July 14, 1964 R. A. DELLIGATTI 3,140,801

AUTOMATIC PLASTERING MACHINE

Filed July 21, 1961 4 Sheets-Sheet 1

Fig. 1.

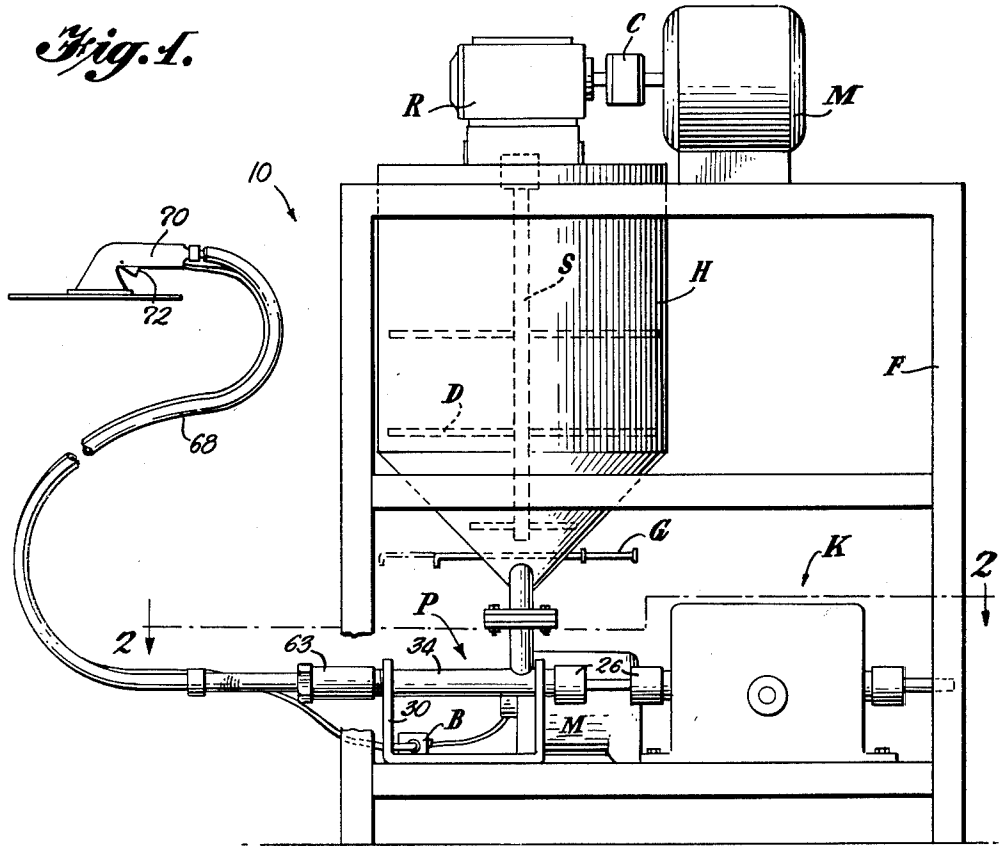
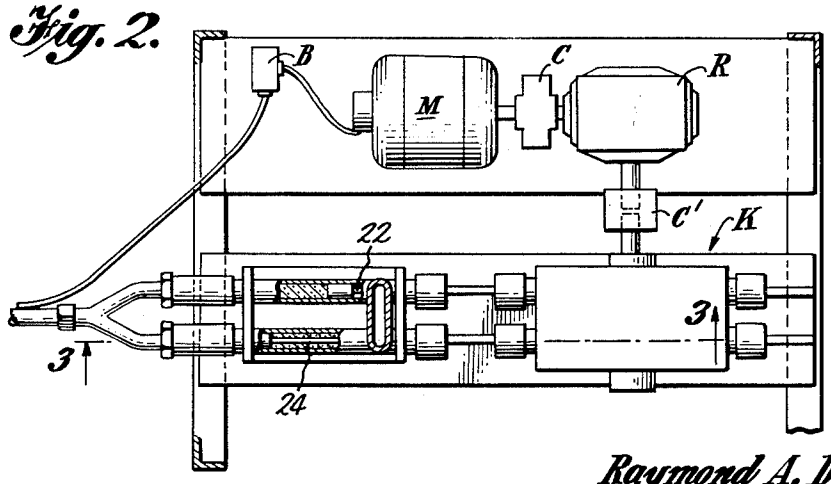


Fig. 2.



