

8 L. ARCE ET AL
APPARATUS FOR CONTROLLABLY APPLYING SEMIFLUID
AND PASTY MATERIALS 4 Sh

4 Sheets-Sheet 1

Fig. 2.

To Gun

22

4

27

19

21

23

29

6

7

18

11

10

5

20

3

2

1

III

IV

IV

III

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Jan. 21, 1958

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AND PASTY MATERIALS

2,820,672

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4 Sheets-Sheet 2

Fig. 3.

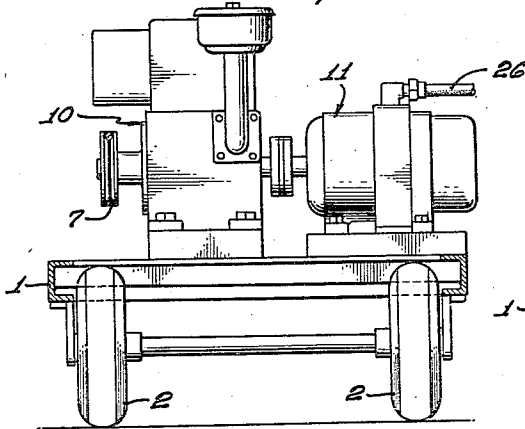


Fig. 4.

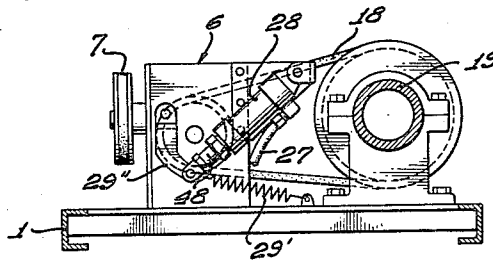


Fig. 5.

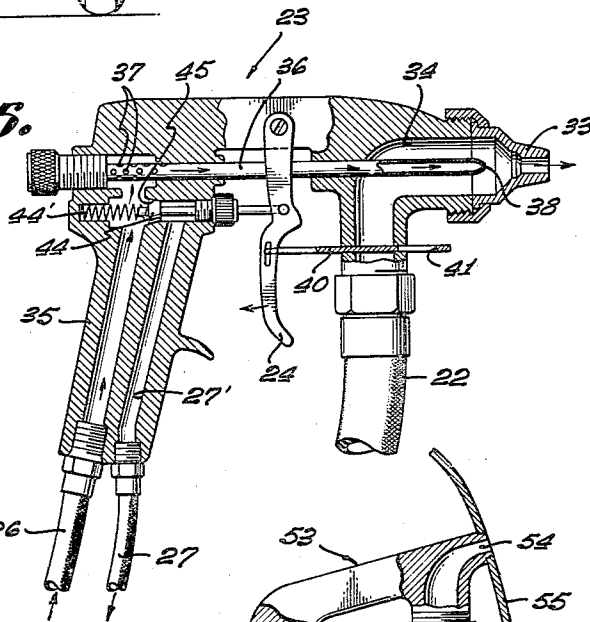
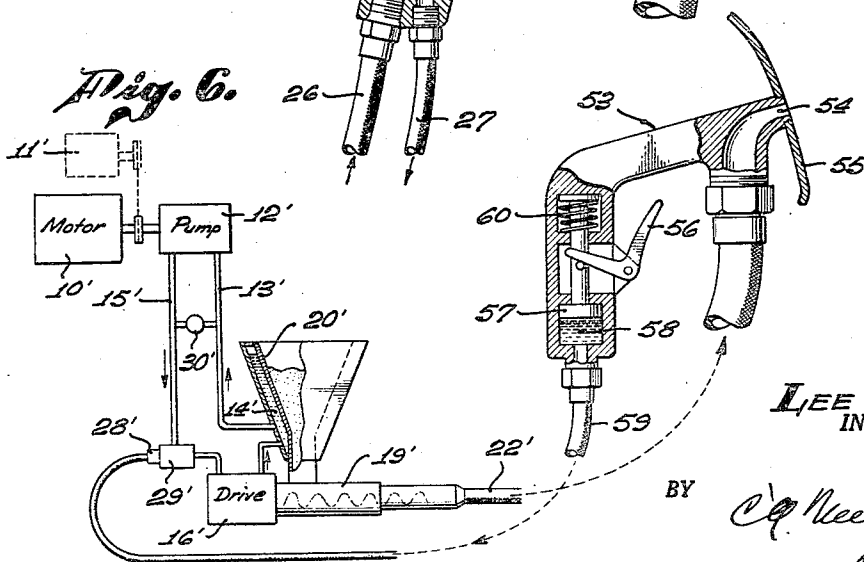


Fig. 6.



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Fig. 7.

