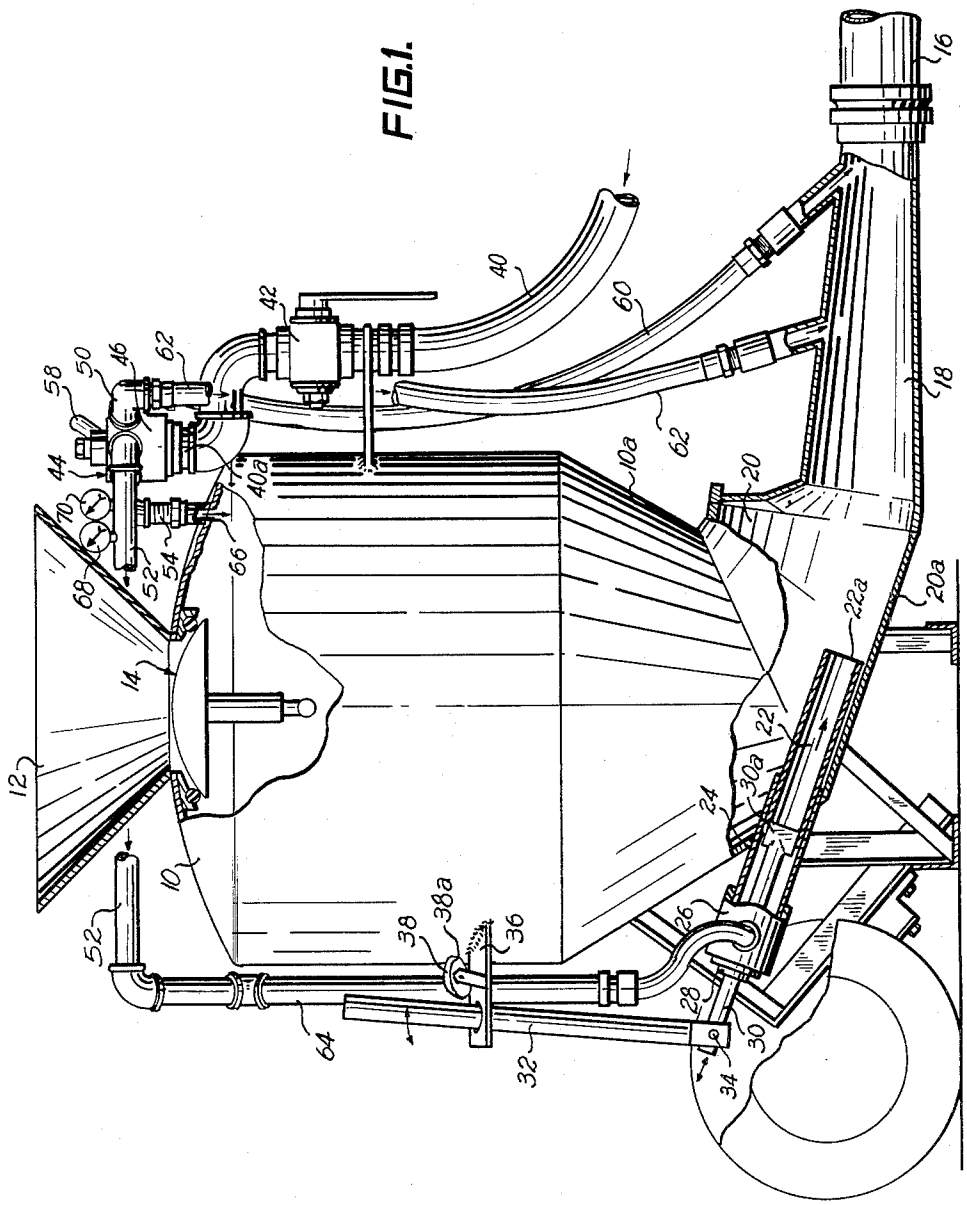
Jan. 30, 1962 G. M. PRO 3,019,058

AIR CONTROL STRUCTURE FOR AGGREGATE HANDLING MACHINES

Filed Sept. 22, 1958 2 Sheets-Sheet 1

FIG. 1.



