FLY PRESS

AIM: -To perform blanking and piercing operation using Fly press.

APPARATUS REQUIRED: -Fly Press, punch and Dies for blanking and piercing operation.

MATERIAL REQUIRED: -Mild Steel sheet of desired gauge.

Description of the equipment: Presses are classified in various ways. They may be classified according to

i. Source of power

ii. Method of actuation of the rams (slides)

iii. Number of slides

iv. Types of frames

v. The type of work for which the press has been designed.

Source of power: Two kinds of sources of power supply to the ram: Mechanical and hydraulic.

Mechanical presses, the energy of flywheel is utilized which is transmitted to the work piece by gears, cranks, eccentrics or levers.

The flywheel rotates freely on the crankshaft and is driven from an electric motor through gears or v- belts. The motors run continuously and stores energy in the flywheel. When the operator presses a foot treadle or actuates a button, the clutch gets engages and the flywheel is connected to the crankshaft. Driveshaft starts rotating and the stored up energy in the flywheel is transmitted to the ram on its downward stroke. The clutch to engage and disengaged the flywheel to the drive shaft can be; a Jaw clutch and the air operated clutch or an electromagnetic clutch. In manually operated mechanical presses, the clutch is disengaged to each cycle. But in automatic presses in which the metal strip is fed to the die automatically, there is no need of single stroke clutch. Disengaging mechanism and the ram moves up and down continuously. These presses can be classified as plain and geared press, the flywheel is carried on auxiliary shaft which is connected to the main shaft, through one or more gear reduction, depending upon size and energy needed. In this arrangement, the flywheel stores considerably more energy than the plain as its speed is higher than the main drive shaft.

Mechanical presses have following advantages over the hydraulic presses.

1. Run faster

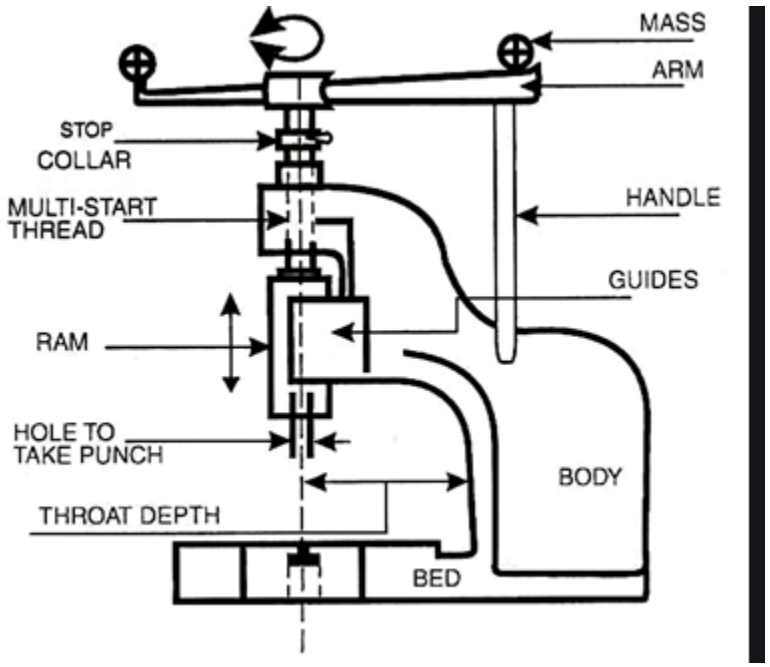
2. Lower maintenance cost

3. Lower capital cost.

A press is rated in tones of force; it is able to apply without undue strain. To keep the deflections small, it is a usual practice to choose a press rated 50 to 100 percent higher than the force required for an operation.

PROCEDURE:-

1. Set the compound die or progressive die in the required position.
2. Pass the MS sheet in to the punch and die set.
3. Rotate the fly wheel with hand till the punch touches and gets forward into the stock and punches the sheet inserted.
4. Rotate the fly wheel back to its original position (upwards) and advance the stock to repeat operation.
5. Take out the finished product from the die.



PRECAUTIONS:-

1. Care should be taken while punching the metal.
2. Align the dies correctly with the plunger.

RESULT: -The blanking operation is performed using blanking die on fly press.

HYDRAULIC PRESS

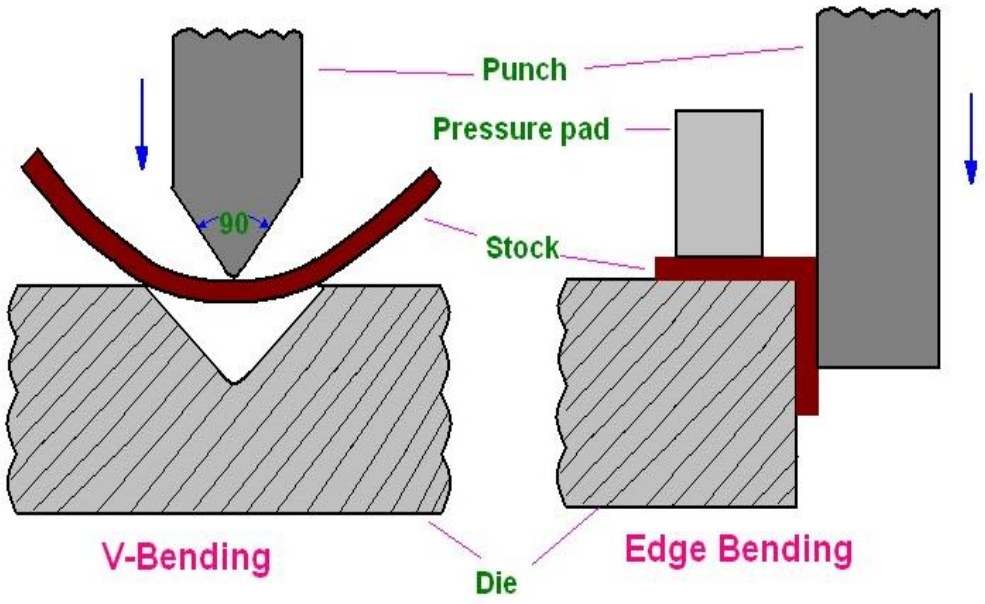
AIM: -To bend the given metal piece by using hydraulic press.