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AUTOMATIC PLASTERING MACHINE

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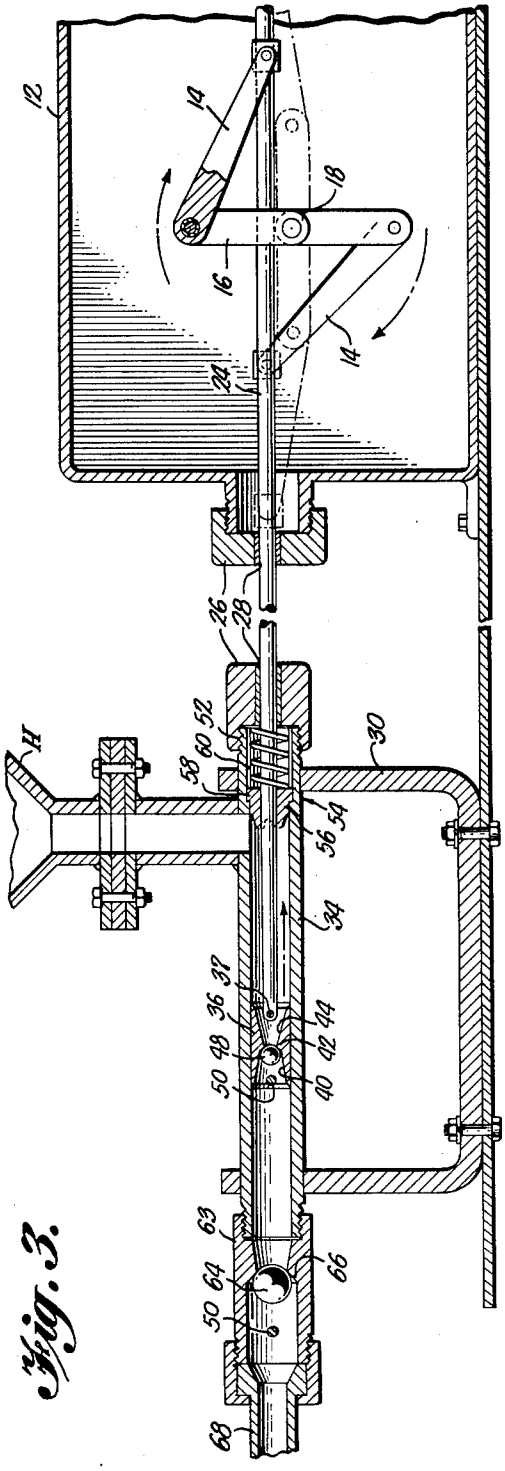

Fig. 3.

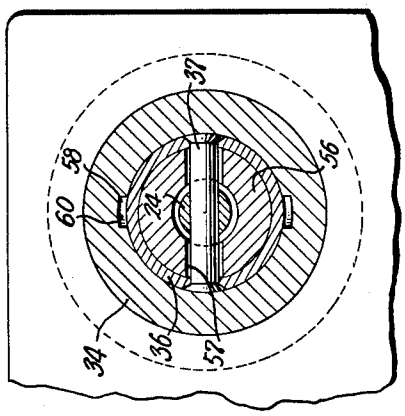

Fig. 5.

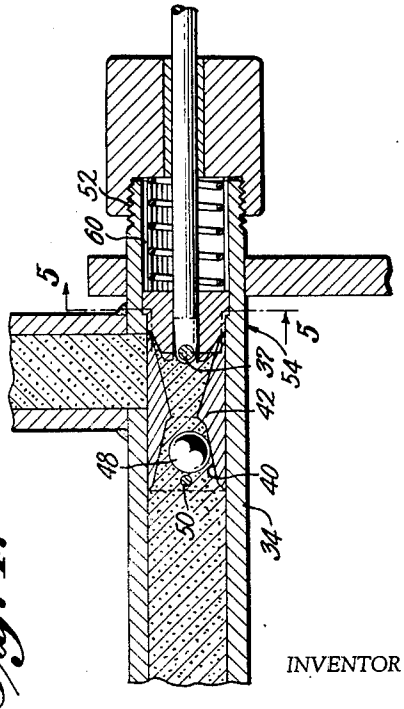

Fig. 4.

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Fig. 6.

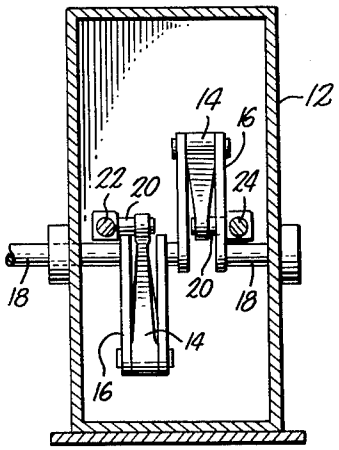

Fig. 10.