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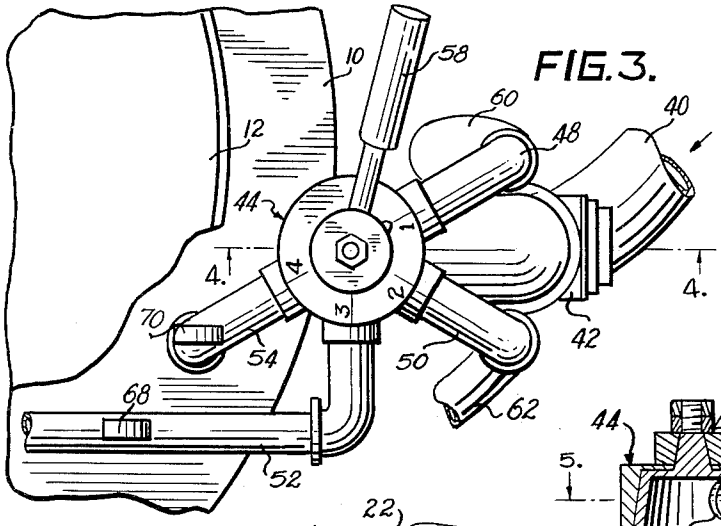


FIG. 3.

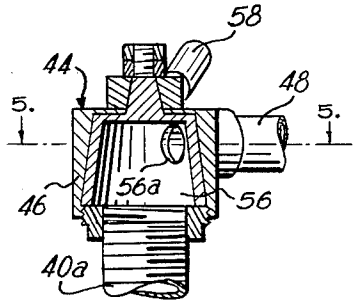


FIG. 4.

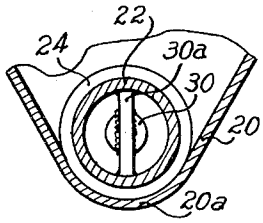


FIG. 6.

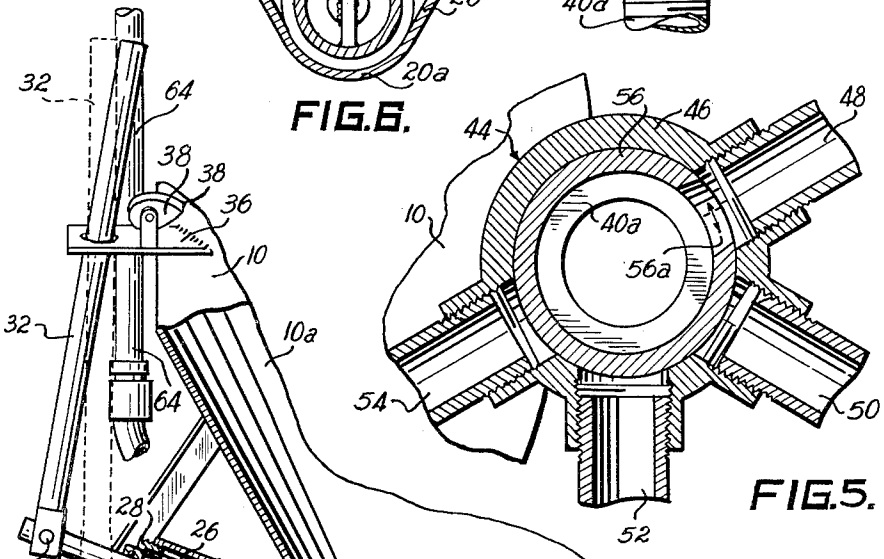


FIG. 2.

FIG. 5.

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AIR CONTROL STRUCTURE FOR AGGREGATE HANDLING MACHINES

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9 Claims. (Cl. 302—53)

This invention relates to a machine for conducting material to a point of use by a blast of compressed air, and especially adapted for placement of concrete either wet or dry and irrespective of the nature and amount of aggregate content thereof.

Conveyance of cementitious materials, particularly to points substantially remote from a mixing hopper or vessel through tubular lines, has always presented many difficult problems, the foremost of which is the tendency of such material to plug the lines. Furthermore, bridging, especially in the case of stiff (low slump) concrete, occurs in the vessel itself resulting in delays, as well as considerable labor in correcting the difficulty. Again, the stiffer (lower slumps) must be moved through the line in slugs, enhancing the difficulties when compressed air is used as a motivating medium. However, there are also many problems incident to the air movement of higher slumps by extrusion.

