International Journal of Advanced Research in

Electronics, Communication & Instrumentation Engineering and Development

Volume: 2 Issue: 2 28-Jul-2014,ISSN_NO: 2347 -7210

AUTOMATIC PLASTERING MACHINE

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ABSTRACT *- Plastering is the plasterwork which is known as ornamentation done by plasterers on walls by manually in most parts of the world. The plasterwork needs more effort of humans and also consumes more time in manual process. This is an intention to implement an innovative process with a development of "Automatic Plastering Machine". Automation is one of the significant and evolving disciplines among all technologies. Our aim of this innovative idea is to render the plasters on walls automatically. This idea aims in reducing the work of plasterer. It is feasible, light weight, inexpensive and simple structure comparing to the existing machine. This innovative process keeps up with the ever changing world of building automation.*

Keywords – Automation; Plastering; rendering; cement mix; mechatronics.

1, INTRODUCTION*:*

1.1 GENERAL VIEW*:*

- This innovative machine is unique and perhaps one kind of automated plastering machinery ideally suitable for the construction/building industry.
- It works with conventional cement mortar which brings it to a smooth, flat finish with variable and adjustable thickness to suit each application.
- It can plaster the wall automatically by moving up and down in vertical direction.
- It can be plastered by one-time in vertical direction. The thickness of the ash/gypsum salleri can be adjusted.
- It has special design for adjusting the thickness of plastering/salleri/cement mix.
- It has two rails for rising and moving automatically, therefore it can be used for different height and width of the wall.
- It has large capacity hopper and you can put the ash/lime/gypsum in it one-time.
- It has microcontrollers for controlling the motor to automatic extend of cement flow and to automatic movement of hopper for cement discharge/plastering.
- It is easy to operate. One or two person can operate.
- Easy to move, without removing any parts of the machine and there are wheels under the machine for easy movement.

- The quality is subject to handmade wall plastering standard and it is suitable for construction site safety and reliability.

1.2 OBJECTIVE:

- It is the new machine used to reduce human work especially work of plasterers.
- It is the machine, instead of handmade in construction plastering area.
- Very easy and simple to operate.
- It is inexpensive when compare to its previous versions.
- Simple structure, light weight, small cubage, easy to operate.
- Saving more than 20% raw material (cement &sand).

2, DESCRIPTION:

- General description of the project is given as, "Quick plastering of walls automatically by pumping the cement mix from funnel and plaster it on wall in vertical and horizontal movement using microcontrollers by controlling the stepper motor. It is cost effective and reduces human effort".
- The cement mix which is poured in a funnel is pumped using centrifugal pump to a hopper.
- Inside the hopper, there will be a gear pump which pumps the cement mix as an output to wall through the cylinder slit
- The cement mix which came out will be captured by the metal plate and it forcibly sticks to the wall.
- The cement mix will be punched by metal plate using rollers.
- The stuck cement mix will also be smudged using metal plate and rollers.
- To make this as automation, we interface the sensors to detect cement flow, the stepper motor for the movement of the header unit in rail guides and the AC motor to control the flow with microcontrollers.
- Here we can give the vertical and horizontal distance as the input for the movement of header unit.

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3, DESIGN OF WORK:

- The design of automatic plastering machine consists of three stages of work. These stages of work is proposed below:

  - Mechanical design.
  - Electronic design.
  - Software embedded.

3.1 MECHANICAL DESIGN:

- The mechanical design of our project covers the 70% of the design of automatic plastering machine**.**
- The enhanced mechanical design for the automatic wall plastering machine consists of:

  - Motor pump to push the cement mix.
  - Funnel to load the cement mix.
  - Flexible pipe to carry the cement mix to the hopper.
  - It is flexible enough to move along with the hopper.
  - Horizontal rail guide to move the plastering unit horizontally.
  - Horizontal head to hold the vertical rail guide and move along the horizontal direction.
  - Vertical rail guide to move the hopper vertically.
  - Vertical head to hold the hopper and move along vertically.
  - Cement mix inlet to the hopper.
  - Hopper to hold the cement mix temporarily.
  - Cylinder slit to discharges the cement evenly with the pressure from the pump present in hopper.
  - Metal sheet to evenly smudge the cement on the wall.

