

PLASTERING MACHINE

This invention relates to plastering and in particular to a machine to apply cement-sand mortar onto brick wall, or concrete wall surfaces to provide a substantially smooth surface.

In the construction of buildings, generally the exposed brick wall surfaces or concrete wall surfaces which are rough or uneven, are plastered with cement-sand mortar to provide a substantially smooth surface. This application of cement-sand mortar plaster is done manually. The manual plastering method is labour intensive and generally does not result in uniform plastered surfaces, if the task is undertaken by persons lacking the necessary skills. Further, the manual rate of application of plaster is also slow.

Various attempts have been made to introduce mechanical contrivances to apply plaster onto walls. In one such example, cement plaster is sprayed onto the wall, resulting in a rough surface. The inventor is not aware of any other machines or contrivances used to apply plaster onto walls.

The present invention discloses a plastering machine to apply cement-sand mortar plaster onto a planar vertical surface.

According to the present invention there is provided a plastering machine for applying cement-sand mortar plaster onto a planar vertical surface, the plastering machine including a container for holding the plaster and having an outlet through which the plaster passes for application to the planar surface, vibration means to compact the plaster onto the planar vertical surface, and a frame assembly supporting the container and being capable of moving the container vertically over the height of the planar surface, the frame assembly including an outer frame which is fixed onto a base, an inner frame longitudinally movable along the outer frame, and a travelling frame which is longitudinally movable along the inner frame and to which the container is secured.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings which show a preferred embodiment thereof by way of example and in which:-

Fig 1 is a rear elevation view of an embodiment of the invention.

Fig 2 is a side elevation view of the embodiment.

Fig 3 (a), (b), (c) and (d) shows details of the container and vibrator locking device.

Fig 4 is an enlarged side view of the container and frame.

Fig 5 (a) and (b) are detailed views of the container and frame.

(a) and (b) are
Fig 6 is a detailed view of the frame assembly.

Referring to Figs 1 to 6, there is shown a plastering machine. The plastering machine includes a base frame (2) which is of rectangular configuration. The base frame is mounted onto four castor swivel wheels (4) rotatable 360° about its mounting. At least one pair of angled roller wheels (6) are installed at the front end of the base frame (2). These angled roller wheels are mounted onto a pair of hydraulic piston rods (8). Another pair of wheels (10) mounted onto a second pair of hydraulic piston rods (12). By activating the hydraulic pistons (8,12), the base frame can be lifted above the ground, so that the castor swivel wheels (4) are free. The pair of angled rollers are mountable onto an angled rail (14). Each of the two pairs of hydraulic pistons (8,12) can be independently operated so that the base frame and the fixtures thereon can be aligned vertically to any desired angle.

The plastering machine further includes an upright mast assembly (16). The upright mast assembly (16) consists of three frames. The outer pair of frame (18) is stationary whose one end is anchored to the base frame (2). The inner frame (20) is slidable along the outer frame by means of 8 to 12 guide rollers (21). The inner

frame (20) is secured to a hydraulic piston (22) at appropriate position, preferably at the connecting bar (21) of the inner frame (see Fig 6). Thus the inner frame can be moved up and down along the outer frame by operating the hydraulic piston (22). A travelling frame (24) is slidable along the inner frame ^{members} ~~members~~ (20) by means of guide rollers (26). The movement of the travelling frame (24) along the inner frame (20) is by means of a hydraulic piston (28) and chain and sprocket assembly. Thus two independent sliding movements are enabled by the provision of the outer frame, inner frame and the travelling frame assembly.

To raise the container assembly, the inner frame is first raised, by energising the hydraulic piston (22). To raise the container assembly further, the second hydraulic piston (28) is energised whereby the travelling frame is raised by sliding along the inner frame (20). The second set of guide rollers (26) facilitate this sliding movement. The frames are lowered by the operation of the hydraulic pistons. The motor (32), ^{and} ~~and~~ the hydraulic pump apparatus (34), ^{and} ~~and~~ hydraulic fluid tank (36) are suitably accommodated and mounted onto the base frame.