The aforementioned problems are all enhanced as the distance of movement is increased, as attempts are made to raise the material to greater heights, as the number of bends and elbows in the line are increased, and other conditions such as weather changes, making it necessary to provide a machine that is at all times completely trouble-free.

It is the primary object of the present invention, therefore, to provide a machine for the aforementioned purposes having operator controls which make it possible to advance virtually any type of material continuously and without shut-down to relatively great heights and distances, irrespective of the characteristics of the materials being conducted and notwithstanding any of the difficult factors above outlined.

It is the most important object of the present invention to eliminate the said problems in a concrete placer by use of an air control system that permits the operator, simply through use of a single selector valve, to quickly and easily direct blasts of air to the material at strategic points within the material-receiving pressure vessel itself, as well as in the material outlet line, especially in the latter adjacent vessel.

Another important object of the present invention is to provide a material conducting machine having a manual control in addition to the aforementioned selector valve, but operable in conjunction therewith to permit discharge of a blast of air into the pressure vessel at points where the force of such air will not only properly motivate the slugs or the extrusion, as the case may be, into and along the material outlet line, but which may also be positioned so as to clear the vessel of substantially all of its content, thereby additionally overcoming the bridging tendencies of the materials.

Still another important object of the present invention is to incorporate in the air control system, and operable in conjunction with the selector valve, means which permit the operator to control the size of the slugs themselves as the same enter the outlet line thereby reducing, if not entirely eliminating, the problem of plugging.

In the drawings:

FIG. 1 is a fragmentary, side elevational view of an aggregate handling machine employing the air control structure of the instant invention, parts being broken away and in section for clearness.

FIG. 2 is a fragmentary view similar to FIG. 1 partially in section and illustrating still further the construction and manner of operation of the shiftable air inlet pipe.

FIG. 3 is an enlarged, fragmentary, plan view partially broken away and illustrating the manual selector valve.

FIG. 4 is a fragmentary, detailed, cross-sectional view taken on line 4—4 of FIG. 3.

FIG. 5 is an enlarged, fragmentary, detailed cross-sectional view taken on line 5—5 of FIG. 4; and

FIG. 6 is an enlarged, fragmentary, detailed cross-sectional view taken on line 6—6 of FIG. 2.

A hollow, material-receiving pressure vessel 10 provided with a hopper 12 facilitating the introduction of material thereinto, is normally closed by valve means 14 which may be in the nature of that disclosed in my co-pending application Serial No. 492,397, filed March 7, 1955, now Patent No. 2,949,275 granted August 16, 1960.

A material outlet line 16 communicates with the vessel 10 preferably adjacent the bottom of the latter, through a laterally extending discharge snout 18 that progressively increases in diameter as the vessel 10 is approached. Noteworthy is the fact that the lowermost end 10*a* of the vessel 10, is desirably of a substantially frusto-conical configuration and terminates in a downwardly and outwardly extending tubular chute 20 that communicates with the larger end of snout 18 and is provided with a sloping bottom 20*a*. An elongated compressed air inlet pipe 22 extending along the bottom 20*a* and having its longitudinal axis disposed at substantially the same incline as the bottom 20*a*, is in opposed relationship to the snout 18 of line 16, thereby positioning its open outlet end 22*a* for directing a blast of air into line 16 substantially in the direction of movement of the material from vessel 10 through line 16.

The pipe 22 is telescoped within an elongated air supply tube 24 that extends through the lower end 10*a* of vessel 10 and is welded or otherwise fixed in place. The tube 24 in turn has a relatively short, tubular air-receiving manifold 26 telescoped thereover at its outermost end (see FIGS. 1 and 2) and suitably attached to the tube 24. A bearing 28 for a reciprocable rod 30 is screw-threaded into the outer end of the manifold 26 in closing relationship thereto. Rod 30 terminates at its innermost end in a cross web 30*a* which diametrically traverses the pipe 22 at the outermost end of the latter, web 30*a* being welded or otherwise rigidly secured to the pipe 22 as seen also in FIG. 6.

Manual means in the nature of a lever 32 is provided to reciprocate the pipe 22 within the tube 24, lever 32 having a pivotal connection 34 at its lowermost end with the outer end of the rod 30.

A perforated plate 36 on vessel 10 loosely receives the lever 32 and supports a rotatable cam 38. Cam 38 is positioned for engagement by the lever 32 to limit the extent of swinging movement of the uppermost end of lever 32 toward the vessel 10 and to thereby limit the extent of outward movement of the pipe 22 under influence of the air pressure in vessel 10.