- The various stages in transferring the cement mix/salleri to the hopper and cylinder slit through motor pump is shown in the proposed block diagram for mechanical design of the plastering machine.

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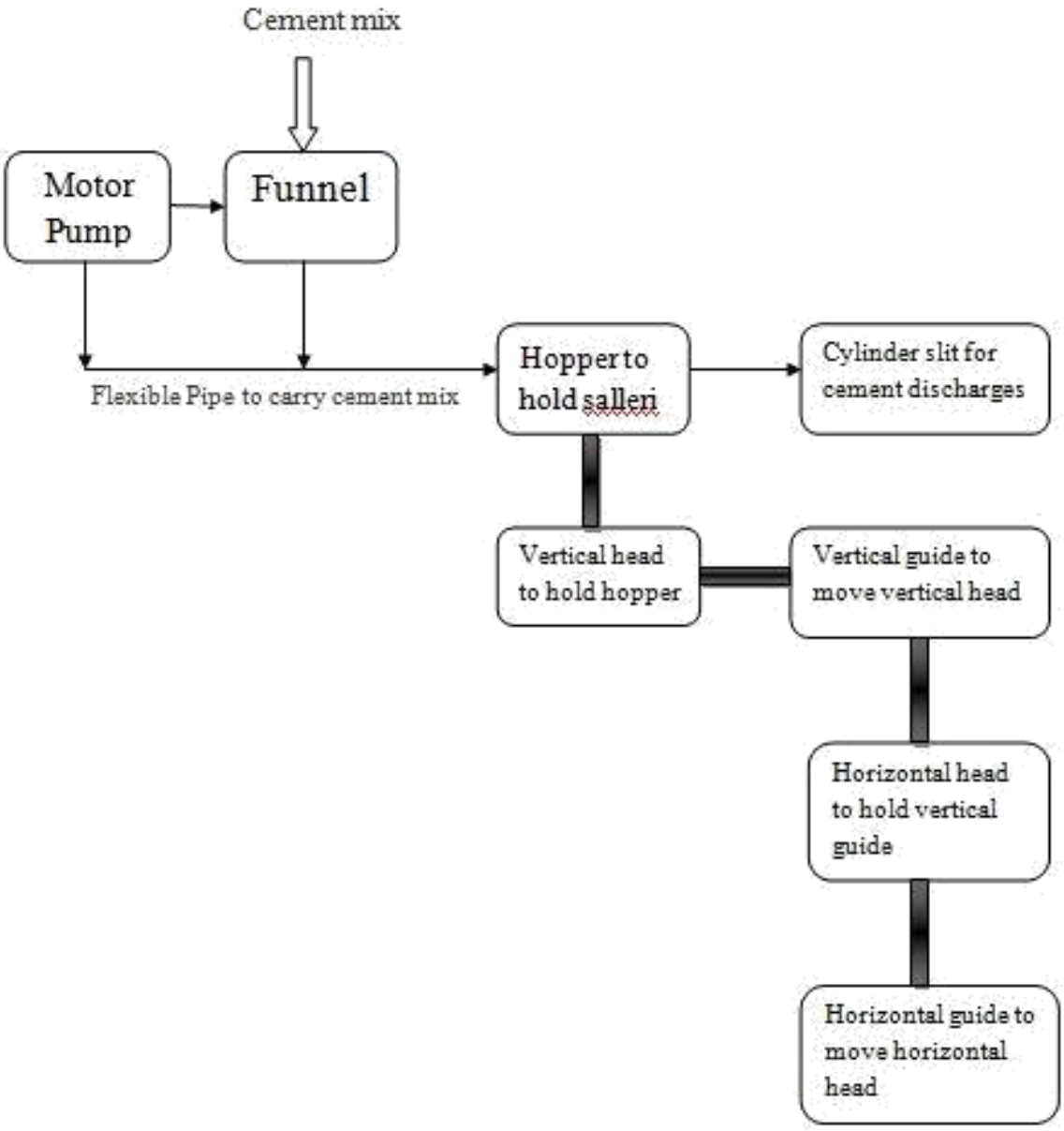