APPARATUS: -Hydraulic Press, punch and Dies.

MATERIAL REQUIRED: -Mild Steel sheet of desired gauge.

PROCEDURE:

1. Prepare the punching machine for bending operation.
2. Select the dies based on the requirement of the job and place the sheet metal between the die.
3. Apply the force by rotating the plunger wheel till upper die is forced to make contact with the lower one and the sheet metal between die bends into required shape.
4. Rotate the wheel back to remove plunger.
5. Obtain the bent sheet from the die and inspect to assure the required shape is obtained.



PRECAUTIONS:

1. Care should be taken while punching the metal.
2. Align the dies correctly with the plunger.

RESULT: - Bending the metal piece is done by using punching machine.

INJECTION MOULDING

AIM: -To Prepare a Plastic product (cap) using Injection Moulding machine.

APPARATUS:-Hand injectionmoulding machine, die of required shape.

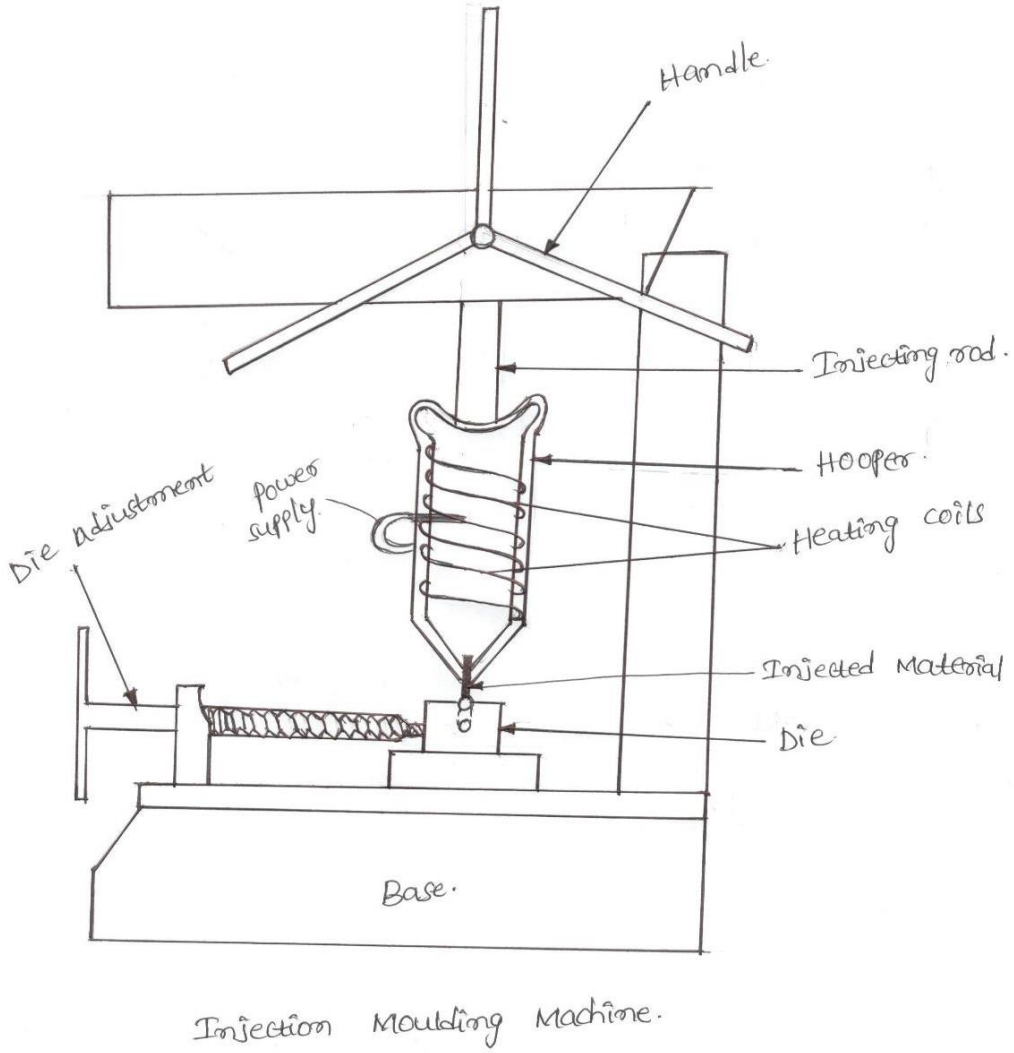
MATERIAL REQUIRED: -Nylon granules

THEORY AND DESCRIPTION:-Injection Mouding is usually employed for thermoplastic materials which are soften by heating and then reharden during cooling. The moulding material (thermoplastic) is fully polymerized before pouring into the mould since they undergo only a physical change during injection moulding. In Injection moulding the material is heated to the soften state and then the soften material is injected into the mould and then allowed to cool to Harden thereby the desired article is obtained.