The container assembly will now be described by referring to Figs 2, 3, 4 and 5. The container (38) is generally a rectangular box with a inclined base. The front panel (40) extends from the top of the container to about 10cm from the edge of the inclined base to leave a rectangular void. A cutter or smoothing device number (42) is attached to the base of the container (30) and lies along the same plane as the front panel (40). A vibrator means preferably a vibrator rod (44) is introduceable onto the container. The vibration generator means (46) is powered by the hydraulic pump (34) or the motor.

The vibration generator means (46) and the vibration rod (44) are connected by a flexible rubber hose of appropriate design and strength (not shown in illustration).

The container (38) is mounted onto the travelling frame (24) by appropriate structural frame-members as shown - Figs 4 and 5. To move the container (38) forward, a hydraulic ram⁽⁴⁸⁾ is provided. By energising this hydraulic ram (48), the container can be moved forward towards the wall or withdrawn backwards. The angle of the container or the front panel and the cutter (42) can be adjusted by rod and bolt means (52). The cutter (42) can be independently adjusted by bolts. Alternatively hydraulic means can be employed to adjust the position of the cutter (not shown in diagram).

To lock the removable vibrator rod (44) suitable vibrator locking devices (54) are provided on both sides of the container side walls. In the present embodiment, the locking device (54) consists of a plate with slots slideable over bolts.

The frames (18, 20) are secured in position by the provision of appropriate frame structures including a turn buckle rod assembly (56). The turn buckle (56) is used to adjust the arm position during the setting up of the machine for plastering. Liquid levels (58) are provided on either side of the outer frames (18) to facilitate the positioning of the machine before commencing the plastering operation. To facilitate the registration of the container distance from the wall, a wall space indicator (60) is provided. The indicator measures the distance of the container from the wall surface. Whenever the machine is moved from one place to another the wall indicator readings are taken.

Thereafter the position of the container is adjusted to the corresponding level. The workings of the machine and other features of the invention will be described now. The machine is moved towards the wall or structure to be plastered and positioned in a manner such that the container is adjusted and parallel to the plane of the wall

or the structure. The angled rail (14) is positioned parallel to the plane of the wall or structure and the rail is preferably fixed in the selected position by driving of nails or screws into apertures provided along the length of the rail. The machine is then positioned in registration with the angled rail. The pair of angled roller wheels (6) is then mounted over the angled rail. It will be observed that with the angled roller wheels (6, 10) in a first rest position, they are above the ground level, while the castor swivel wheels are on ground bearing the weight of the machine. Thus it is relatively convenient to move the machine to adjacent the wall or the angled rail, before positioning the angled roller wheels (6) over the rail. The four hydraulic ~~rods~~ ^{pistons} (12, 8) are energised so that the wheels are extended downwards thus "lifting" the machine above the ground level, whereby the castor swivel wheels (4) are lifted above the ground. The hydraulic ~~rods~~ ^{pistons} are independently adjusted in such a manner that the machine is vertical. The positioning of the machine vertically is facilitated by the liquid level indicators (58).

The container (38) is lowered to the ground wherein the cutter (42) is at ground level. The desired thickness of the plaster to be applied onto the wall is determined. The desired distance of the container (38) from the wall is determined and fixed in position. If necessary the hydraulic ram (48) is energised to ensure that the container is at the desired position. The angle of inclination of the container to the wall can be further adjusted if necessary by adjusting the rod and adjusting bolts (52). The vibrator rod (44) is inserted into the container (38) at the front edge of the container and at least one end of the vibrator rod is locked in position by the use of the vibrator locking device (54).

Cement plaster is introduced into the container (38) by any known means, either by pumping plaster into the container or by manual means. The vibrator rod (44) is energised and the container is moved vertically upwards in a controlled manner. The cement mortar is compacted onto the wall, the vibration generated in the mortar in the container, ensuring that the mortar flows downwards by gravitational force. As the container is raised upwards, an even layer of plaster is compacted onto the wall structure by vibration action. The cutter (42) as it moves upwards with the movement of the container (38) ensures that the mortar is smoothed out to produce an even and smooth plastered wall.