Figure 1 Proposed Block Diagram of Electronic Design

3.2 ELECTRONIC DESIGN:

- The enhanced mechanical design for the automatic wall plastering machine consists of two microcontrollers (AtMega16) :
    - Plastering controller.
    - Cement controller.
- Both are connected with RS232 interface and communicate the commands to control each other and to start/stop the plastering.
- The functions of both the microcontrollers is given below:
    - The plastering controller
        - Controls horizontal and vertical movement of stepper motor.
        - Command the cement controller to start/stop the cement pumping.
        - Senses the cement discharge via sensor signal.
    - The cement controller
        - Controls the cement pumping.
        - Senses the cement flow into and out of the pump.
        - Command the cement controller to start/stop the plastering.
- There will be three sensors to control the cement flow.
- Two sensors are monitored by the cement controller and one sensor is monitored by plastering controller.
- The various stages in communicating/controlling of microcontrollers is shown in the proposed block diagram of electronic design of plastering machine.

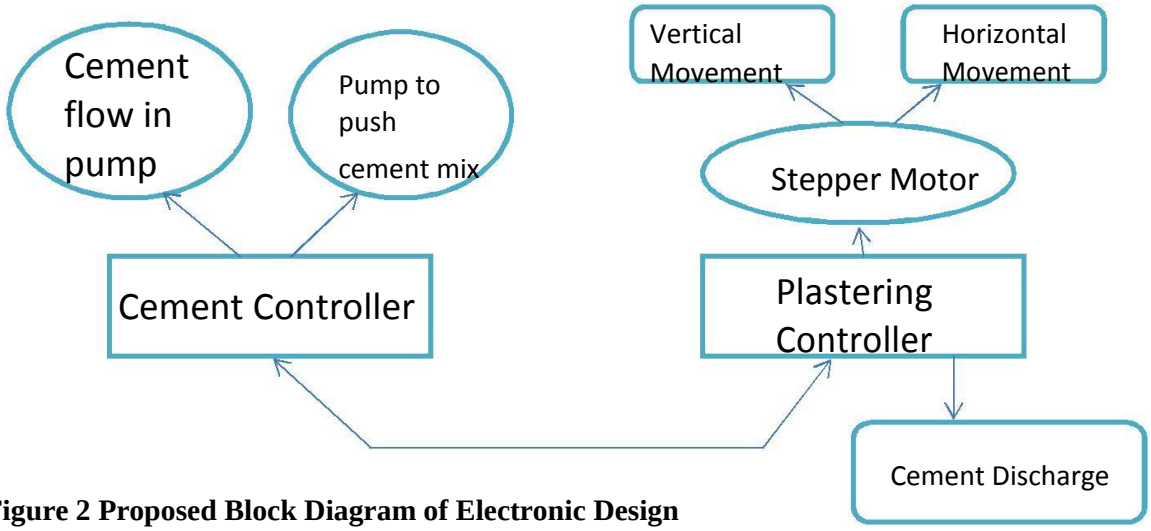

Figure 2 Proposed Block Diagram of Electronic Design

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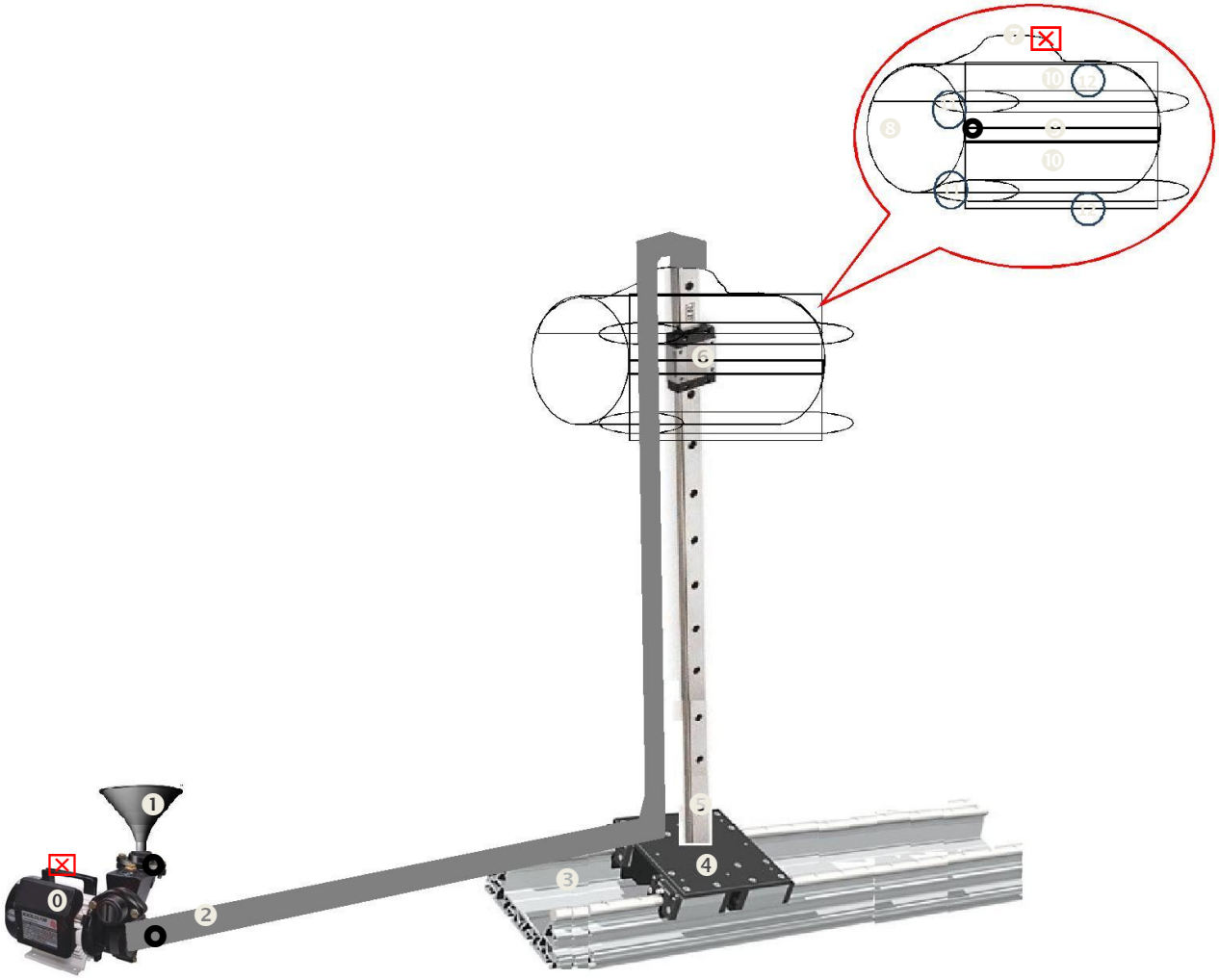

Figure 2 Proposed Structure of Automatic Plastering Machine

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3.3 SOFTWARE EMBEDDING:

- RS232, UART serial communication devices to interface the system with the ARDUINO environment to evaluate the parameters and also utilized to communicate and control.
- The microcontroller based system hardware has been interfaced through serial communication port with the completed ARDUINO software.
- Before interfacing the hardware, the software has to be configured to enable and establish the communication between hardware unit and the ARDUINO software environment.
- Before the continuous functioning of the entire system, the certain parameters have to be set in ARDUINO software.

4, CONCLUSION:

- Automated plastering machine is unique and perhaps one kind of automated plastering machinery ideally suitable for the construction/building industry.
- Automated plastering machine works with conventional cement mortar which brings it to a smooth, flat finish with variable and adjustable thickness to suit each application.
- Automated plastering machine makes rendering easier, faster, and effortless as compare to manual application.
- This idea can also further enhanced by interfacing LCD display & Keypad for making the process without external source.
- This time and money saving machine, keeps up with the ever changing world of building automation.

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