The mould used, consists of two parts . one is movable and the other is stationary. The stationary part is fixed to the end of the cylinder while the movable part is opened or locked on to the stationary part. The moulding material in the form of Granules or pellets is fed through the hopper to the cylinder where it gets softened. Then the mould is closed tightly and the plunger is moved forward by applying force manually to push and inject the soften material through a nozzle into the mould after the mould is filled, it is allowed to cool and harden. Then the plunger return backwards and the mould is opened to eject the plstic articles. Heating unit temperatures usually ranges from 150°C to 300°C and injection pressure ranges from 100 N/mm to 150 N/mm. advantage of injection molding is that mass production is possible which offset the higher capital cost.

PROCEDURE:-

1. First the plastic material is granulated and poured into the Hopper.
2. Then the plastic material enters into a basin which has thermostat
3. By giving power supply to thermostat, the plastic material gets melted.
4. When the Plastic material gets melted apply the pressure, with help of ram externally.
5. The plastic material solidifies in the die and we get req. shape of the material
6. There by the molten plastic material passes through the small orifice of the req.dia.
7. The product is taken out and cleaned and the surface finishing is done properly.
8. The final product is checked for any defects.



Injection Moulding Machine.

PRECAUTIONS:-

1. Temperature should be maintained within the limit of the plastic used.
2. Die should be properly filled to get the exact shape of component.
3. External pressure is applied very carefully to ensure the uniform flow of the material into the die.
4. Proper time should be given to the process in order to solidify the plastic material completely.

RESULT: - The required die set shape has been obtained.

Blow Moulding

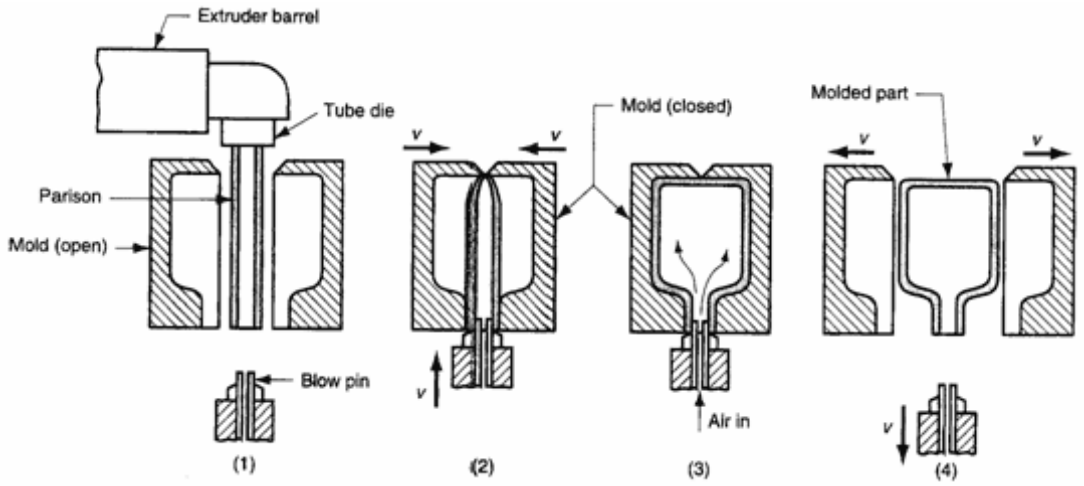
AIM:-To Prepare the Plastic product (Bottle) using blow Moulding machine