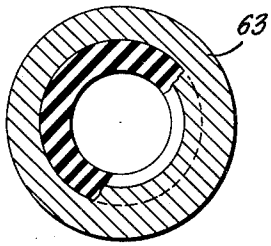

Fig. 7.

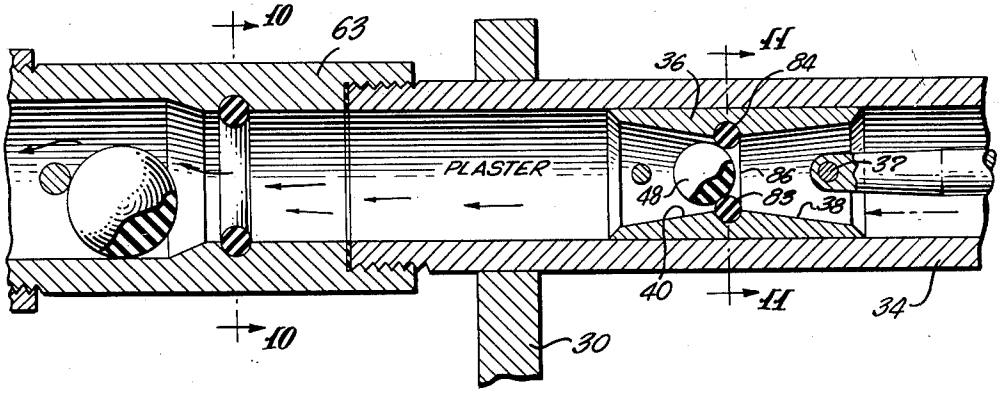

Fig. 11.

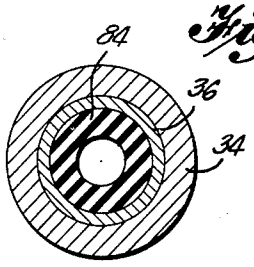

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Fig. 8.

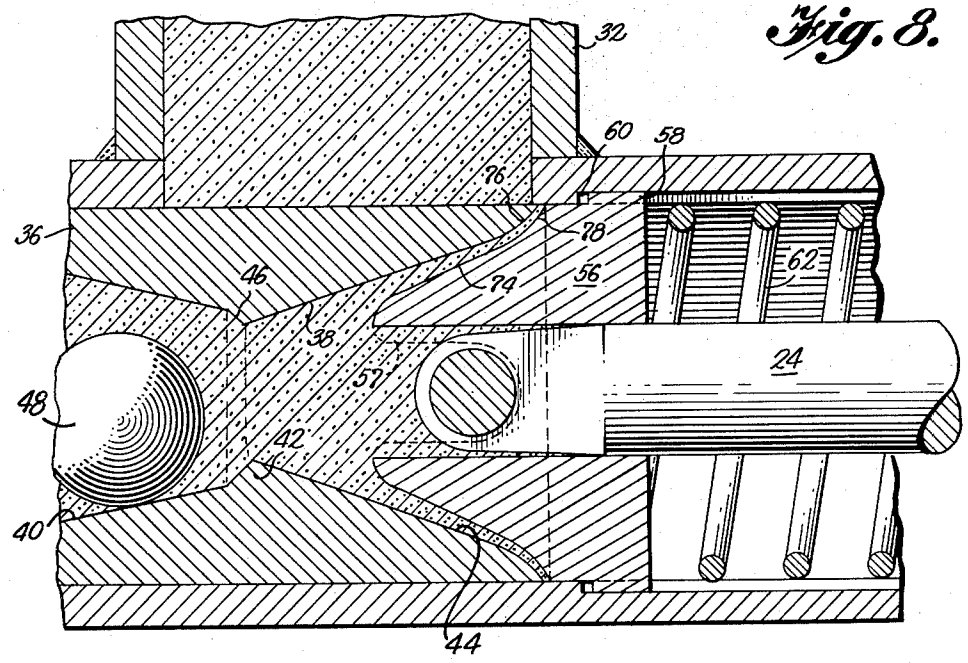
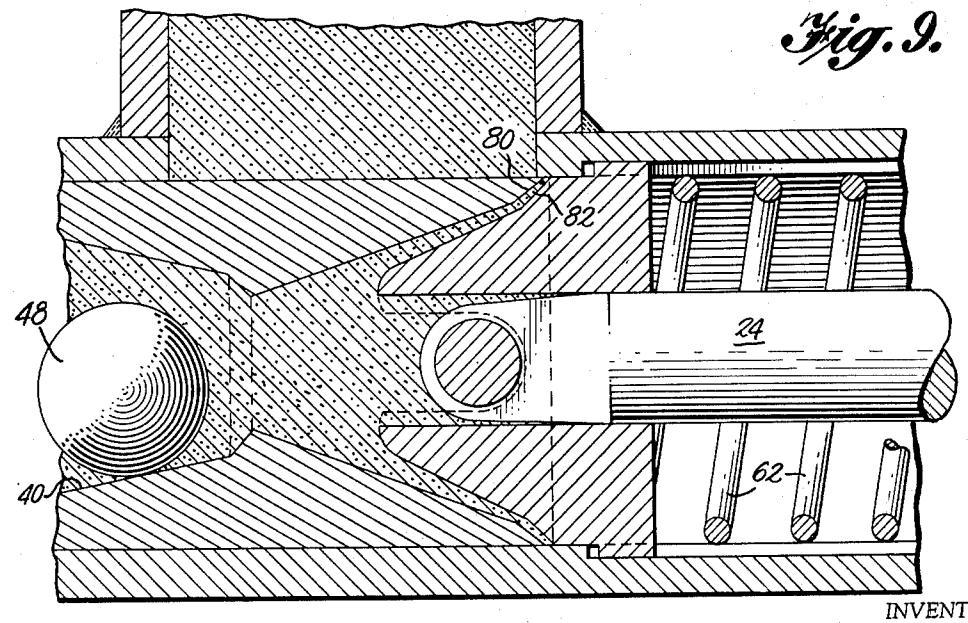