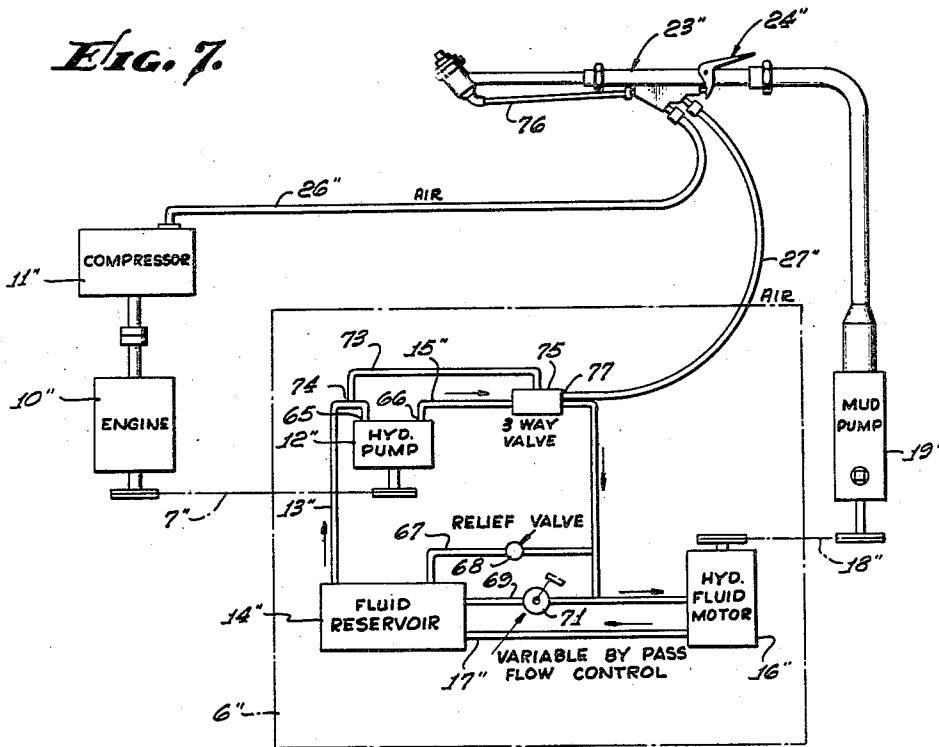
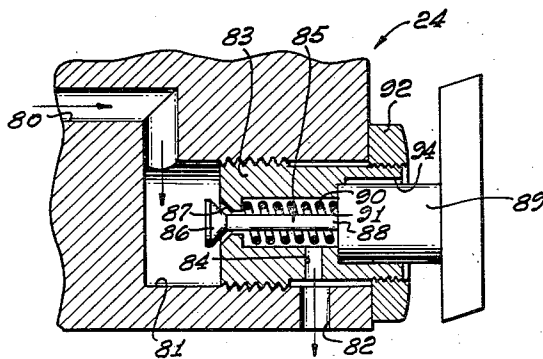


Fig. 10.



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Fig. 8.

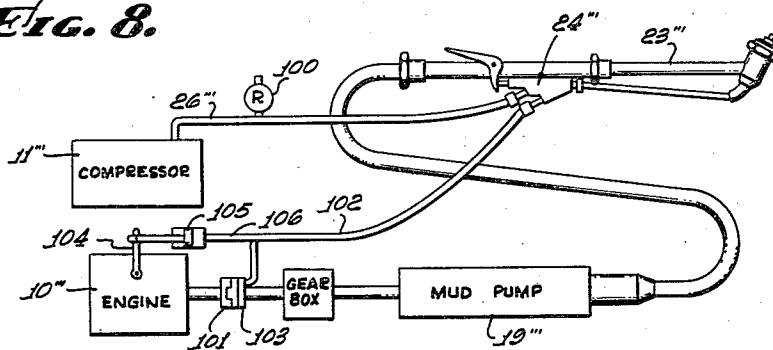


Fig. 9.

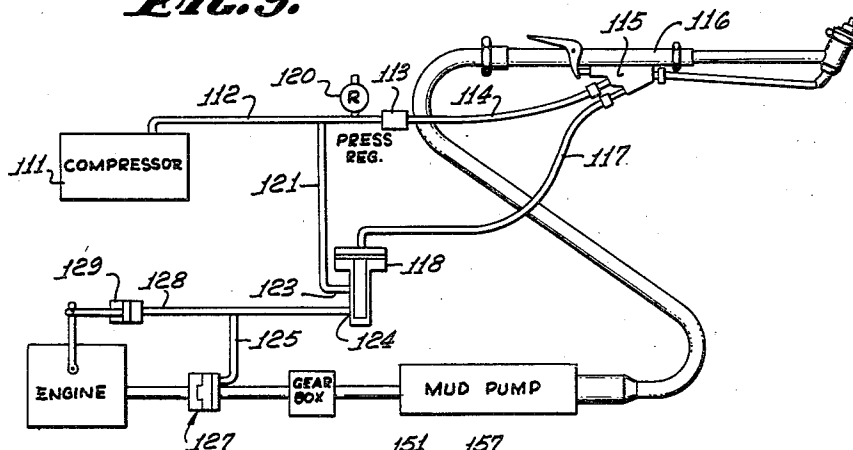
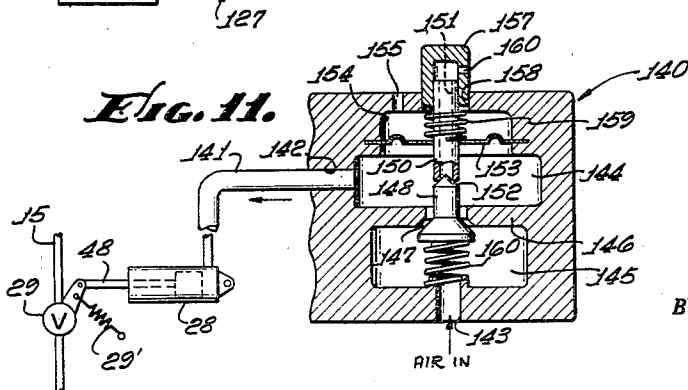


Fig. 11.



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2,820,672

APPARATUS FOR CONTROLLABLY APPLYING SEMIFLUID AND PASTY MATERIALS

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Application July 17, 1956, Serial No. 598,433

18 Claims. (Cl. 299—86)

This invention relates to an apparatus for conveying to and discharging from an independently movable applicator semifluid and pasty materials from a remote supply. The apparatus of the present invention is particularly directed toward means and devices whereby semifluid and pasty materials such as cementitious compositions, sound-absorbing plasters, plastic finishes, thick paints and protective coatings, stuccos, and similar coating materials can be applied to the surfaces of buildings, rooms, walls, ceilings and the like, by means of an applicator which is manually and independently movable, such applicator being removed from a source or supply of the material which is being placed upon such walls, ceilings and the like.

This application is a continuation-in-part of our co-pending application Serial No. 417,454, filed March 19, 1954, and now abandoned.