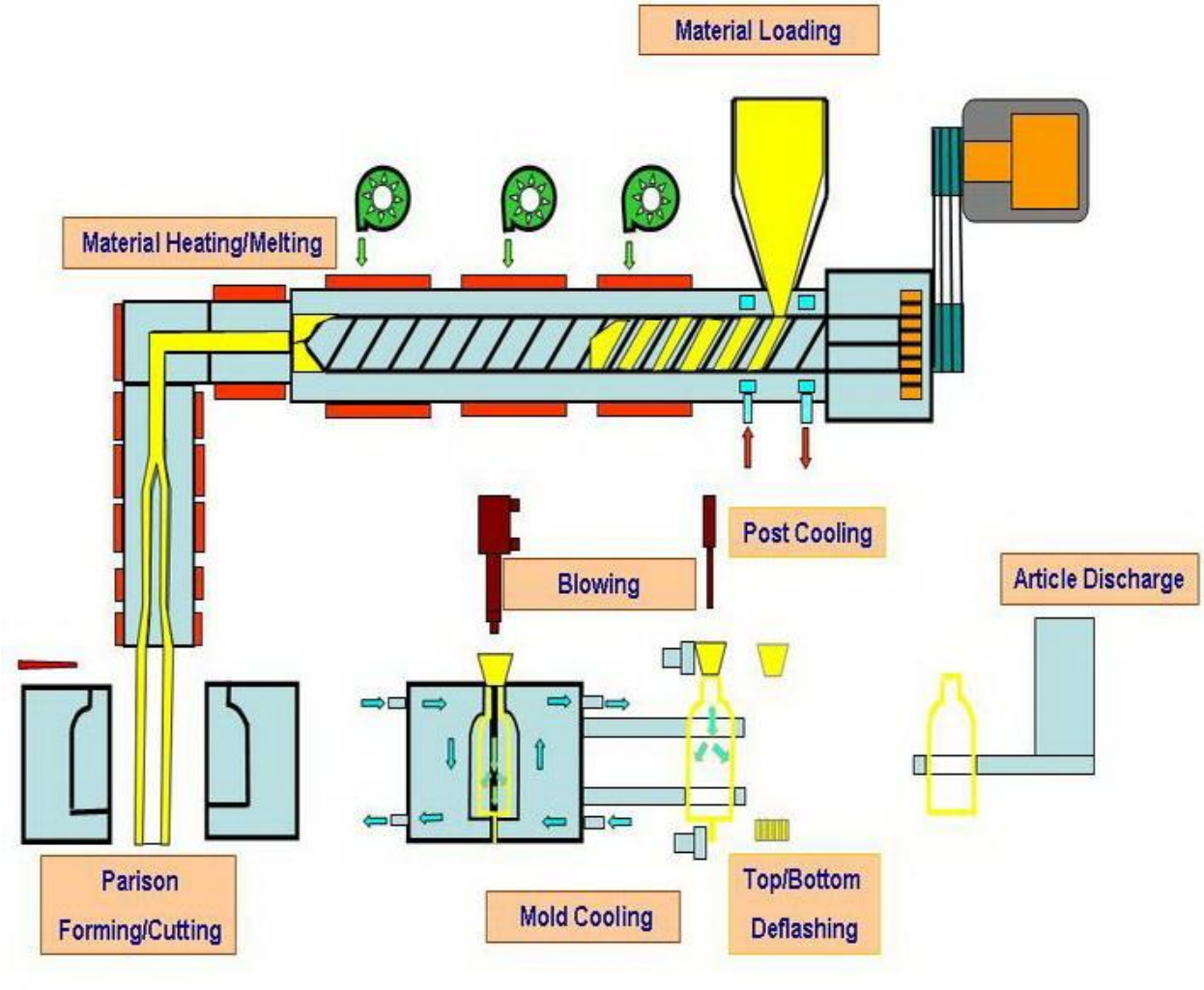
APPARATUS: -Blow moulding machine, die of required shape

MATERIAL REQUIRED: - Nylon granules.

PROCEDURE:-

1. First the plastic material is granulated and poured into the Hopper.
2. Then the plastic material enters into a basin which has thermostat
3. By giving power supply to thermostat, the plastic material gets melted.
4. When the Plastic material gets melted apply the pressure, with help of ram externally.
5. Than supply the air with suitable pressure from compressor.
6. The plastic material solidifies in the die and we get req. shape of the material
7. There by the molten plastic material passes through the small orifice of the req.dia.
8. The product is taken out and cleaned and the surface finishing is done properly.
9. The final product is checked for any defects.





Blow Moulding Machine

PRECAUTIONS:-

1. Temp. Should be maintained within the limit of the plastic used.
2. Die should be properly filled to get the exact shape of component.
3. External pressure is applied very carefully to ensure the uniform flow of the material into the die.
4. Proper time should be given to the process in order to solidify the plastic material completely.

RESULT: - The required die shape has been obtained (20ml. bottle is prepared).

SPOT WELDING

AIM: - To join two MS Sheets using spot welding technique.

MATERIAL REQUIRED: -(100 x50x3) two mild steel sheets.

EQUIPMENT REQUIRED: - Spot Welding Machine & sand paper.

TOOLS REQUIRED:-Steel rule, Centre punch, Marker, Brush.

DESCRIPTION OF THE EQUIPMENT: -

A typical resistance spot welding machine essentially consists of two electrodes, out of which one is fixed. The other electrode is fixed to a rocker arm (to provide mechanical advantage) for transmitting mechanical force from a pneumatic cylinder. This is simplest type of arrangement. The other possibility is that of a pneumatic or hydraulic cylinder being directly connected to the electrode without any rocker arm.

For welding large assemblies such as car bodies, portable spot welding machines are used. Here the electrode holder and the pneumatic pressurizing system are present in the form of a portable assembly which is taken to the place, where the spot is to be made. The electric current, compressed air and the cooling water needed for the electrodes is supplied through cable and hoses from the main welding machine to the portable unit.

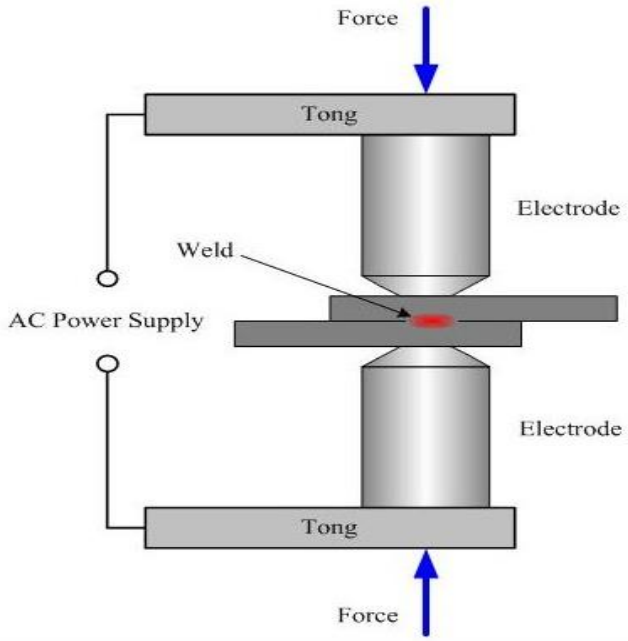
In spot welding, a satisfactory weld is obtained when a proper current density (A/Sq mm) is maintained. The current density depends on the contact area between the electrode and the work piece. With the continuous use, if the tip becomes upset and the contact area increases, the current density will be lowered and consequently the weld is obtained over a large area. This would not but able to melt the metal and hence there would be no proper fusion.