Fig. 9.



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United States Patent Office 3,140,801 Patented July 14, 1964

3,140,801

AUTOMATIC PLASTERING MACHINE

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Filed July 21, 1961, Ser. No. 125,835
13 Claims. (Cl. 222—380)

This invention relates generally to an automatic plastering machine, and in particular, this invention relates to means for pumping plaster from a hopper to a plastering tool.

It has been a problem in the plastering art in the past to pump a mixture of plaster ready for application to a wall, ceiling or the like from a holding vessel to the plastering tool such as a trowel. The problem was created by reason of the fact that the plaster when in wet condition must be moved through a conduit in a uniformly mixed condition to prevent setting of the plaster. In the past, plaster transmitting machines frequently forced the water from the plaster mixture, which resulted in the setting of the plaster or at the very least a nonuniform plaster mixture of unsatisfactory consistency for application to any surface.

Another difficulty that plagued prior art machines was the fact that a gradual build up of plaster would occur within the plastering machine, particularly on any surface not in contact with another relatively moving surface. For instance, in any pumping machine that utilized a flat headed piston, the build up of plaster would occur on the front face of the piston, with the result that the effective stroke of any such piston would be reduced, and eventually, due to serious build up, the machine would be stopped. While some attempts to avoid these problems have been made, no successful machine is known to exist.

Consequently, it is the primary object of applicant's invention to provide an automatic plastering machine which will pump plaster from a holding vessel, such as a hopper, to a plastering tool while maintaining the plaster in a uniformly mixed condition.

It is also the object of the present invention to provide an automatic plastering machine which will not suffer from the usual occurrences of plaster build up within the plaster pumping portion of the machine such that will prevent operation of the machine.

This invention also has for its object the provision of a cleaning means which will assure the effective cleaning of those portions of the machine that are normally affected with plaster build up.

While it is one of the important objects of this invention to prevent build up of plaster within the plastering machine, this invention also provides for means which will permit the plastering machine to operate at peak efficiency even with a slight plaster build up within the machine.

It is a further and more limited object of the present invention to provide for quick and easy disassembly of the machine, to permit rapid cleaning of the machine.

A further object of the present invention is the provision of means for providing constant and uninterrupted flow of uniformly mixed plaster to a plastering tool.

These and other objects of the present invention will be more clearly understood upon careful study of the following description in conjunction with the accompanying drawing, in which:

FIGURE 1 is a vertical side view of the automatic plastering machine according to the present invention showing general organization thereof, including the mixing means, pumping means, and dispensing means;

FIGURE 2 is a view partially broken away along lines 2—2 of FIGURE 1, showing the general organization of the invention in addition to the dual pumping means;

FIGURE 3 is a sectional view in elevation, taken along

the line 3—3 of FIGURE 2, wherein the motivating crank means is shown along with the details of the pumping means, and additionally there is shown the cleaning means at the rearward portion of the piston chamber;

FIGURE 4 is an enlarged sectional view of FIGURE 3, showing the piston engaging the cleaning means and the provision of the biasing means, permitting the cleaning means to move rearwardly in the case of build up of plaster between the cleaning means and the piston;

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 4, and particularly shows the keyway in the piston chamber;

FIGURE 6 is an elevational view in section, showing further detail of the crank means for motivating the pumping means;

FIGURE 7 is an enlarged sectional view of another embodiment of the present invention, showing another form of the construction means within the piston;

FIGURE 8 is an enlarged fragmentary sectional view of the cleaning means in operation, showing the divergent surfaces whereby the plaster is urged axially of the piston;

FIGURE 9 is an enlarged fragmentary sectional view of another embodiment of the invention, showing a different configuration for the coacting surfaces of the piston and cleaning means;

FIGURES 10 and 11 are sectional views taken along lines 10—10 and 11—11, respectively, of FIGURE 7.