Heretofore plastering machines have been disclosed whereby compositions of a cementitious character containing gypsum and/or Portland cement could be applied by means of an applicator. Certain of these machines applied the cementitious composition as a sort of a spatter coat by using an applicator provided with revolving brushes, as for example, that shown in United States Letters Patent No. 1,734,044. Other machines employed air for the purpose of placing the plaster mix under air pressure so as to convey the plaster through a flexible hose to an applicator (see, for example, United States Letters Patent No. 2,198,271 and No. 2,618,149). These prior devices have not been satisfactory and it was not possible to accurately regulate the rate at which the materials were supplied to the applicators. Moreover, the apparatus heretofore employed was heavy, not portable, and could not be quickly and easily loaded with premixed plaster, paint, sound-absorbing compositions, or the like.

The present invention is particularly directed to an apparatus which is capable of being controlled by the operator of an applicator located at a point removed from the source of material which is being placed upon the walls or ceilings. Furthermore, the apparatus of the present invention most effectively utilizes the energy of a prime mover.

Generally stated, the invention relates to a portable frame provided with a supply hopper which can be easily loaded with the material. A mud pump is positioned beneath the hopper for the purpose of forcing the material through a hose or flexible conduit, the remote end of such conduit being provided with an applicator of any suitable design, depending upon the plasticity and consistency of the material being applied and the type of finish which is to be imparted to the surface of a wall or ceiling coated with such material. The frame on which the hopper and mud pump are mounted is also provided with a primary engine or source of power and a fluid transmission operably connected to the mud pump for driving the same. The primary engine may also drive a compressor in the event compressed air is employed in the applicator. At all events, the applicator includes a trigger-operated

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mechanism whereby the operation of the fluid transmission can be controllably varied without affecting the operation of the primary engine, thereby permitting absolute control as to the rate at which material is supplied to the applicator without the necessity of starting and stopping the engine. The control device may be built into the applicator and operate a flow control valve or throttle valve associated with the fluid transmission by way of a relatively small, flexible tube extending from the applicator to the main unit.

An object of the present invention, therefore, is to disclose and provide an apparatus for controllably conveying to and discharging from an independently movable applicator semifluid and pasty materials from a remote supply thereof.

A further object of the invention is to disclose and provide apparatus including a fluid or hydraulic transmission associated with means, located at a remote point and associated with an applicator, for controlling the amount of material supplied to such applicator.

Another object of the invention is to disclose and provide apparatus including a power transmission means selectively operably connecting a motor means and a fluid pump with means located at a remote point and associated with an applicator for not only controlling the amount of material supplied to such applicator but also for controlling the selectively operable connection between the mud pump and the motor means.

A more specific object of this invention is to disclose and provide apparatus including a motor means and a mud pump and clutch means disengageably connecting the motor means and the mud pump wherein the clutch connecting means may be controlled from a control device on the applicator at a remote location, and wherein the motor means may be returned to idle speed when discharge of material is stopped.

A still further object of this invention is to disclose and provide an apparatus as mentioned above wherein a control device on an independently movable applicator is connected to a source of compressed air, and wherein an air bleeding orifice is associated with the control device for relieving air in part of said air system when discharge of material is discontinued.

This invention contemplates an apparatus for controllably conveying to and discharging from an independently movable applicator semifluid and pasty materials from a remote location wherein control means are provided which utilize high-pressure and low-pressure air supply, said low-pressure air supply being controlled by a control device on the applicator for supplying sufficient air to the pasty material discharged from the applicator and for actuating a pilot valve for controlling the high-pressure air which is utilized to actuate means selectively connecting the mud pump and motor means and to actuate a device associated with throttle means on the engine to bring the engine to idle speed when flow of material from the applicator is stopped.

These and various other objects, uses and advantages of the present invention will become apparent from the following description of certain exemplary devices embraced hereby, reference being had, for purposes of illustration, to the appended drawings, in which:

Fig. 1 is a diagrammatic representation of a supply unit, an applicator and control system.

Fig. 2 is a side elevation of a mobile unit embodying the elements illustrated in Fig. 1.

Fig. 3 is a section taken along plane III—III of Fig. 2.

Fig. 4 is a vertical section taken along plane IV—IV of Fig. 2.

Fig. 5 is an enlarged view of one form of applicator adapted for use in the system illustrated in Fig. 1.

Fig. 6 is a diagrammatic representation of a modified form of system and control device.

Fig. 7 is a diagrammatic representation of a different modification of an applicator and control system embodying this invention.

Fig. 8 is a diagrammatic representation of a low pressure control system for a modification of this invention.

Fig. 9 is a diagrammatic representation of a high pressure, low pressure control system for another modification of this invention.

Fig. 10 is a fragmentary sectional view of an air bleed means used with the control devices of Figs. 7, 8 and 9.

Fig. 11 is a part diagrammatic and part sectional view of a control device on an applicator showing a different modification of this invention.

As illustrated in Fig. 1, the mobile unit containing a source of material, mud pumps and driving elements may comprise a primary source of power or engine 10 (generally a small, internal combustion engine) operably connected to an air compressor 11 and also driving a hydraulic pump 12 supplied with suitable fluid as by line 13 from a fluid reservoir 14. Fluid under pressure is supplied by the hydraulic pump 12 through line 15 to a variable speed, pressure-fluid-actuated motor 16, spent fluid being discharged from such motor 16 back to the reservoir 14 as by line 17. The variable speed fluid motor 16 is operably connected as by belt drive 18 to a mud pump 19 positioned beneath a supply hopper 20 having an outlet port 21 through which plaster, paint or other cementitious or coating material may be supplied from the hopper to the mud pump 19. The mud pump may be of any desired type or construction capable of handling the pasty or semifluid material and discharging it into an elongated, flexible conduit 22 leading to an applicator generally indicated at 23, such applicator being independently and manually movable with respect to the other elements of the device.

In the system illustrated in Fig. 1, the compressor 11 supplies compressed air by tube 26 to control means located in the applicator 23 and controlled by trigger 24. This trigger may control the amount of air from the applicator as by tubing 27 to an actuating mechanism 28 operably connected with a throttle valve 29 in conduit 15 of the hydraulic transmission. The hydraulic transmission may be said to comprise the hydraulic pump 12, a low pressure fluid reservoir 14 and the hydraulic fluid motor 16, as well as interconnecting conduits, ports and the like. It may also include a pressure relief valve 30 located in branch conduit 15' permitting pressure fluid to return to the reservoir in the event the throttle valve 29 is closed.