A resistance-welding schedule is the sequence of events that normally take place in each of the welds. The events are the squeeze time is the time required for the electrodes to align and clamp the two work pieces together under them and provides the necessary electrical contact.

The weld time is the time of the current flow through the work pieces till they are heated to the melting temperature.

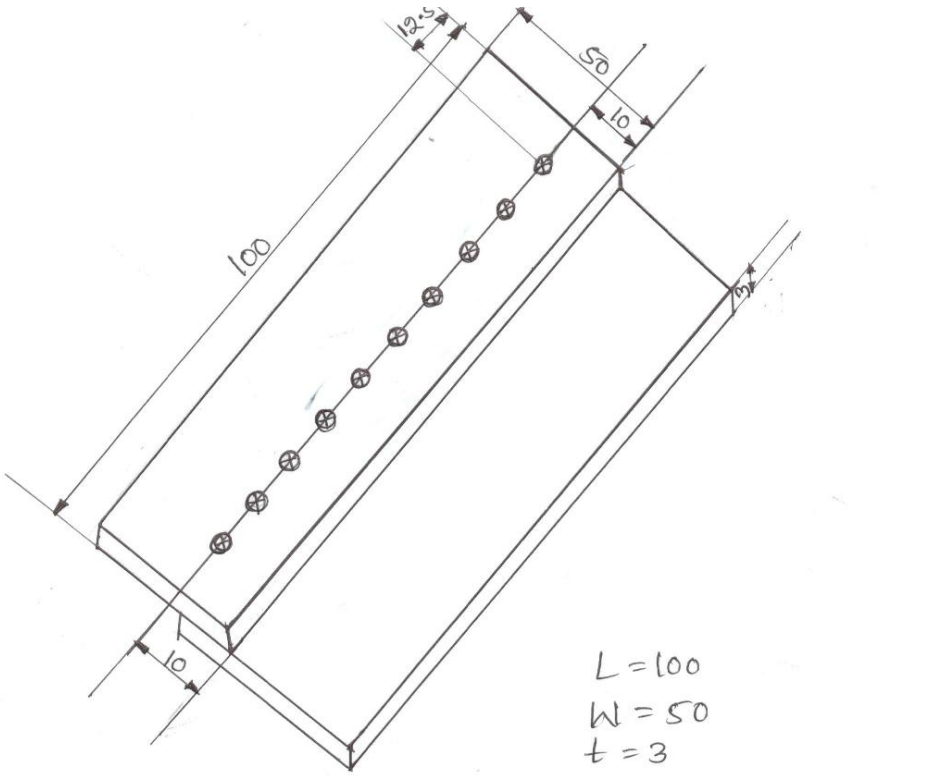
The hold time is the time when the pressure is to be maintained on the molten metal without the electric current. During this time, the pieces are to be forge welded.

The off time is time during which, the pressure on the electrode is taken off so that the plates can be positioned for the next spot. The off time is not normally specified for simple spot welding, but only when a series of spots are to be made in a predetermined pitch.



PROCEDURE:-

1. The required dimensions are marked on the MS sheet are cut accurately.
2. The sheet is made rust free and impurities are removed.
3. Markings are made on the sheets where spot welding is to be done.
4. Switch on the machine and set the current in the machine to 2 index.
5. Set the timer to two seconds.
6. Overlap the two metal pieces to the required size and place them between the two electrodes.
7. Apply pressure by foot on the lever such that two electrodes come into contact if the over lapped metals.
8. After 2 seconds remove the pressure on the lever slowly.
9. Finally, this welded job is checked for defects.



Spot welding (Lap joint)

PRECAUTIONS:-

1. Care should be taken for no air gaps between the work sheets.
2. Hand gloves should be wear to prevent the spark from harming.
3. The electrodes are to be made contact with work piece only for very short time as the prolonged contact leads for the formation of several holes.
4. Don't touch the welded potion by hand immediately after the welding is done.

RESULT: - The two MS Sheets are spot welded as per the drawing

Arc Welding

AIM: To Prepare Lap JointandButt Joint using Arc Welding Process.