Briefly, the present invention comprises a plastering machine having a novel piston construction which is cleaned by the passage of plaster through a smooth passageway within the piston as it reciprocates to be moved continually, thereby preventing any substantial build up of plaster within the piston. Additionally, the present invention provides a cleaning means biased within the piston chamber to be inserted at intervals into the piston passageway to further prevent any substantial build up of plaster on the piston or at the end of the piston chamber.

Broadly, this invention as depicted primarily in FIGURES 1 and 2, includes a plastering machine shown generally by the numeral 10, and includes a hopper H for holding plaster which encompasses any form of plaster such as gypsum or one of the well known and recognized equivalents of gypsum, such as plaster of Paris. The hopper is secured in any suitable manner to a surrounding frame F, which houses and protects the plastering machine 10. Secured on an upper member of the frame F is a conventional motor M, which drives a reducer gear box R through a high speed flexible coupling C. The output from the reducer R operates through a low speed coupling C', a set of rotating paddles D, which are secured to a vertical mixer shaft S. A conventional gate valve G, which may be suitably operated, opens and shuts the passageway from the hopper into the pumping means, shown generally at P. The pumping means P is motivated through a crank means, shown generally at K.

The crank means K is operated by a convention motor M similar to the mixer motor, which in turn operates a gear reducer R through a flexible coupling C. The gear reducer R operates the crank K through the low speed coupling C'. Suitable energizing means, such as starter box B, controls the operation of the various motors M simultaneously, or a separate starter box may be used for each motor.

As best shown in FIGURES 3 and 6, the crank means includes a housing 12, which incorporates simple crank arms 14, pivotally operating at the ends of rotating control arms 16. These control arms 16 are suitably keyed to a rotating shaft 18, connected to the low speed coupling C', which in turn has its speed governed by the speed reducer R. In any suitable fashion the end of the crank arms 14 are pivotally mounted on rods 20,

having an integral or otherwise suitably affixed opening **22** for receiving the piston rod **24**.

It is to be understood that the crank means described above can be substituted for by any means which will impart the required reciprocation in the piston rods **24**. Each piston rod is stabilized by means of a bearing **26**, secured to the housing **12** in any suitable manner. The bearing **26** has soft bearing material **28**, as is conventional.

While shown as including tandem pumping means P, it is to be understood that one or more pumping means may be used. If only one is incorporated in the plastering machine, less than a uniform flow will occur which is generally not desirable, but can be utilized.

The following description of the pumping means will describe only a single means. However, regardless of the number utilized, each should incorporate the features of this invention.

The pumping means P is best shown in FIGURE 3, where it can be seen that it is suitably supported as by the U-shaped member **30**, secured to the frame F. The hopper H is suitably secured to an inlet pipe **32**, which communicates the interior of the hopper with the interior of a piston chamber **34**. The piston chamber is smooth, as best shown in FIGURE 3, and extends solely in the direction of the longitudinal axis of the chamber—that is, it does not have any projecting surfaces transverse to the axis of the chamber. Slidably disposed within the piston chamber, is a piston **36**, which constitutes one of the important features of the present invention. The piston **36** is suitably connected to piston rod **24** by cross rod **37**. Included in the piston **36** are a rearward passage **38** and a forward passage **40**, between which is included a constricting means **42**. This constricting means is an enlargement having a rear portion **44** contiguous with the rearward passage, and a forward portion **46**, which is contiguous with the forward passage **40**, forming a valve seat for ball valve **48** shown in seated position in FIGURE 3. The ball valve **48** is suitably limited in its movement from its valve seat or forward portion **46**, to obstructing member **50**. This obstructing member, as shown in FIGURES 3, 4 and 7, is rod-shaped and has smooth non-flat forward and rearward surfaces, thus preventing any build-up of plaster. The rearward passage **38**, forward passage **40**, rearward portion **44** and forward portion **46** of the constricting means all form a passageway through the piston. It is important that this passageway be smooth, in order that there be no build up of plaster when plaster is moved through the piston. Thus, all curves and changes in slope of the piston are gradual. The rearward portion **44** and the rearward passage **38** may have the same or slightly different shapes. In general, it has been found that the rearward passage and rearward portion each having a conical surface, are satisfactory for operation. Similarly, the forward passage can be conically shaped similar to the rearward passage, but of course, must be larger to offset the restriction in flow, due to the presence of the ball valve **48** within the piston.