By referring to Fig. 5 it will be noted that the applicator 23 is provided with a removable nozzle 33 communicating with a chamber 34 which is capable of being supplied with semifluid or pasty material conveyed to the applicator by hose 22. In the particular form of device illustrated, the incoming air supplied by tubing 26 leads into a chamber formed in the handle 35 of the device, the upper end of such chamber including a hollow tube 36 provided with air inlet ports 37. The rear end of the tube 36 is closed and the forward end terminates in a tip within chamber 34, said tip being provided with a forwardly directed air outlet 38 extending in the direction of the discharge port of nozzle 33. Compressed air will therefore normally be supplied to the applicator by tubing 26, enter the tube 36 by way of ports 37 and be discharged therefrom in the direction of the nozzle by port 38.

It will be noted that material supplied to the applicator by conduit 22 can be shut off at the applicator by means of a slide valve 40 provided with a port 41. The slide valve is operably connected to the trigger 24 so that when the trigger is squeezed and moved in the direction of the arrow indicated in Fig. 5, the slide valve will be opened, the port 41 permitting material to pass into chamber 34 and be discharged therefrom through the nozzle 33. It

will also be noted that movement of the trigger 24 opens multiple position control valve 44 permitting compressed air to pass through valve port 45 into discharge passage-way 27' in communication with return tube 27.

The multiple position control valve 44 actually controls the supply of material to flexible conduit 22. By referring to Fig. 1 it will be noted that throttle valve 29, is normally in a closed position and its arm is connected to a piston rod 48 of a piston in the actuating mechanism 28. When the trigger 24 is pulled back and control valve 44 is opened, a quantity of compressed air will be supplied through tube 27 to the actuating mechanism 28, causing the piston and its piston rod to move the throttle valve 29. This permits the pressure fluid from the hydraulic pump 12 to pass through conduit 15 to the pressure-fluid-actuated motor 16, thereby starting such motor, varying its speed in accordance with the amount of air thus supplied to the actuating mechanism 28 and thereby varying the speed of the mud pump 19 and the quantity of material supplied by flexible hose 22 to the applicator 23.

It may also be noted at this time that valve 44 is biased into closed position by means of spring 44' so that normally air under pressure is not supplied to line 27 and slide valve 40 is closed. The chamber 34 of the applicator is therefore normally empty in that compressed air discharged through tubing 36 and port 38 cleans out chamber 34. Attention is also called to the fact that the actuating mechanism 28 is provided with a small, bleeding orifice permitting line 27 and the chamber in which the piston of the actuating device operates to bleed back to the atmospheric pressure, permitting bias spring 29' to close the throttle valve.

Figs. 2, 3 and 4 illustrate a complete operative device embodying the elements heretofore shown in somewhat diagrammatic fashion. It will be noticed that the mobile supply and driving unit comprises a frame 1, one end of the frame being preferably supported upon wheels 2, whereas the other end of the frame is supported upon a pair of bent tubing members 3 provided with handles 4 so that the entire unit can be easily wheeled about from place to place. The engine 10 and compressor 11 may be mounted near one end of frame 1. The hopper 20 may be supported from the frame 1 by vertical standards 5, the open top of such supply hopper 20 being at a height permitting ready dumping of material into the hopper. The mud pump 19 may be of the progressing cavity type wherein a spiral rotor extends through a stator whose inner surface is provided with a cooperating spiral groove. Tubular pumps of this type were devised by Moineau and are generally known as Moyno pumps, although other types of mud pumps capable of handling somewhat abrasive or thick, pasty material may be used.

The entire hydraulic transmission (bounded by dash lines 6 in Fig. 1) may be also mounted on frame 1, the pump portion of such hydraulic transmission being driven by the engine 10 as by belt 7. The actuating mechanism 28 may be connected directly to the side of the hydraulic transmission assembly, the return air line 27 being in the form of a flexible tubing paralleling and preferably tied to the material supply conduit 22. Fig. 4 illustrates the location of the actuating mechanism 28, the piston rod 48 being pivotally connected to the arm 29' of the throttle valve which is, in turn, also connected to the biasing spring 29' tending to return such valve to closed position.

Attention is drawn to the fact that in operation of the apparatus described the engine and compressor can be started, the hopper 20 loaded with material to be applied at some remote point by the applicator 23, and although the hydraulic pump 12 is constantly driven, the mud pump 19 and its operation is absolutely controlled by the operator handling the applicator 23. The amount of movement imparted the trigger 24 controls the supply of material to the applicator. The slide valve 40 can be dis-

pensed with completely and is only used in order to prevent material remaining in supply hose 22 from flowing out of the applicator when the applicator is laid down upon the ground after having been used. The control of the supply of material to the applicator is extremely flexible and such material may be supplied at rates under the control of the operator and depending entirely upon the position of the trigger 24. As a result, the operator may apply thin or thick coatings and produce different effects and surface finishes.

A somewhat modified form of device is illustrated in Fig. 6, wherein the motor or engine 10' is shown driving a fluid pump 12', such pump being supplied with low pressure fluid as by line 13' from a fluid reservoir 14' acting as a jacket around supply hopper 20'. This arrangement permits the heat generated in the hydraulic fluid to be absorbed by the material in the supply hopper. Fluid under considerable pressure is discharged by line 15' to a throttle valve 29' provided with an actuating mechanism 28'. The pressure fluid is thus independently supplied to a pressure fluid actuating motor 16' operably connected to a mud pump 19' capable of receiving material from the hopper 20' and discharging it from a flexible conduit 22' leading to an applicator 53. This applicator is shown provided with a discharge opening 54 (which may be in the form of an elongated slot) surrounded by a slightly curved troweling plate 55. The handle of the applicator is again provided with a trigger or control element 56, this control element being capable of moving a piston 57 acting upon a body of oil 58 in the chamber beneath the piston and in tubing 59 leading to a similar closed chamber of the actuating device 28'. It will be evident that movement of the trigger 56 will impart considerable pressure to the fluid in 58, 59 and 29', thereby causing a movable piston in the chamber of actuating device 28' to move the throttle valve 29'. The stem of piston 57 is biased in upper position by means of a spring 60 so that normally throttle valve 29' is closed and motor 16' is not driven, pressure fluid bypassing the motor through a pressure relief valve 30'. The system illustrated in Fig. 6 is particularly useful when pasty plaster mixes are being applied and does not require the use of compressed air. For this reason a compressor 11' is simply indicated in dash lines in Fig. 6 and need not be used.