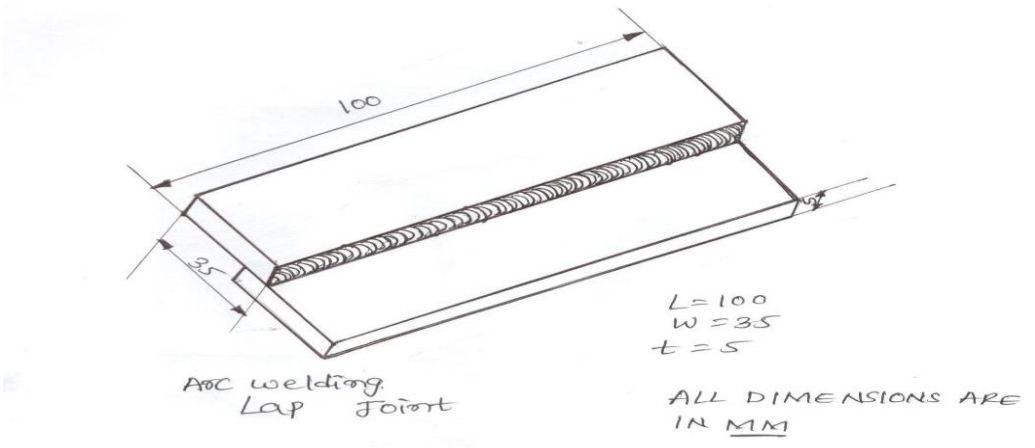
APPARATUS REQUIRED: -Wire Brush, Grinding Machine, Protective Equipment, Welding Transformer, Electrodes, Tong, Chipping Hammer

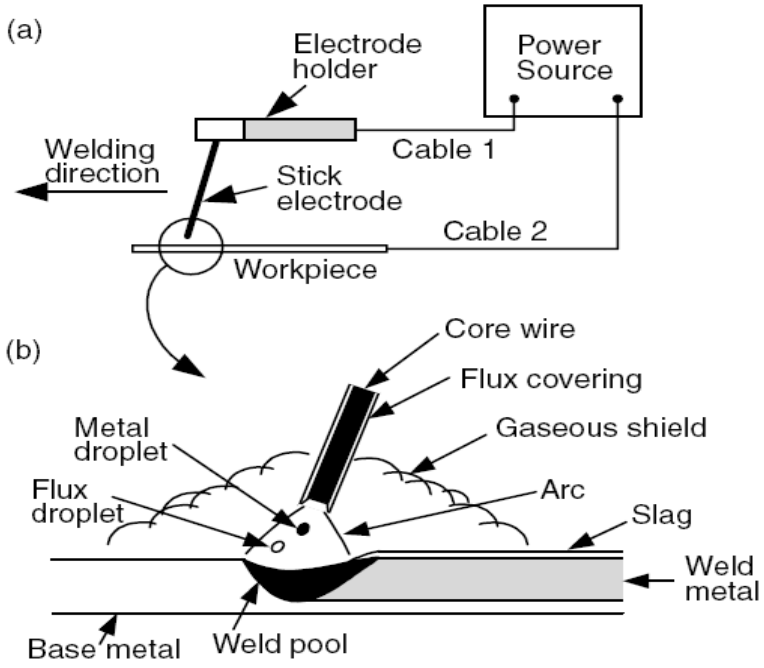
MATERIAL REQUIRED: -Mild steel flat of (50 x45 x 10) mm– 2 No's.

PROCEDURE:-

Plug weld (shown in fig) may be made without or with a hole in the upper member. This joint is used where bottom or second plate is not easily accessible for fillet welding. Plug weld can be employed to impart added strength to the structure.

1. The edges of the given material is prepared using wire brush and finish the same grinding machine to remove the rust and scales presented on the edges.
2. The machine is set to the required current (75 amps).
3. Place the work pieces on the table with required position as shown in figure.
4. The work pieces are kept in the required position and tack welding is performed on the work pieces.
5. First run of welding is done to fill the gap and penetration of the weldment by holding the electrode at about 70^0 and moving the electrode to another end uniformly.
6. Second run of welding is done with proper weaving and uniform movement.
7. The scale formed is chipped with chipping hammer.
8. Filing is done to remove any spatter around the weld.





PRECAUTIONS:-

1. Never look at the arc with the naked eye. Always use a shield while welding.
2. Always wear the safety hand gloves, apron and leather shoes.
3. Ensure proper insulation of the cables and check for openings.
4. Care is taken to avoid arc blow, which will cause serious defect in the weldment.
5. Inflammable and combustible materials are removed from the vicinity of welding operations.

RESULT: -The Lap joint of two MS plates is made by arc welding technique

TUNGSTEN INERT GAS (TIG) WELDING

AIM: To prepare a V–Butt Joint Using TIG Welding.

MATERIAL AND APPARATUS REQUIRED:
MS flat (60 x 60 X 10) mm– 2 No.s Tong, chipping hammer, goggles, Tungsten Electrode, ceramic nozzle and filler rod.

EQUIPMENT REQUIRED: Transformer, Rectifier and Argon gas cylinder.

THEORY:

The Endeavour of welder is always to obtain a joint which is as strong as the base metal and at the same time, the joint is as homogeneous as possible. To this end, the complete exclusion of oxygen and other gases which interfere with the weld pool to the detriment of weld quality is very essential. In manual metal arc welding, the use of stick electrodes does this job to some extent but not fully. In inert gas shielded arc welding processes, a high pressure inert gas flowing around the electrode while welding would physically displace all the atmospheric gases around the weld metal to fully protect it.

The shielding gases most commonly used are argon, helium, carbon dioxide and mixtures of them. Argon and helium are completely inert and therefore they provide completely inert atmosphere around the puddle, when used at sufficient pressure. Any contaminations in these gases would decrease the weld quality.