The piston **38** is suitably secured to the piston rod **24** for reciprocal movement within the piston chamber **34**. Bearing means **26** and **28** similar to that positioned on the crank housing is removably secured as by threads **52** to the end of the piston chamber.

Disposed at the end of the piston chamber, as shown, is the cleaning means **54**, which constitutes another important feature of the present invention. This cleaning means is essentially a cone-like cleaner **56**, which is to be inserted at least partially into the rearward passage of the piston **36**. The cleaner **56** slidably and sealingly receives piston rod **24**, as shown, and is provided with a cut-out portion **57** to receive the cross rod **37**. At the end of the member **56**, suitable keying **58** is provided to be received in complementary keyways **60**, which may be seen in any one of FIGURES 3, 4, 5 and 8, thus permitting the cleaner member **56** to reciprocate within the limits of the keyway **60**, depending upon the build up that may unavoidably occur between the piston and the cleaner. Abutting the rearward face of the member **56** is a suitable biasing means such as spring **62** which is compressed between the forward face of the bearing **26**, attached to the piston chamber **34** and the rear face of the cleaner member **56**. In normal position the biasing means **62** forces the cleaner member **56** forwardly for engagement with the rearward passage **38** of the piston **36**, to thereby clean any plaster from the portion of the piston so contacted. The biasing means is designed to be stiff enough to move only when forced to by a plaster build up on the piston.

At the forward end of the piston chamber **34** is removably disposed as by threads, an extension **63** having therein a ball check valve **64** and a restricting means **50**. It is to be noted that the only valves that may be used within the piston chamber or its extension are smooth surface valves, such as those of the ball type, otherwise, build up of plaster will collect on one side or another of any type of valve that is alternatively shaped. The ball check valve **64** is seated on a suitable seat **66** formed within the extension of the piston chamber. It will be noted that the seat **66** is formed by the smooth and gradual tapering of the extension, thus forming a smooth, unobstructed and continuous passage with the smooth interior of the chamber **34**. Suitably threaded to the extension **63** is the outlet hose **68**, having a conventional trowel **70** removably coupled thereon. As shown in FIGURE 1, this trowel is trigger operated at **72** to energize the control box B to control the pumping action.

It has been determined that the diameter of the flexible hose **68** compared to the diameter of the piston chamber must be such as will not express the water or other liquid from the plaster composition. For practical reasons the hose must be at least ⅜ inch in diameter and not substantially greater than 1 inch diameter. In such case the piston chamber must be about 2 inches in diameter or less. As a general rule the piston chamber should not be greater than twice the size of the flexible hose. The following examples will illustrate.

Piston Chamber Diameter, Inches	Flexible Hose Diameter, Inches	Satisfactory
3	1	No
2	1	No
1½	½	No
1	1	Yes
1¾ to 1	1	Yes
1	⅝	Yes
1	½ to 1	Yes

The cleaner member **56** preferably has a blunt cone-like shape and a surface **74** which is similarly shaped to fit within the rearward passage **38** of the piston. As shown, particularly in FIGURE 8, the surface **74** recedes more sharply towards the axis of the piston than the surface **38**. This divergence thus creates an expelling action, which motivates any plaster between the cleaner member **56** and the piston **36** towards the center of the piston from which position it would be swept. According to the form of the invention shown in FIGURE 8, the piston and the cleaner member have complementary rounded edge surfaces **76** and **78**, respectively. These surfaces **76** and **78** will contact or be in closer proximity than surfaces **38** and **74**, due to the divergent slope of the surface **74** towards the axis of the piston.

As shown in FIGURE 9, the surfaces **76** and **78** may respectively be substituted with flat edge surface **80** on the piston and flat edge surface **82** on the cleaner.

While it is believed preferable to form the cleaner member surface **74** and the rearward passage **38** having surfaces with a divergent relationship, it has not been de-

termined that this is critical, since the cleaner member and the piston will cooperate to force substantially all the plaster out through the opening between the cleaner and the piston which is towards the center of the piston even without the divergent relationship. It may be added, however, that the divergent surfaces improve the cleaning result.

In FIGURE 7 there is shown a different embodiment of the constricting means wherein O-ring **84** is positioned to form a seat for the ball valve **48**. While the rearward portion **83** of the O-ring does not have the same slope as the rearward passage **38**, no build-up of plaster will occur on the surface **86**, in view of the fact that the normal action of the ball valve will distort the O-ring to such extent that any plaster tending to build up will be cracked off and carried along with the remainder of the plaster as it passes through the piston.