In Fig. 7 is diagrammatically illustrated a different modification of this invention following generally the diagrammatic illustration of Fig. 1. Wherever possible like parts are given like reference numerals with a double prime sign.

An engine or motor means 10'' may be provided with a driving connection illustrated at 7'' with a pressure-fluid pump means 12''. The pump means 12'' is supplied with fluid from a low-pressure fluid reservoir 14'' through a line 13''. Fluid from line 13'' is introduced to the pump means 12'' at an inlet 65. An outlet 66 is connected to a line 15'' which provides fluid communication with a pressure-fluid motor 16''. The pressure-fluid motor 16'' may be connected to a mud pump 19'' by any suitable means such as a chain drive indicated at 18''. A discharge port of the mud pump 19'' may be connected to a flexible conduit which provides fluid communication with an independently movable applicator 23''. Spent fluid from the pressure-fluid motor means 16'' may be conveyed to the reservoir 14'' by means of a return line 17''.

Adjacent the reservoir 14'' may be provided a bypass line 67 interconnecting line 13'' and line 15''. The bypass line 67 may be provided with a relief valve 68. Between bypass line 67 and its connection to line 15'' and the pressure-fluid motor means 16'' may be provided a line 69 connected to line 15'' at 70 and to reservoir 14''. The line 69 may be provided with a preset, flow control valve generally indicated at 71. The flow control valve 71 may be preset prior to operation of the

applicator to bypass a selected amount of pressure fluid to the reservoir for driving the fluid motor 16'' at a preselected speed under conditions of full flow of fluid from the pump 12''. The pump 12'', reservoir 14'', motor 16'' and the lines associated therewith provide a fluid transmission 6'' indicated by phantom lines as in the prior embodiment.

In this modification of the invention, adjacent to the pressure-fluid pump 12'', the line 13'' and the outlet line 15'' may be provided with a bypass 73. The bypass line 73 is provided a connection at 74 to a line 13'' and at its connection to line 15'' a three-way valve means 75 may be provided. The three-way valve means 75, in one position, may bypass all of the fluid pumped by pump 12'' into the inlet line 13' to recirculate pumped fluid, if necessary, and to stop flow of fluid to motor means 16''. In a second position, three-way valve 75 may be fully opened to permit virtually all of the fluid being pumped to flow along line 15'' to the pressure-fluid motor means 16'' for driving said motor. The fluid driving motor means 16'' is regulated to a selected amount by valve 71. When the three-way valve means is in first position (closed), recirculation of fluid through the pump 12'' permits the engine 10'' to continue to operate at running speed while flow of plastic material is discontinued from the applicator 23''.

Means for controlling the three-way valve 75 includes air under pressure controlled by a control device 24'' located at the applicator 23''. A compressor 11'' driven by engine 10'' provides a source of air under pressure which is communicated to the control device 24'' by a flexible conduit or pipe means 26''. The pressure air supplied in this embodiment may be of low pressure and is connected to the applicator for combining with flow of plastic material through a conduit 76 carried by applicator 23''. The low pressure air supplied to device 24'' is also provided with communication through a flexible duct 27'' to the three-way valve 75 by a connection at 77. The pressure air supplied through duct 27'' actuates the three-way valve 75 by well known means.

It will thus be apparent that actuation of control device 24'' at applicator 23'' provides a control means for hydraulic transmission 6'' so as to control the discharge of material from mud pump 19''. The actuation of the three-way valve to closed position bypasses pressure fluid back to the hydraulic pump so that the fluid motor 16'' ceases to drive the fluid motor 16''. When the control device 24'' is actuated to open the three-way valve for flow of pressure fluid from pump 12'' through line 15'' to motor 16'', the motor drives mud pump 19'' at a preselected speed as determined by the setting of the variable by-pass flow control valve 71.

When the control device 24'' is actuated to cease operation of the mud pump 19'', pressure air in duct 27'' must be relieved. In Fig. 10, an air relief means associated with control device 24'' is illustrated in only fragmentary form. Pressure air from pipe means 26'' may be introduced through an inlet 80 to a chamber 81 having valved communication to an outlet 82 which is connected to duct 27''. At one end of chamber 81 may be provided a hollow valve body 83 having a port 84 adjacent outlet 82. Within the body 83 is mounted a biased coaxial valve member 85 provided with a tapered valve head 86 cooperable with a complementary tapered valve seat 87 on body 83. The valve member 85 includes an elongated stem 88 extending through the body 83 and having an outer enlarged end 89 slidably guided in a retainer nut 92 threaded on the end of body 83 and sealably seated on the end face of device 24'' therefrom. A spring 90 seated against a shoulder 91 on the valve member biases valve member 85 into closed position. Internal longitudinal relief passageways 94 provided in the end of body 83, may be closed by enlarged end 89 when the valve is open. The outer end

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face of 89 is adapted to contact the trigger means of the control device 24". Thus when the trigger means is actuated, pressure against end 89 of the valve member will open the valve to permit flow of air through chamber 81, port 84, and outlet 82. When the trigger means is released, the valve member 85 is biased to closed position and pressure air in duct 27" is permitted to bleed to atmosphere through the now open passageway 94.

The prior embodiments show a fluid transmission for driving of the mud pump and control means at the applicator for the fluid transmission to control and vary the material discharge, the control means utilizing pressure air. In Fig. 8 a modification is shown in which a mechanical transmission of driving power for the mud pump is used and in which pressure air control means is cooperably associated with the mechanical transmission means for control thereof.