*Argon*is normally preferred over helium because of a number of specific advantages. It requires a lower arc voltage, allows for easier arc starting and provides a smooth arc action. A longer arc can be maintained with argon, since arc voltage does not vary appreciably with arc length.

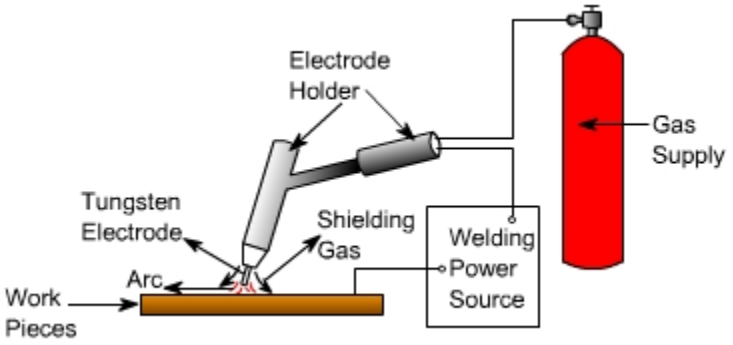
It is more economical in operation. Argon is particularly useful for welding thin sheets and for out of position welding.

The main advantage of *Helium* is that it can with stand the higher arc voltages. As a result it is used in the welding where higher heat input is required, such as for thick sheets or for higher thermal conductivity materials such as copper or aluminium. *Carbon dioxide* is the most economical of all the shielding gases. Both argon and helium can be used with AC as well as DC welding power sources. However, carbon dioxide is normally used with only DC with electrode positive.

TUNGSTEN INERT GAS(TIG) WELDING:

Tungsten inert gas (TIG) welding is as inert gas shielded arc welding process using non consumable electrode. The electrode may also contain 1 to 2% thoria mixed along with core tungsten or tungsten with 0.15 to 0.4% zirconia. The pure tungsten electrodes are less expensive but will carry less current. The thoriated tungsten electrodes carry high currents and are more desirable because they can strike and maintain stable arc with relative ease. The zirconia added tungsten electrodes are better than pure tungsten but inferior to thoriated tungsten electrodes.

A typical TIG welding setup is shown in fig.



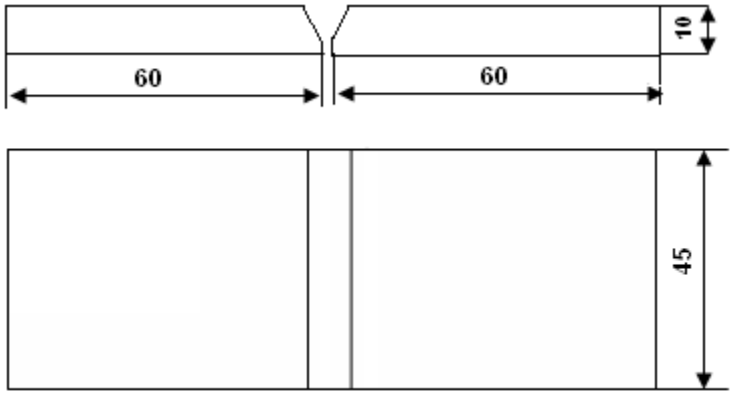
It consists of a welding torch at the centre of which is the tungsten electrode. The inert gas is supplied to the welding zone through the annular path surrounding the tungsten electrode to effectively displace the atmosphere around the weld puddle. The TIG welding process can be used for the joining of a number of materials though the most common ones are aluminium, magnesium and stainless steel.

The power sources used are always the constant current type. Both DC and AC power supplies can be used for TIG welding. When DC is used, the electrode can be negative (DCEN) or positive (DCEP). With DCEP is normally used for welding thin metals whereas from deeper penetration welds DCEN is used. An Ac arc welding is likely to give rise to a higher penetration than that of DCEP.

PROCEDURE:-

1. Prepare the edges of the work pieces to be joined to the required V shape.
2. Finish the edges using emery paper.
3. Place the work pieces on the work table in the required position.

4. Set the current of the machine to 100 A.
5. Fix the tungsten electrode to the electrode holder.
6. Required size of the nozzle is selected and it is fixed to the torch.
7. Adjust the inert gas flow rate to the required rate.
8. Select the filler rod (same as base metals) of required diameter.
9. Touch the electrode to the work, so that current flow will be established and then separated by a small distance and the arc will be generated.
10. First tack weld is done on the work pieces.
11. Move the electrode slowly along the length of the joint with the filler rod, so that the filler metal will be deposited in the joint.
12. Repeat the operation for the second pass, so that required amount of filler metal will be deposited on the work pieces.



V - BUTT JOINT

PRECAUTIONS:-

1. Never look at the arc with the naked eye. Always use a shield while welding.
2. Always wear the safety hand gloves, apron and leather shoes.
3. Ensure proper insulation of the cables and check for openings.
4. Select the parameters of the machine properly based on the metals to be welded.
5. Set these parameters properly before performing the operation.
6. Inflammable and combustible materials are removed from the vicinity of welding operations.

