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## Automatic Pneumatic Ramming Machine

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### ABSTRACT:

Moulding is one of the important metals forming process in manufacturing components for various applications in industry. Casting of any size and shape can be made accurately. Automation in this field helps to improve the foundry environment and accuracy of the cast parts. Efficiency of moulding is affected by various parameters like permeability, collapsibility, adhesiveness etc. So it is a must to avoid defects in casting. The defects occur in sand castings post a great problem in foundry. On account of defects more than 10% castings are rejected. Even though skilled labor is employed for ramming operation, the packing of molding sand will not be even throughout the molding box. So we have selected the idea of fabricating "PNEUMATIC RAMMER". This rammer is operated pneumatically. By using this rammer moulding sand will be packed evenly throughout the box.

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### 1.Introduction:

The pneumatic rammer is used for ramming the sand uniformly around the pattern. It can be used even in small scale industries. To operate this rammer an air compressor is needed. A butt which is attached to the bottom of the piston rod does the operation of ramming. The pressure developed inside the cylinder reciprocates the piston and hence the butt. This rammer is handled by an operator just by moving it over the moulding sand.

The butt rams the sand at places moved and the sand is uniformly rammed. This rammer reduces the ramming time and labor. Due to this the cost is reduced considerably. So this machine finds application in foundries.

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### 2.Literature Review:

Sand moulding process casting process involving the use of sand as a moulding medium is known as sand moulding. Conventional Ramming Machine: The cam is actuated by a user by rotating the handle, causing a cam to lift the weight and let it fall freely on the frame attached to the ram head. This produces a standard compacting action to a pre-measured amount of sand. Variety of standard specimen for Green Sand and Silicate based (CO<sub>2</sub>) sand are prepared using a sand rammer along with accessories. The sand rammer machine can be used to measure compatibility of prepared sand by filling the specimen tube with prepared sand so that it is level with the top of the tube. The tube is then placed under the ram head in the shallow cup and rammed three times. Compatibility in percentage is then calculated from the resultant height of the sand inside the specimen tube.

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### 3.Objectives of work:

The pneumatic rammer is used for ramming the sand uniformly around the pattern. It can be used even in small scale industries. To operate this rammer an air compressor is needed. A butt which is attached to the bottom of the piston rod does the operation of ramming.

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#### 4. Working Principle:

The compressed air goes to the flow control valve. The flow control valve is used to control the flow of air. It is adjustable one. We have to adjust the lever, so that the required pressurized air goes to the Solenoid Valve. In our project, the solenoid valve is used as a direction control valve. This solenoid valve is controlled by the electronic control timing unit. The ramming time is varied by adjusting the timing (timer 555 IC) control of the electronic unit. The compressed air goes to the pneumatic double acting cylinder. The ram is fixed at one end of the pneumatic cylinder. The compressed air pushes the pneumatic cylinder, so that the piston moves downward by giving air supply in one direction of pneumatic cylinder. The solenoid valve is changing the air flow in the opposite direction by the small time delay. In this time the pneumatic cylinder piston moves upward due to changing of the air flow direction. This air flow direction is controlled by the solenoid valve.

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#### 5. Description of Components :

**Cylinder** is a device which converts fluid power into linear mechanical force and motion. These cylinders are widely used in industrial pneumatic systems. These cylinders are also called as linear motors and reciprocating motors pneumatic cylinders are designed for a variety of services. Fig no 4 Pneumatic cylinders are designed for a variety of services. Pneumatic cylinders transform the flow of pressured fluid into a push or pull of the piston rod since our system uses double acting cylinders we shall see some details about them.

**SOLENOID CONTROL VALVE:** The solenoid valve is responsible for reciprocating motion of the Ram. It is electrically powered. The trip dogs actuate the solenoid valve.

**Technical Data:** Size : 1/4" Pressure : 0 to 10 kg / cm<sup>2</sup> Media : Air Working Principle: Double acting cylinder are controlled by 2 way 5 port two position valve as shown in the fig. This valve has one inlet port (P), two cylinder ports (A and B), and two exhaust ports (R and S).