Thus, pipe 22 may be held at selected positions, depending upon the position of cam 38, it being noted that when end 38*a* of cam 38 is swung into engagement with lever 32, pipe 22 is held extended inwardly to its extreme innermost position as shown by dotted lines in FIG. 2. Conversely, when the cam 38 is positioned as shown in FIGS. 1 and 2, the air pressure in vessel 10 will move the pipe 22 to the opposite end of its path of travel until the lever 32 comes into engagement with the cam 38.

A compressed air supply hose 40 best illustrated in FIG. 1 of the drawings, and provided with a manual shut-off valve 42, communicates with a manual selector valve 44 at the bottom of the latter (see FIGS. 4 and

5) in a coupling 40*a*. More specifically, coupling 40*a* is connected with housing 46 of valve 44 and the latter is provided with a plurality of outlets 48, 50, 52 and 54 as best seen in FIGS. 3 and 5.

A frusto-conical valving member 56 rotatable in the housing 46, is open at its bottom in communication with the coupling 40*a* and has a lateral orifice 56*a* selectively registrable with the outlets 48, 50, 52 and 54, or with certain pairs thereof as hereafter explained.

A handle 58 is operably connected with the valving member 56 for rotating the latter.

The outlets 48 and 50 communicate with snout 18 of line 16 through conduits 60 and 62 respectively (see FIG. 1) that are spaced at the snout 18 and disposed at an angle to the latter in a direction for moving the material through the line 16 away from vessel 10.

The outlet 52 communicates with the manifold 26 through a conduit 64 and the outlet 54 communicates directly with the vessel 10 at port 66 shown in the top wall of vessel 10. In this respect, however, it is to be pointed out that the port 66 may be located in the top of vessel 10 directly above the tube 24 if desired, or, an additional port be provided at such location, both communicating with outlet 54.

Still further, one or more inlet ports may be provided in the side of the vessel 10, all communicating with the selector valve 44 by way of outlet 54. Pressure gauges 68 and 70 may be provided in outlets 52 and 54 respectively, as desired.

Manifestly, the position of the valve 44, as well as the pipe 22, depends upon many factors such as those hereinabove initially referred to. Although the positioning of orifice 65*a* into register with outlet 54 pressurizes vessel 10 through port 66 and tends to move the material downwardly into chute 20, the primary motivating force for the material into the line 16, is the blast of air emanating from pipe 22. Consequently, if the materials are of such nature as to gravitate in the vessel 10 either smoothly and evenly or in slugs without difficulty, the operator, by manipulating handle 58, may cut off the air entirely to port 66 by shifting the valving member 56 to bring its orifice 56*a* into register with outlet 52. If, at this time, the pipe 22 is held in the dotted line position shown in FIG. 2 by cam 38, a maximum blast of air will be directed to the materials, forcing the same into line 16 at a high discharge rate. This operation may continue as long as no plugging occurs in the line 16 and as long as the materials continue to gravitate into the chute 20 into the blast of air emanating from the discharge end 22*a* of pipe 22.

If, however, bridging does occur in the vessel 10, appreciably reducing the rate of gravitation into the chute 20, the operator may manipulate valve 44 to divert some of the incoming air to the outlet 54; as noted in FIG. 5, the orifice 56*a* is adapted to bridge across the outlets 52 and 54 so that air may be directed simultaneously into the pipe 22 and through the port 66. Continual manipulation of the valve 44 to direct more or less air through the port 66, will break up the bridging and at the same time reduce the blast at the discharge end 22*a*.

If, however, the bridging persists, particularly above the tube 24 and pipe 22, the operator can then operate lever 32 by partial release of the cam 38, permitting pipe 22 to retract so that the air emanating from pipe 22 will loosen the material thereabove and cause the same to gravitate into the chute 20.

Complete retraction of the pipe 22 along with the force of air emanating from port 66, permits substantial discharge of the entire content of the vessel 10 prior to opening valve 14 to dump a new batch into the vessel 10.

As above indicated, the stiffer, lower slumps tend to plug the line 16 since materials of such consistency gravitate into the chute 20 and pass into the snout 18 in slugs of various sizes. The problem is enhanced because of the necessity of reducing the diameters of such slugs so that the same will pass into the relatively small line 16. It is advantageous therefore, to progressively decrease the diameter of the material outlet from chute 20, through snout 18 to line 16 as clearly shown in FIG. 1.

