July 7, 1953 R. M. DOULL ET AL 2,644,725

CEMENT APPLYING APPARATUS

Filed May 29, 1948 2 Sheets-Sheet 1

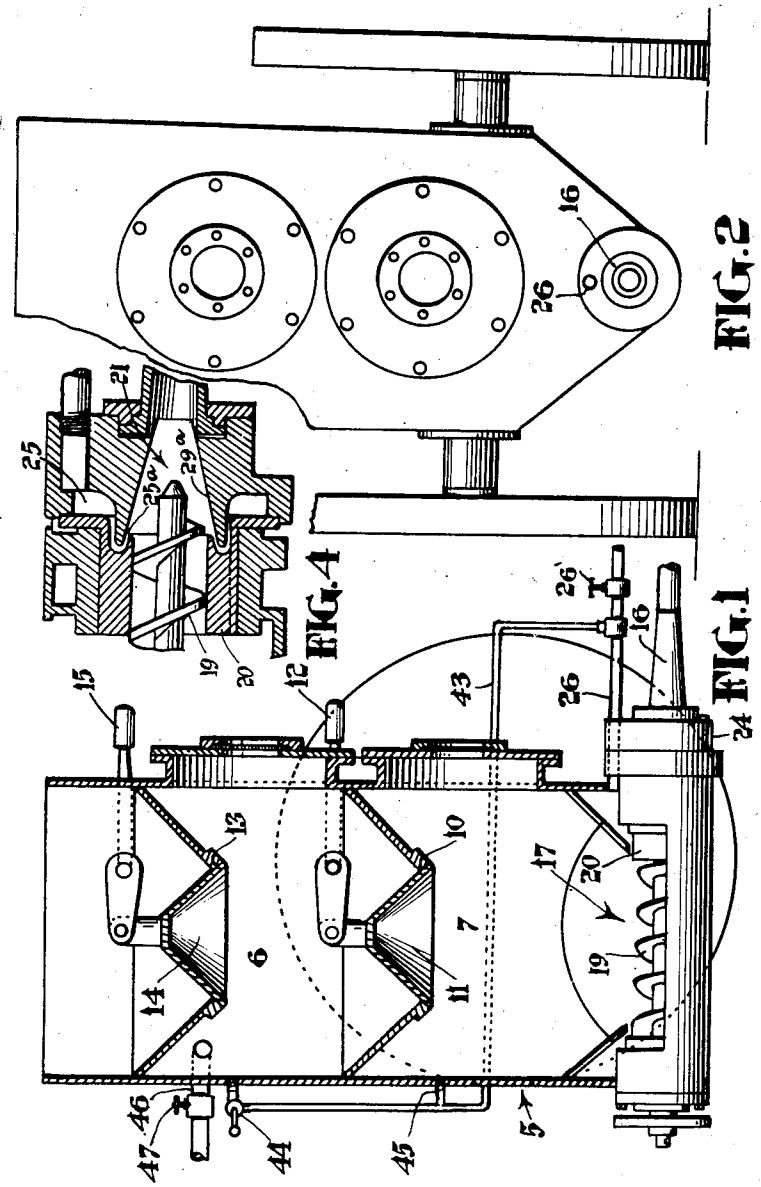


FIG. 2

FIG. 4

FIG. 1

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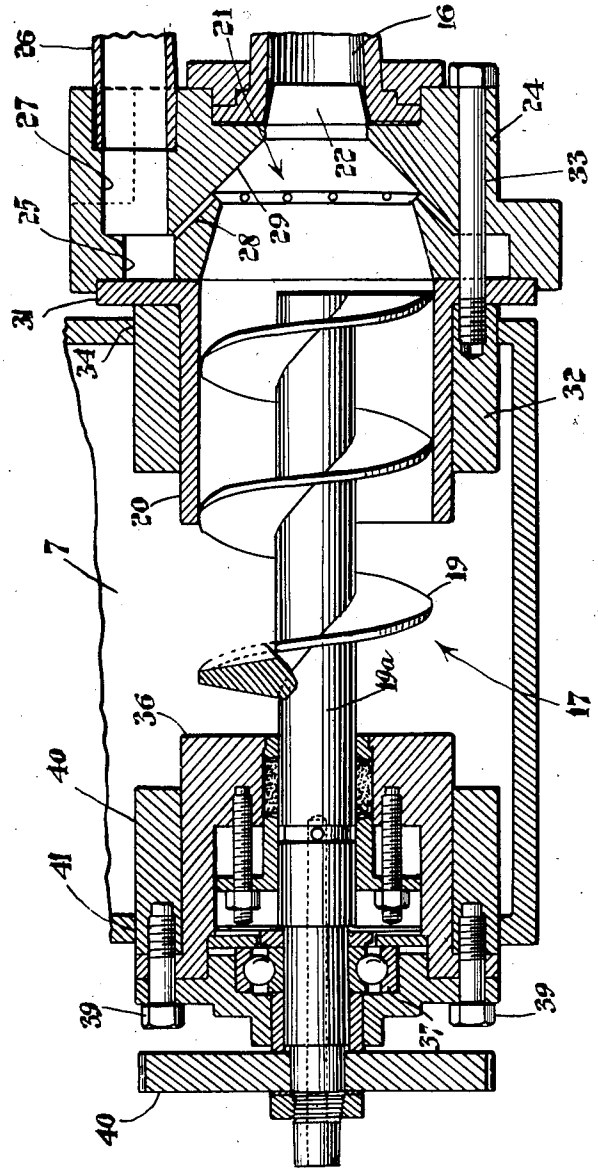


FIG.3

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CEMENT APPLYING APPARATUS

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Application May 29, 1948, Serial No. 30,173

1 Claim. (Cl. 302—50)

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This invention relates to pneumatic apparatus for "shooting" a hydrated mixture of cement and aggregate onto walls and other surfaces. More particularly, the invention relates to apparatus in which a dry mixture of the materials is transported by compressed air from the lower chamber of a double-chamber pressure vessel to a nozzle in which the dry mixture is hydrated before being ejected through the discharge orifice of the nozzle.

In conventional apparatus of the type to which the invention relates the pressure vessel comprises upper and lower pressure chambers each equipped with a compressed air connection and having a top opening controlled by a manually operable airtight valve. The materials which have previously been thoroughly mixed in the desired proportions are introduced into the upper chamber in which they are alternately under pressure and free from pressure, as regulated by the operator. From the upper chamber the materials flow to the lower chamber where they are always maintained under air pressure. A feed mechanism is arranged in the bottom of the lower chamber for feeding the materials into a pneumatic material hose or conduit through which the materials are transported by air pressure to and through the hydrating nozzle.

In the operation of the apparatus described herein it is important that the materials be continuously fed from the bottom of the lower pressure chamber to the material conduit at a uniform rate. It is also important that the material-propelling compressed air which is directed against the material as it is fed to the inlet end of the material hose by the feed mechanism be prevented from leaking past the feeding mechanism into the lower chamber of the pressure vessel. These requirements have not been adequately met by the feeding mechanism heretofore employed for feeding the material from the bottom of the lower pressure chamber and the object of the present invention is to provide an improved feed mechanism for this purpose which ensures continuous feeding of the material to the material conduit at a uniform rate and which is also designed to prevent undesirable leakage of the material-propelling air into said chamber.