At the first stage, the traveling frame and the container is moved vertically upwards by moving the inner frame (20) upwards, by activating the main hydraulic position (22). Once the inner frame reaches the maximum height, the second stage of vertical movement is activated. In the second stage, the second hydraulic piston (28) is activated, the traveling frame (24) moves upwards along the inner frame (20). The configuration of the outer pair of frame (18), the inner pair of frame (20) and the traveling frame (24) is similar to that found in fork-lift truck where the forks are mounted to a traveling frame, in corresponding relationship to the traveling frame and the container (38) in this invention. Once a rectangular patch of wall is plastered, the container is withdrawn backwards and is lowered to the ground level, the machine is moved laterally along the angular rail to the next position such that edge of the container is at the edge of the rectangular patch to be plastered. The process is repeated as described earlier.

The speed of the movement of the container upwards and the rate of vibration has to be coordinated so that the cement mortar is effectively plastered.

The hydraulic rams, are powered by a hydraulic pump (34), the hydraulic control levers (62) are conveniently located towards the side edge of the machine, so that it is convenient for the operator to stand adjacent to the machine and operate the control levers. The hydraulic fluid tank (36) is conveniently located beneath the hydraulic pump, on top of the base frame (2). For convenience, the vibration generating means is positioned at the back of the machine, adjacent to the hydraulic levers.

Vibration forces are transferred to the vibrator rod by means of a suitable detachable rubber hose (not shown).

The present embodiment is desired to be easily disassembled and assembled at site, thus enhancing the flexibility of the machine. The size, in particular the length of the container can be varied so that at each upward movement of the container a larger surface area of the wall can be plastered.

The entire machine can be conveniently motorised, so that an operator can move the machine from one point to another, just similar to the operation of fork-lift trucks. Alternatively the hydraulic pump, hydraulic tank and the hydraulic control levers can be isolated from the machine.

It has been found in practice that the use of the machine as described above, greatly increases the rate of plastering of wall. Further the finish of the surface area after plastering is much smoother and even as compared to the manual operations. The strength of the plaster compacted onto the wall surface is stronger as compared to that plastered surface produced in manual operation.

**CLAIMS**

1. A plastering machine for applying cement-sand mortar plaster onto a planar vertical surface, the plastering machine including a container for holding the plaster and having an outlet through which the plaster passes for application to the planar surface, vibration means to compact the plaster onto the planar vertical surface, and a frame assembly supporting the container and being capable of moving the container vertically over the height of the planar surface, the frame assembly including an outer frame which is fixed onto a base, an inner frame longitudinally movable along the outer frame, and a travelling frame which is longitudinally movable along the inner frame and to which the container is secured.
2. A plastering machine as claimed in Claim 1 which the travelling frame is secured to rollers which are movable along a pair of corresponding grooves in the inner frame.
3. A plastering machine as claimed in Claim 1 or Claim 2 in which the travelling frame is moveable relative the inner frame by means of a hydraulic piston and chain and sprocket assembly.
4. A plastering machine as claimed in any preceding claim in which the inner frame is slidable relative the outer frame by means of guide rollers and movable by means of an hydraulic piston connected between them.
5. A plastering machine as claimed in any preceding claim in which the container is mounted on means allowing it to be



movable towards and away from the planar surface along a horizontal axis.

6. A plastering machine as claimed in any preceding claim in which the vibrator means includes a longitudinal vibration rod disposed horizontally across the width of the container substantially parallel with the outlet.

7. A plastering machine as claimed in Claim 6 in which the vibration rod is detachably attached to the container.

8. A plastering machine as claimed in any preceding claim in which means for smoothing the plaster on the vertical planar surface are provided.

9. A plastering machine as claimed in Claim 8 in which the means for smoothing the plaster comprise of an elongate member positioned below the base of the container.

10. A plastering machine as claimed in any preceding claim which is mounted on wheels and at least two front wheels are angled roller wheels and are moveable and guided by an angle rail positioned parallel to the vertical planar surface.

11. A plastering machine as claimed in any preceding claim which can be aligned at a desired upright alignment by independently adjusting the level of the base frame of the machine relative the ground level.

12. A plastering machine for applying cement-sand mortar plaster onto a planar vertical surface, substantially as herein described by the reference to the accompanying drawings.