Consequently, in order to avoid plugging in the snout 18 where the slugs are gradually decreased in diameter, and to avoid slugging anywhere along the line 16, the operator may, by manipulation of valve 44, break up the slugs in the snout 18 by direction of air through the conduit 60 and/or 62. Here again it is seen that orifice 56*a* may be placed into direct communication with conduit 60, as shown in FIG. 5, thereby forcing a slug into line 16 and breaking the same into a smaller mass at the point of merger between snout 18 and line 16.

Or, if a large slug is plugged into the snout 18, valve member 56 may be rotated to bring orifice 56*a* into direct communication with conduit 62. Thus, by manipulating valve 44 between outlets 48 and 50 to direct air into either conduit 60 or 62, or into both of such conduits simultaneously, the operator is able to effectively cause the materials to move through the line 16 continuously without plugging because of the breaking of the slugs into fragments that are sufficiently small to pass through the line 16 without plugging.

Again, the orifice 56*a* may be brought into bridging relationship to outlets 50 and 52, in which event the slugs are broken by air flowing in conduit 62 and such slugs are immediately forced into the line 16 by air emanating from the pipe 22.

It is now apparent that an operator will soon become skilled in the manipulation of valve 44, as well as the adjustment of manual control means 32 so as to keep the point of placement or use, irrespective of the nature of the materials or the many other operating conditions that would normally adversely affect proper operation. In this respect, he will be able to determine partially by listening to the flow, whether or not such flow is proper and if the same ceases or slows down because of slugs or because of bridging it can quickly actuate the valve 44 to direct the compressed air properly through any of the four outlets 48, 50, 52 and 54, or in pairs as above indicated and as illustrated in FIGS. 3 and 5.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a machine for conducting material to a point of use comprising a normally closed, hollow, material-receiving, pressure vessel provided with a material outlet line and an opposed, compressed air inlet pipe, said pipe adapted to be operably coupled with a source of air under pressure extending into the vessel in position to direct the air toward said line and being shiftable whereby to vary the distance between its innermost discharge end and said line; an air inlet conduct communicating with the line adjacent the vessel and disposed at an angle to the flow of material within the outlet line and in a direction for moving the material through the line away from the vessel; and a selector valve common to said pipe and to said conduit for directing the air to either the pipe or the conduit.

2. In a machine for conducting material to a point of use comprising a normally closed, hollow, material-receiving, pressure vessel provided with a primary compressed air inlet port, said vessel having a material outlet line and an opposed, compressed air inlet pipe, said pipe adapted to be operably coupled with a source of air under pressure extending into the vessel in position to direct the air toward said line and being shiftable whereby to vary the distance between its innermost discharge end and said line; an air inlet conduit communicating with the line adjacent the vessel and disposed at an angle to the flow of material within the outlet line and in a direction for moving the material through the line away from the vessel; and a selector valve common to said inlet port, to said pipe and to said conduit for directing the air to either the port, the pipe or the conduit.

3. In a machine for conducting material to a point of use comprising a normally closed, hollow, material-receiving, pressure vessel provided with a compressed air inlet port adapted to be operably coupled with a source of air under pressure and a compressed air and material outlet pipe; a plurality of air inlet conduits communicating with the pipe adjacent the vessel in spaced relationship therealong and disposed at an angle to the flow of material within the outlet pipe and in a direction for moving the material through the pipe away from the vessel; and a selector valve having a plurality of outlets operably coupled to said inlet port and to said conduits respectively for directing the air to either the port, the pipe or either conduit.

4. The invention of claim 3, said pipe terminating adjacent the vessel in a discharge snout progressively increasing in diameter as the vessel is approached, the conduits communicating with the snout.

5. The invention of claim 3, said valve including means adapted to direct air to said conduits simultaneously.

6. The invention of claim 3, said valve including means adapted to direct air to said pipe and to said port simultaneously.

7. The invention of claim 6, said valve including means adapted to direct air to said conduits simultaneously.

8. The invention of claim 7, said valve including means adapted to direct air to said pipe and one of said conduits simultaneously.

9. The invention of claim 3, said valve including means adapted to direct air to said pipe and one of said conduits simultaneously.

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