In Fig. 8 a compressor 11" may provide a source of low-pressure compressed air. As in the prior embodiment a control means 24" is provided on an applicator 23". A flexible pipe means 26" connects the compressor 11" with the control device 24" and said flexible pipe means may be provided with a suitable relief valve indicated at 100. A clutch means generally indicated at 101 provides means for disengageably connecting engine 10" with mud pump 19". In this embodiment fluid-pressure line 102 connects control device 24" with the clutch 101 and said clutch is provided with an actuating means 103 responsive to air pressure for engagement and disengagement of the clutch. Thus when the control device 24" is actuated flow of compressed air at low pressure is provided through the line 102 to the clutch and the clutch may be actuated into engaged position for causing the engine to drive the mud pump 19".

Similarly, a throttle means 104 on engine 10" may be connected to a cylinder and piston actuator means 105 therefor which may be connected by line 106 to the outlet of the low-pressure air from the control device 24". Thus when low-pressure air is admitted into the line 106, actuating means 105 causes the engine accelerator to be moved to a predetermined setting whereby the engine will operate at a selected speed. Upon deactivation of the control means 24" for stopping discharge of material from the applicator, the relief of pressure air on one side of the piston and cylinder means 105 will cause the engine throttle means to return to a normal idle position. It will thus be readily apparent that control means 24" at the applicator not only will control the rate of discharge of the material but will also automatically disengage the clutch 101 so that the mud pump will no longer be driven to provide flow of material to the applicator, and the engine which drives the mud pump will be brought to idle speed.

In Fig. 9 is shown another modification of the control means for disengaging a mechanical power transmission between an engine and a mud pump and for controlling the speed of the engine. In some apparatuses of large capacity, it may be desirable to employ a source of high-pressure air and Fig. 9 illustrates diagrammatically a high-low pressure system for accomplishing control of a clutch means and an engine in connection with control of a mud pump as described in the prior embodiments.

In Fig. 9 a compressor means 111 provides a source of high-pressure air and is provided with a connection to a high-pressure conduit 112 which is provided at its other end with an air pressure regulator 113. The outlet side of regulator 113 may be connected to a low-pressure line 114 which is connected to a control device 115 on an applicator 116. The outlet side of the control device 115 for low-pressure air may be connected to a low-pressure line 117 which is connected to a pilot valve 118. Between the compressor 111 and the pressure regulator 113, the high-pressure line 112 may be provided with a pressure-relief valve of any well known manufacture at 120.

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A high-pressure line 121 is provided with a connection to line 112 adjacent relief valve 120 and is also connected at 123 to pilot valve 118. The high-pressure air communicates through the pilot valve to an outlet at 124 which is connected to high-pressure line 125 which is connected to a pneumatically actuated clutch means or means for disengageably connecting the engine and the motor means generally indicated by 127. The high-pressure line 125 is also provided a connection to high-pressure line 128 which is connected to an actuating means 129 which may be connected to an engine throttle means as described in the prior embodiment.

Thus in the high-pressure control system described above it will be readily apparent that actuation of the control device at the applicator will cause the pilot valve to admit high-pressure air to the lines 125, 128, for actuation of the clutch 127 and the actuator for the engine throttle 129. The operation of the high-pressure control system results in control of the clutch and the engine described above.

In the embodiment of this invention shown in Fig. 11, a control device 140 may be substituted for control device 24 of the first embodiment and may similarly include a through valved passageway for pressure air, such valved passageway not being shown. The part of the device shown is a portion of the control device similar to that of Fig. 10 and shows a means for variably regulating control pressure air which is employed to vary flow of material from the applicator.

The diagrammatic portion of Fig. 11 is similar to the flow control arrangement of Fig. 1 and includes an actuating mechanism 28 operably connected to a throttle valve 29 in conduit 15 of the hydraulic transmission shown in Fig. 1. The throttle valve 29 includes an arm connected to a piston 48 of actuating mechanism 28. A spring 29' is connected to the arm to bias the throttle valve to closed position. The actuating mechanism 28 is connected by a conduit 141 to an outlet port 142 of control device 140.

The control device 140 comprises an air inlet 143 in communication with the through passageway in the control device. The inlet 143 leads to an inlet chamber 144 separated from an outlet chamber 145 by a valved ported partition wall 146, said ported wall 146 providing a tapered valve seat at 147. A needle valve element 148 is provided with a valve head cooperable with valve seat 147. The end of valve element 148 within outlet chamber 145 is tapered and cooperates with a hollow control rod 150 provided with a bore 151 having a valve seat 152 cooperable with the tapered end of valve element 148. The control rod 150 is secured in any suitable manner to a flexible resilient diaphragm 153 which defines one wall of outlet chamber 145. A chamber 154 provided on the other side of diaphragm 153 is provided with an air bleed port 155 for communication with atmosphere to relieve pressure on that side of the diaphragm.

The control rod 150 carries a thumb press button 157 slidably mounted in an opening 158 in the control device. A spring 159 biases the diaphragm and control rod attached thereto inwardly of outlet chamber 145 and a spring 160 in the inlet chamber biases the valve element toward valve seat 147 to provide normal closed position of valve element 148 on valve seat 152. Bore 151 communicates with atmosphere through ports 160 provided in the press button 157. Spring 159 and 160 are balanced so that equal pressure on both sides of wall 146 will maintain valve element in closed position on seat 152 and in selected relation with valve seat 147.

In operation of this modification, pressure against button 157 will cause valve element 148 to open to admit pressure air into outlet chamber 145 and into communication with the actuating mechanism 28 for responsive action of the flow control valve 29. Since the valve element 148 meters the flow of pressure air, a selected pressure is transmitted to actuating mechanism 28 to move the

flow control valve 29 to a selected position. If greater flow of material is desired, further pressure against button 157 will open valve element 148 to admit greater pressure to the actuating mechanism 28.

In the event there is an unbalance of air pressure between inlet and outlet chambers 144 and 145, such unbalance will automatically be compensated for by diaphragm 153. For example, if pressure decreases in outlet chamber 145, diaphragm 153 will respond thereto by moving inwardly urging needle valve element 148 further into inlet chamber 144 to increase the opening of the valved port to increase pressure air in outlet chamber 145. In the event pressure in outlet chamber 145 exceeds a desired pressure for a selected position of button 157, then diaphragm 153 moves outwardly of chamber 145 to thereby open bore 151 to bleed excess pressure air to atmosphere.