According to the preferred embodiment of this invention, the aggregate in the lower receptacle chamber is picked up by a conveyor screw and forced through a sleeve into a conical air chamber having an outlet at its apex connected to the material hose through which the aggregate is transported to the cement applying nozzle. The

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conical wall structure of the air chamber is pierced by a circular series of holes through which compressed air is delivered to said chamber. These holes are drilled at an angle so that the streams of air delivered therethrough are directed substantially parallel to a conical surface of the air chamber and converge within said outlet. The aggregate delivered through the air chamber by the conveyor screw is picked up by these streams of air and projected at a uniform rate into said outlet and thence into the material hose. The sleeve through which the aggregate is forced from the lower receptacle chamber into the air chamber constitutes the only means of communication between said chambers. The conveyor screw extends into this sleeve with a close running fit so that when the machine is in operation, the bore of the sleeve is blocked by the screw conveyor and the aggregate so that there is very little leakage of air from the air chamber into the lower receptacle chamber. During feeding of the material therefrom the lower receptacle chamber is maintained under air pressure in the usual way but this pressure is regulated so that it is slightly lower than the pressure in the air chamber to which the aggregate is delivered by the screw conveyor. The air pressure thus maintained in the lower receptacle chamber during the feeding of the aggregate therefrom serves mainly as a seal to prevent air flowing back into this chamber through the conveyor screw encircling sleeve communicating with the air chamber.

Proceeding now to a more detailed description of the invention, reference will be had to the accompanying drawings, wherein—

Fig. 1 is a view partly in vertical section and partly in side elevation of a cement gun machine embodying our improved feeding mechanism.

Fig. 2 is a front elevation of the machine shown in Fig. 1.

Fig. 3 is an enlarged vertical sectional view of the feeding mechanism.

Fig. 4 is a fragmentary vertical sectional view showing a slight modification of the feeding mechanism.

Referring more particularly to the drawings, 5 designates a double-chamber pressure vessel including an upper chamber 6 and a lower chamber 7. The lower chamber 7 is provided with the usual top opening 10 controlled by a cone valve 11 carried by a valve operating lever 12. The upper chamber 6 is similarly provided with a top charging opening 13 controlled by a conven-

tional cone valve 14 carried by a valve operating lever 15.

Our improved feed mechanism by which the material is delivered from the lower chamber 7 to the material hose 16 is generally indicted at 17. It comprises a conveyor screw 19 by means of which the material in chamber 7 is forced through a sleeve 20 into the adjacent base of a conical air chamber 21 provided at its apex with an outlet 22 through which the material is forced into the material hose 16.

Air chamber 21 is formed in a casting 24 including an annular air channel 25 to which compressed air is supplied through a compressed air supply pipe 26 and communicating passage 27, said compressed air pipe being equipped with a flow controlling valve 26'. Channel 25 surrounds the base of air chamber 22 and communicates therewith through a circular series of drilled holes 28 through which streams of compressed air are delivered to said air chamber. The holes 28 are drilled at an angle so that the streams of compressed air supplied therethrough are directed parallel to the conical surface 29 of air chamber 21 and converge within the outlet 22. These streams of air pick up the material delivered to air chamber 21 by conveyor screw 19 and project it at a uniform rate through outlet 22 into material hose 16. The conveyor screw 19 is a close running fit in sleeve 20 and the latter is provided, at its front end, with a flange 31 interposed between the air chamber casting 24 and the front end of a ring-shaped member 32 to which the air chamber casting is fastened by stud bolts 33. The ring-shaped member 32 encircles and supports sleeve 20 and is secured within an opening 34 provided in the front wall of chamber 7.

The shaft 19a of conveyor screw 19 extends rearwardly through a stuffing box assembly 36 and an anti-friction bearing assembly 37 which are fitted together and fastened by stud bolts 39 to a ring-shaped supporting member 40 which extends through an opening 41 provided in the rear wall of chamber 7. The rear end of shaft 19a projects beyond the anti-friction bearing assembly 37 and is fitted with a gear 40' which is driven by a suitable driving gear (not shown).

Compressed air is delivered from compressed air supply pipe 26 to chamber 6 through line 43 and valve 44. An intermediate portion of line 27 is connected to chamber 7 by a valveless branch connection 45. Chamber 6 is also provided with a pressure relief connection 46 controlled by a valve 47.