From the foregoing description, the operation of the plastering machine according to the present invention, should be obvious. However, a brief statement may add to the full understanding of the mode of operation.

The plaster or equivalent material, which includes any normal mixtures of gypsum, lime and water, may be added to the hopper H which will maintain the contents properly mixed by means of the rotating paddles D. The control box B when switched on, will begin the operation of the motors M to rotate the paddles D and begin the pumping action of the pumps P. Of course, it is to be understood that a single control box B may control the operation of both motors simultaneously, or separate control boxes can be used to independently control the motors. The gate valve G is opened manually or by a suitable control, to permit the passage of the plaster into the pump. The operation of the pump should be clear from FIGURE 3, wherein it can be seen that as the piston **36** moves forwardly or to the left, as shown in FIGURE 3, plaster will be drawn into the piston chamber 34. When the piston has reached its limit of forward travel, it will begin its return, as controlled by the crank means K. During the return travel, the ball valve **48** will unseat and permit the passage of the plaster through the piston at the limit of rearward travel. The piston will receive the cleaner member **56** which will engage at least the outer edges of the piston, but in any event will squeeze the plaster from the edges of the piston towards the center, to prevent any substantial build up at the edges of the piston. Then as the piston moves forwardly, the ball valve **64** will unseat at the same time the ball **48** will abut against the seat **46** in the piston, and forward movement of the piston will force the plaster out through the extension **63** into the hose **68** and through the trowel **70**, as controlled by the trigger **72**. Upon its return travel, the piston **36** will permit plaster to again pass through the passageway within the piston, carrying with it the plaster that was forced from the edges of the piston by the cleaner during the previous return movement. Thus, it can be seen that the normal abrasive action of the movement of the plaster will tend to maintain the piston clean and without any substantial build up of plaster. However, in the event that any such build up does occur, particularly around the edges of the piston, the cleaner having either the rounded edge surface **78** which would complement the rounded edge surface **76** on the piston according to one embodiment, or the straight edge surface **82**, which would complement the straight edge surface **80** of the piston according to the other embodiment of the invention, will tend to force the plaster from the edges toward the center of the piston, where it will be carried away by the movement of the plaster. Particularly in view of the divergent sloping relationship of the surfaces of the piston and cleaner, the plaster will be forced centrally of the piston.

If either due to slow operation of the machine or for any other reason, a slight build up of plaster does occur on the edge of the piston, for instance at rounded edge surface **76**, the piston will be permitted to move to its full limit of travel, by reason of the biasing of the cleaner member **56** by spring **62**. Thus, the stroke of the piston will be unimpaired and will always be permitted to move to its full extent. The spring **62** is of such strength that the cleaner member will move rearward only at the time that some build up unavoidably occurred on the edge surfaces of the piston. Key **58** and keyway **60** assure the proper movement of the cleaner, in the event that it is forced rearwardly by the piston. The cleaner member **56** not only maintains a clean surface on the piston, but also maintains the rear of the piston chamber free of any plaster build up by the action of the piston on the cleaner member. The cross rod **37** also prevents any substantial build up of plaster within the cut-out **57** by forcing any plaster from the cut-out on to the cleaner **56** for subsequent removal. Thus, there is a mutual cleaning effect between the piston and the cleaner member, assuring that no substantial build up will occur on either part of the plastering machine that would prevent the normal operation of the plastering machine.

It can also be seen by the various threaded connections that the plastering machine according to the present invention can be easily disassembled at the end of the operation.

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations, and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention, be considered as within the scope thereof as limited solely by the appended claims.

What is claimed is:

1. A plastering machine comprising a hopper adapted to hold plaster, a piston chamber having a plaster inlet which communicates with said hopper, a piston slidably mounted within said chamber, a piston rod connected to said piston for reciprocally moving said piston within said chamber, outlet means at one end of the chamber, passageway means including a forward and a rearward passage formed axially through said piston, ball valve means positioned within said passageway means, constriction means within said passageway means, said constriction means including a smooth continuous rearwardly sloping surface portion contiguous with said rearward passage and a smooth continuous forwardly sloping surface portion contiguous with said forward passage forming a seat for said ball valve means, the construction and arrangement being such that the passageway means is substantially self-cleaning by reason of the flow of plaster therethrough to prevent substantial build up of plaster within the piston, and cleaning means cooperating with said piston to prevent build up of plaster at the rearward end of said piston and at the rearward end of said chamber.

2. The plastering machine according to claim 1, wherein the cleaning means is biased and positioned within the chamber for engagement with the rearward passage.