It will thus be readily apparent that by controlling the pressure air in communication with the actuating mechanism 28, a variable control of the hydraulic transmission (through flow control valve 29) can be achieved whereby variable control of discharge of material from the applicator is accomplished.

From the description given, it will be evident that the apparatus is compact, easily transported or moved into buildings or rooms is self-contained and free from electrical wiring, switches and attachments which are capable of shorting, fouling or otherwise causing trouble. A single operator can use the entire unit. The primary power source need not be started or stopped repeatedly. The unit is free from valves interfering with the free flow of material to the applicator. The operator has complete and flexible control over the rate at which material is supplied to his applicator by reason of the multiple position control means at the applicator. It is to be understood that various types of applicators, nozzles, etc., may be used and the invention is not limited to the specific forms of devices illustrated, but instead embraces all changes and modifications of the inventive concept here disclosed and covered by the appended claims.

We claim:

1. Apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof, comprising: a frame provided with a material supply hopper having a bottom outlet port; a mud pump positioned beneath said outlet port and adapted to receive material therefrom; a variable speed, pressure-fluid-actuated motor for driving the mud pump; a closed hydraulic system connected to said fluid-actuated motor including a low-pressure fluid reservoir, a pressure fluid pump, means for conveying fluid from the fluid motor to said reservoir and fluid pump, conduit means for conveying pressure fluid from the fluid pump to said fluid-actuated motor and a throttle valve in the last-named conduit means, said valve being provided with an actuating mechanism; a compressor; a primary source of power operably connected to said pressure-fluid pump and compressor; a manually movable applicator including a material inlet port, a material discharge port and a trigger-operated, multiple position air valve; flexible conduit connecting the discharge outlet of the mud pump with the material inlet port of the applicator; flexible tubing connected to the compressor for supplying compressed air to the air valve of the applicator; and a flexible return air tubing from said applicator to the actuating mechanism of said throttle valve for conveying air as modulated by said trigger-operated multiple position air valve to said throttle valve to vary the rate at which material is supplied to the applicator by the mud pump.

2. Apparatus of the character stated in claim 1, wherein the low-pressure fluid reservoir of said closed hydraulic system is in heat-exchange relation to material in said hopper.

3. Apparatus of the character stated in claim 2, in-

cluding means for discharging air, which is not returned by the multiple position air valve, through the material discharge port of the applicator.

4. Apparatus of the character stated in claim 1, wherein the mud pump is of the helical type, material is supplied to said pump by gravity and no air is introduced into the flexible conduit for material conveyed to the applicator.

5. Apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof, comprising: a frame; a material supply hopper provided with a bottom outlet port, carried by the frame; a mud pump positioned beneath the outlet port of the supply hopper, said mud pump having a discharge port adapted to be connected to one end of an elongated flexible conduit, the other and removed end of said conduit being connected to an applicator; a variable speed, pressure-fluid-actuated motor operably connected to the mud pump to drive the latter; a pressure fluid pump carried by the frame; a motor carried by the frame and operably connected to the fluid pump to drive the latter; a closed conduit system for fluid, including a low-pressure fluid reservoir, for supplying fluid to said fluid pressure pump and conveying pressure fluid from said pump to said fluid-pressure-actuated motor, a throttle valve in the conduit conveying pressure fluid to the fluid-actuated motor, an actuating mechanism for the throttle valve and means for supplying a different fluid to said actuating mechanism including a tube from said actuating mechanism to the applicator and control means located at the applicator for such different fluid.

6. Apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof, comprising: a frame; a material supply hopper provided with an outlet port and carried by the frame; a mud pump positioned beneath the outlet port of the supply hopper, said mud pump having a discharge port adapted to be connected to one end of an elongated flexible conduit, the other end of said conduit being connected to an applicator; a pressure fluid actuated motor operably connected to the mud pump to drive the same; a pressure fluid pump carried by the frame; a motor carried by the frame and operably connected to the fluid pump to drive the latter; a closed conduit system for fluid including a low pressure fluid reservoir for supplying fluid to said fluid pressure pump and conveying pressure fluid from said pump to said fluid pressure motor; a valve means in the conduit conveying pressure fluid to the fluid actuated motor; an actuating mechanism for the valve; means for supplying a different fluid to said actuating mechanism including a tube from said actuating mechanism to the applicator; and a control means located at the applicator for such different fluid.

7. An apparatus as stated in claim 6 wherein said valve means include a three way valve.

8. Apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof, comprising: a material supply hopper provided with an outlet port; a mud pump connected to said port in fluid communication therewith; an applicator; a flexible conduit connecting the applicator and mud pump in fluid communication; a motor means connected to the mud pump to drive said pump; a source of compressed air; means connecting said said motor means and mud pump for driving and non-driving relation; and means to control the quantity of material discharged by said mud pump, said control means being on said applicator and including flexible tube means providing communication between said control means and the source of compressed air; and means connecting said control means with said motor and mud pump connecting means for actuating said connecting means.

9. In an apparatus as stated in claim 8 wherein said control means includes a bleed element for relieving air in the means connecting said control means with the motor and mud pump connecting means.

10. In an apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof, comprising: a mud pump connected to a material supply hopper; an independently movable applicator; a flexible conduit connecting the applicator and mud pump in fluid communication; a motor means to drive the mud pump; means selectively connecting the motor means and the mud pump; a source of compressed air; and control means on the applicator to vary the discharge of material from the applicator, said control means being connected in fluid communication to the source of compressed air; and means connecting the control means with said selective connecting means and responsive to actuation of said control means for control of flow of material from the mud pump.

11. In an apparatus as stated in claim 10 including throttle means for the motor means, an actuating device for the throttle means, and means connecting the control means to the actuating device for varying the position of the throttle means to change the speed of the motor means.