The apparatus described herein is started in the usual manner by first filling the chambers 6 and 7 with cement and aggregate which have previously been thoroughly mixed in the desired proportions. During this operation the main valve 26' and the valve 47 controlling the flow of compressed air from line 43 directly to the upper chamber 6 are closed. When the chambers 6 and 7 have been filled to the desired level the upper cone valve 14 is closed by the operation of hand lever 15 and the main control valve 26' is opened slightly to supply compressed air to air chamber 21 and to compressed air line 43. The air thus supplied to compressed air line 43 enters chamber 7 through the valveless branch connection 29 and establishes air pressure in this chamber as well as in the upper chamber 6. The pressure thus established in chambers 6 and 7 acts against the cone valve 14 to hold said valve tightly against its seat 13. When chamber 6 is emptied the lower

cone valve 11 is closed by operation of the hand lever 12 and the air previously supplied to chamber 6 is exhausted through exhaust connection 46 and exhaust valve 47. This reduction of pressure in chamber 6 permits cone valve 14 to drop to its open position by gravity and chamber 6 is then refilled with valve 11 held in its closed position by the air pressure in chamber 7. Valve 14 is then reclosed by hand and is maintained in its closed position by opening valve 44 to admit compressed air to chamber 6 from compressed air line 43. The compressed air thus admitted to chamber 6 through valve 44 equalizes the pressure in chambers 6 and 7 so that cone valve 11 opens by gravity to permit the material in chamber 6 to flow into chamber 7 as the material is fed from the latter chamber by the feed mechanism 17.

When the feed mechanism is in operation the portion of the conveyor screw 19 operating in the sleeve 20 and the material being conveyed by this portion of the conveyor screw serve to substantially block the bore of said sleeve so that the operation of the apparatus is not adversely affected by excessive leakage of air from air chamber 21 directly into chamber 7 by way of sleeve 20. The pressure in air chamber 21 is maintained at a slightly higher value than the pressure in chamber 7.

The shrouding of conveyor screw 19 by sleeve 20, the conical shape of air chamber 21, and the inclination of holes 28 through which compressed air is delivered to said air chamber are all factors which mutually contribute to efficient delivery of the aggregate at a uniform rate into the material hose 16.

In the modified arrangement shown in Fig. 4, the feed screw 19 is lengthened so that its discharge end projects beyond the outer end of sleeve 20 and into the conical chamber 21. In this modified arrangement the previously mentioned holes 28 are dispensed with and the air channel 25 is placed in communication with the larger end of air chamber 21 through an annular port 25a which is reversely curved, as shown, so that the air enters chamber 21 parallel to the conical surface 29a and is directed toward the outlet 22.

Having thus described the nature of our invention and a preferred embodiment thereof, it will be understood that various modifications may be resorted to within the scope and spirit of the invention as defined by the appended claim.

We claim:

In apparatus of the character described, an aggregate-containing chamber having a horizontally disposed tubular outlet through which the aggregate is discharged therefrom, a feed screw arranged in said chamber with a portion only of the screw extending into said tubular outlet and terminating short of the discharge end of said outlet, a conical air chamber into which the discharge end of said outlet opens, said conical air chamber having its base portion adjacent said outlet and being provided, at its apex, with a discharge outlet in axial alignment with said tubular outlet, a closed air channel surrounding the base of said air chamber and having a compressed air inlet and a circular series of air passages through which separate streams of compressed air are delivered from said air chamber to said conical chamber, said air passages opening into said conical chamber at a point substantially midway between the base and the apex of said chamber and being inclined so that the

streams of air delivered therethrough are directed along lines paralleling a conical surface of the air chamber adjoining the outlet of said air chamber, means for supplying compressed air to the compressed air inlet of said channel and a material conveying conduit having its receiving end connected to the outlet of said air chamber.

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