**TIMER CIRCUIT:** Need for a Timer Circuit: Main purpose of timer circuit is to actuate the solenoid valve at regular interval of time to achieve proper lubrication at the desired interval.

**ELECTRONIC CONTROL UNIT:-** Here the 555 IC has been used as a multi vibrator. The output of IC 555 is fed to the input pin (pin no 14) of CD 4017 continues counting. The output of the IC becomes available at pin Nos. 3, 2 and 4. The output pulse of any one of output pin triggers (Puts ON) the Triac and current starts flowing across the load connected. This process continues on other pins at different time intervals and the cycle continues. The frequency interval (Time) of the cycle can be adjusted by the pre-set look connected to pin 6 of 555 Timer IC. International Journal of Mechanical And Production Engineering, ISSN: 2320-2092, Volume- 2, Issue-9, Sept.-2014 Automatic Pneumatic Ramming Machine 62 IC 555 TIMER The IC SE / NE 555 monolithic circuit is a highly stable controller capable of producing accurate time delays or oscillations. Additional terminals are provided for triggering or resetting if desired. In the timing operations, the time is precisely controlled by one external resistor and a capacitor, by the operation as an oscillator, the free running frequency and the duty cycle are both accurately contributed with the external RC constants.

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#### 6. Design and Calculation:

Pressure available from the compressor = 1000000Pa (10 bar) Diameter of the piston = 32mm Cross sectional Area of the cylinder =  $\pi \times 32^2 \times \frac{\pi}{4} =$

804.352mm<sup>2</sup> Force = Area \* Pressure PISTON AND PISTON ROD: The piston is machined to the specified dimension in a lathe and piston rod is mated (tight fit) in the bore of the piston and then turned in a lathe. Surface grinding is done on piston and piston rod.

The nature of fit between cylinder and piston is clearance fit – running fit. Tolerance =  $32 \pm 0.02$

Total stroke length = 135 mm

Working stroke length = 65mm

The diameter of the piston = 32mm

The piston force  $F = P * A = 10 \times 804.352 \times 10^3 = 804.352 \text{ N}$

## 7. Sample work:



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## 8. Result and Discussion:

The rammer can be handled by an operator without feeling uneasiness. No separate skill is required to operate this rammer. The operation is quick and hence it is a time saving one. The operation is easy and consumes less cost. Due to the above reasons it finds its extensive application in manufacturing industries. It has an extensive application in both large scale and small scale industries because of its economy and easy handling. strength Uniform ramming of sand is obtained by this rammer. The time consumption for ramming is reduced greatly. Skilled labor is not required. Easy operation It can be transported easily from one place to another since dismantling and assembling is simple. It reduces more labor for ramming operation. Maintenance is easy

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## 9. Conclusion:

Uniform ramming of sand is obtained by this rammer. The time consumption for ramming is reduced considerably. It eliminates more labour for ramming operation and hence the labour cost is reduced. Skilled labour is not required to operate this machine. Transportation of this machine is easy. Maintenance is also easy, The reduction of production time and elimination of more labour for ramming operation reduce production cost, thereby the economy is greatly achieved.

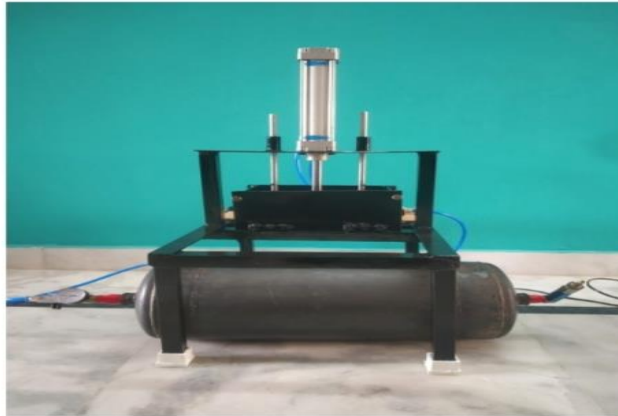
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**FINAL PRODUCT:**

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**Automatic Pneumatic Ramming Machine****ANNEXURE:**

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**PROJECT GUIDE**

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