12. An apparatus as stated in claim 10 including a high-pressure source of compressed air, a pressure regulator between said compressed air source and said applicator to provide low pressure air at said applicator; means connecting said high pressure air source to said means selectively connecting the motor means and the motor pump and including a pilot valve; means connecting the applicator to said pilot valve for low-pressure air communication therebetween for response of the pilot valve thereto for communication of high pressure air to said connecting means for actuation thereof.

13. An apparatus as stated in claim 12 including a throttle means for the motor means, an actuating device for the throttle means, and means connecting the high-pressure air between the actuating device and the pilot valve for varying the position of the throttle means to change the speed of the motor means.

14. An apparatus of the character described including a mud pump having a discharge port and a flexible conduit connected to said port, motor means for driving said mud pump, and a source of compressed air, the combination of: an independently movable applicator connected to one end of the flexible conduit for receiving and discharging material pumped by said mud pump; a flexible pipe means providing communication between said applicator and the source of compressed air and serving to facilitate discharge of material from said applicator; a control device carried by the applicator for control at said applicator of air supplied from said source of compressed air through the flexible pipe means; a throttle valve means connected with said motor means for controlling the quantity of material discharged by the mud pump through the applicator; and actuating means for said throttle valve means including pressure air conduit means separate from said flexible pipe means and in communication therewith at said control device connecting said actuating means and said control device whereby said actuating means is responsive to said control device for controlling said motor means for varying the flow of material from said mud pump and discharged through the applicator.

15. In an apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof including a mud pump having a discharge port, an elongated flexible conduit for said material having one end connected to said discharge port and the other end to said applicator, motor means for driving the mud pump, and a source of compressed air serving only to

facilitate flow of material from and at the applicator and to actuate means responsive thereto for regulating flow of said material, the combination of: an applicator connected to said other end of said flexible conduit; flexible pipe means interconnecting said applicator with said source of compressed air; a control device carried by the applicator; and means to vary the discharge of material from the applicator including an air control line connected to the control device, a valve means connected with the air control line between the control device and the motor means driving said mud pump, said valve means being responsive to pressure air in said air control line as controlled by said control device to vary the material discharged through said applicator.

16. In an apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof including a mud pump having a discharge port, an elongated flexible conduit having one end connected to said discharge port, motor means operably connected to the mud pump for driving the latter, and a source of compressed air, the combination of: an applicator connected to the other end of said flexible conduit; flexible air pipe means interconnecting in fluid communication said applicator with said source of compressed air; a control device carried by the applicator for regulation of material discharged through said applicator, said control device including means to variably regulate pressure air at said applicator; valve means operably connected to said motor means between said motor means and said control device; and actuating means for said valve means including air control conduit means separate from said air pipe means interconnecting said actuating means and said control device for communication of pressure air therebetween whereby said actuating means is responsive to said control device for variable operation of said valve means whereby said mud pump is variably driven to vary control of material discharged through the applicator.

17. In an apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof comprising: a positive displacement material pump adapted to be operatively connected to a material supply hopper; an independently movable applicator; a flexible material conduit interconnecting in communication the applicator and pump; a source of compressed air; an air supply line from said source to said applicator; means for driving said pump independently of said compressed air source; means for selectively interconnecting the pump drive means and the pump; and means at the applicator for controlling the pump drive means to vary flow of material from said applicator and including a control device at said applicator; an air control line, separate from said air supply line, connected to said control device and to said interconnecting means for the drive means and the pump, valve means associated with said air control line and including an actuating mechanism responsive to pressure air in said control line as controlled by said control device whereby said means interconnecting the drive means and the pump is responsive to said pressure air through said actuating mechanism and valve means for varying material flow from the pump.

18. In an apparatus for controllably conveying to and discharging from an independently movable applicator semi-fluid and pasty materials from a remote supply thereof including material supply hopper, a material pump means supplied from said hopper, a source of pressure air, and motor means actuated by other than air pressure for driving the pump means comprising, in combination: an independently movable applicator remote from said pump means; a first flexible conduit for conveying material from said pump means to said applicator; a second flexible conduit conveying pressure air from

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said source of pressure air to said applicator; a control device at said applicator provided with communication with said pressure air delivered by said second flexible conduit; a valve means connected to said motor means for controlling driving of said pump means; actuating means for said valve means; and a third flexible conduit for connecting said control device to said actuating means for communication of pressure air with said actuating means for selective operation of said valve means whereby flow of material from said pump to said applicator

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may be regulated without stopping flow of pressure air from said source of pressure air through said applicator.

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Disclaimer

2,820,672.—*Lee Arce, William K. Vogel, and Milton C. Vogel*, Arcadia, Calif.
APPARATUS FOR CONTROLLABLY APPLYING SEMIFLUID AND PASTY
MATERIALS. Patent dated Jan. 21, 1958. Disclaimer filed Aug. 7, 1961,
by the assignee, *Lee-Mart Mfg. Co.*

Hereby enters this disclaimer to claims 12 and 13 of said patent.
[*Official Gazette September 11, 1962.*]

UNITED STATES PATENT OFFICE

Certificate

Patent No. 2,820,672

Patented January 21, 1958

Lee Arce, William K. Vogel and Milton C. Vogel

Application having been made jointly by Lee Arce, William K. Vogel and Milton C. Vogel, the inventors named in the patent above identified, and Lee-Mart Mfg. Co., Arcadia, California, a corporation of California, the assignee, for the issuance of a certificate under the provisions of Title 35, Section 256 of the United States Code, deleting the names of the said William K. Vogel and the said Milton C. Vogel from the patent as joint inventors, and a showing and proof of facts satisfying the requirements of the said section having been submitted, it is this 27th day of March 1962, certified that the names of the said William K. Vogel and the said Milton C. Vogel are hereby deleted from the said patent as joint inventors with the said Lee Arce.

[SEAL]

EDWIN L. REYNOLDS,
First Assistant Commissioner of Patents.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,820,672

January 21, 1958

Lee Arce

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 29, for "our" read -- my --.

Signed and sealed this 7th day of August 1962.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents