from one portion thereof to another portion, the lower portions of said vessels containing liquid and being in communication through a conduit having adjustable restricting means.

2. In a pneumatic control system for operating a pressure responsive device, a control-pressure conduit, means for establishing a control pressure in said conduit which varies in accordance with a variable condition, means responsive to the control pressure including a bleed valve and a Bourdon pressure tube for operating the same for establishing a relay pressure proportional to the control pressure, means for retarding the application of the control pressure to the relay pressure establishing means comprising a pair of vessels having their upper ends respectively connected with the control conduit in a manner to transmit pressure from one portion thereof to another portion, the lower portions of said vessels containing liquid and being in communication through a conduit having adjustable restricting means.

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