3. A plastering machine comprising a hopper adapted to hold plaster, a piston chamber having a plaster inlet which communicates with said hopper, a piston slidably mounted within said chamber, a piston rod connected to said piston for reciprocally moving said piston within said chamber, outlet means at one end of the chamber, passageway means including a forward and a rearward passage formed axially through said piston, ball valve means positioned within said passageway means, constriction means within said passageway means, said constriction means including a smooth continuous rearwardly sloping surface portion contiguous with said rearward passage and a smooth continuous forwardly sloping surface portion contiguous with said forward passage forming a seat for said ball valve means, the construction and arrangement being such that the passageway means is substantially self-cleaning by reason of the flow of plaster

therethrough to prevent substantial build up of plaster within the piston, and cleaning means having a surface diverging from the interior surface of said rearward passage relative to the axis of the piston, said cleaning means being rearwardly disposed within said piston chamber for insertion into said passage to effect substantial mutual cleaning of said surfaces thereby preventing substantial build up at the end of the piston and the end of the piston chamber.

4. The plastering machine according to claim 3, wherein the constriction means comprises an O-ring embedded within said passageway means.

5. A plastering machine comprising a hopper adapted to hold plaster, a piston chamber having a plaster inlet which communicates with said hopper, a piston slidably mounted within said chamber, a piston rod connected to said piston for reciprocally moving said piston within said chamber, outlet means at one end of the chamber, passageway means including a smooth and continuous forward and rearward passage formed axially through said piston, ball valve means positioned within said passageway means, constriction means within said passageway means, said constriction means including a smooth continuous rearwardly sloping surface portion contiguous with said rearward passage and a smooth continuous forwardly sloping surface portion contiguous with said forward passage forming a seat for said ball valve means, and passageway cleaning means being positioned rearwardly of said piston and being slidably received on said piston rod, the construction and arrangement being such that the passageway means is substantially cleaned by the cleaning means and by reason of the flow of plaster therethrough to prevent substantial build up of plaster within the piston.

6. The plastering machine according to claim 5, wherein the cleaning means is biased and positioned within the chamber for engagement with the rearward passage.

7. The plastering machine according to claim 6, wherein the rearward passage has a conically shaped surface and wherein cleaning means having a diverging conically shaped surface is rearwardly disposed within said chamber for entrance into and movement towards engagement with said conically shaped surface of said rearward passage to force plaster from between said surfaces toward the axis of the piston to prevent build up on the rear portion of the piston and the cleaning means.

8. A plastering machine comprising a hopper adapted to hold plaster, a piston chamber having a plaster inlet which communicates with said hopper, a piston slidably mounted within said chamber, a piston rod connected to said piston for reciprocally moving said piston within said chamber, outlet means at one end of the chamber, passageway means including a smooth and continuous forward and a rearward passage formed axially through said piston and extending continuously and smoothly to the outer periphery of the piston, ball valve means positioned within said passageway means, constriction means forming a seat for said ball valve means and cleaning means cooperating with said piston to prevent build up of plaster at the rearward end of said piston and at the rearward end of said chamber.

9. The plastering machine of claim 8 wherein the cleaning means is slidably received on said piston rod.

10. The plastering machine of claim 8 wherein the surface of the cleaning means is complementary to the surface of the rearward passage.

11. The plastering machine of claim 8 wherein the cleaning means is slidably received on the piston rod and has a surface complementary to the rearward passageway.

12. The plastering machine of claim 11 wherein the cleaning means is biased and slides within a keyway positioned within the machine.

13. A plastering machine comprising a hopper adapted to hold plaster, a piston chamber having a plaster inlet which communicates with said hopper, a piston slidably mounted within said chamber, a piston rod connected to said piston for reciprocally moving said piston within said chamber, outlet means at one end of the chamber, passageway means including a forward and a rearward passage formed axially through said piston, ball valve means positioned within said passageway means, constriction means within said passageway means, said constriction means including a smooth continuous rearwardly sloping surface portion contiguous with said rearward passage and a smooth continuous forwardly sloping surface portion contiguous with said forward passage forming a seat for said ball valve means, the construction and arrangement being such that the passageway means is substantially self-cleaning by reason of the flow of plaster therethrough to prevent substantial build-up of plaster within the piston, and wherein the rearward passage has a conically shaped surface and wherein cleaning means having a rearwardly diverging conically shaped surface is rearwardly disposed within said chamber for entrance into and movement towards engagement with said conically shaped surface of said rearward passage to force plaster from between said surfaces toward the axis of the piston to prevent build-up on the rear portion of the piston and the cleaning means.

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