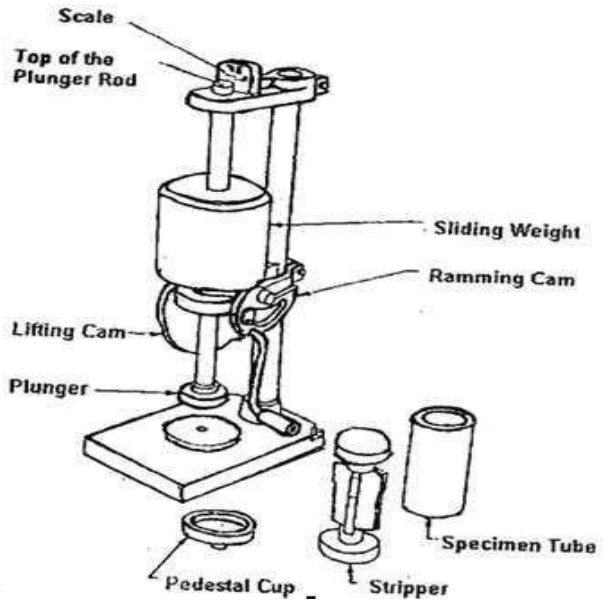
RESULT:-The butt joint of two MS plates is made by TIG welding technique

Sand properties Testing

Sand Rammer

AIM: -Sand rammer is used for preparing specimen according to ASTM standard.

APPARATUS: -Main body, specimen tube, pedestal cup, stripping rest.



PROCEDURE:-

1. Place the equipment on non-vibrating plot form. Take the height such that the reading marks of the top bracket should be in eye level.
2. Place the specimen tube in the pedestal cup fill approximately 145-175 grams sand sample in the specimen tube.
3. Lift the left cam upward, place the specimen tube with pedestal cup on the base.
4. Take ramming head downward with left cam and ram the sample three times with the help of right cam.
5. See the top of the plunger rod matches the zero of the scale. It should match within 1mm.
6. Lift the left cam upward. Take the specimen tube and place it on stripping post.
7. Pull the tube downward for removing the specimen.

PRECAUTIONS:-

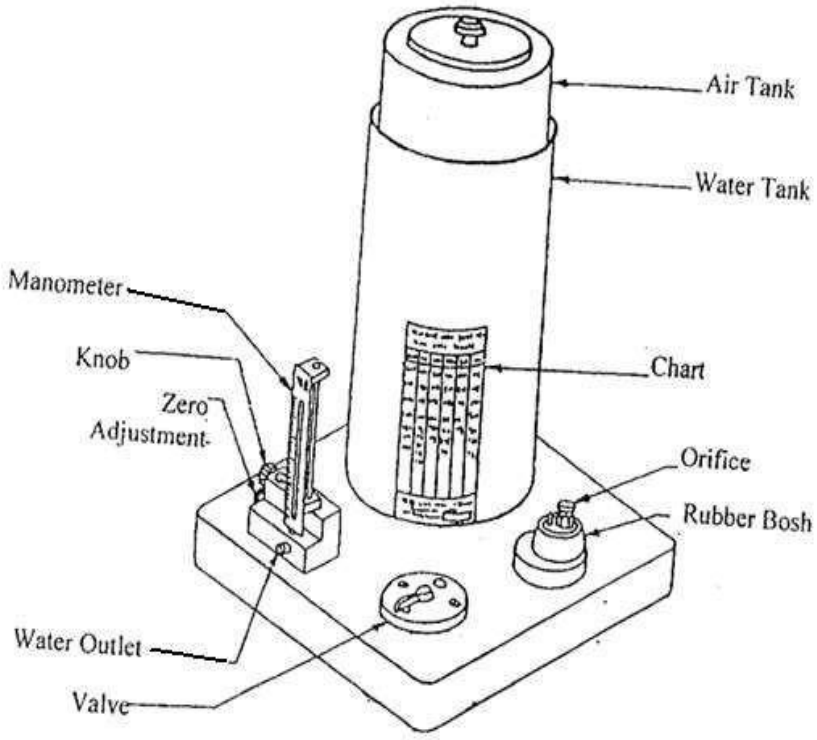
1. Keep the instrument clean.
2. Apply rust preventive oil to moving parts, specimen tube and pedestal cup.
3. Don’t ram right handle without specimen.
4. Lubricate all moving parts at least once in the week.

RESULT:-The sand specimen is prepared according to ASTM standard.

PERMEABILITYTEST

AIM: - To determine permeability number of green sand, core and raw sand.

APPARATUS: - Water tank, air tank, manometer, standard chart, rubber boss, O-P-D valve, orifices.



PROCEDURE:-

1. Place the instrument on leveled plotform.Take O-P-D valve knob at D position.
2. Close the air opening of the air tube inside water tank by thumb and pour water up to the W mark.
3. Insert air tank into water tank carefully a screw is provided at the left side of the manometer to fill the water in manometer unscrewing the knob operates this screw and water is filled in the manometer.
4. The Water level should coincide with the zero of the manometer scale .The screw is closed by tightening final zero level is adjusted by opening zero adjust screw provided in front of the manometer
5. Selection of orifice it is recommended to use small orifice for permeability below 50Nos and large orifice for permeability above 50Nos.
6. Tightening the orifice by fingers only.
7. Take the specimen tube with rammed specimen and place in inverted over the rubber boss put the valve on P position.

8. Read the height of water column in the manometer tube. Find out corresponding permeability number from the chart provided with the instrument put the valve on O position.
9. Whenever the air tank is flush with water tank keep the valve on D position and slowly lift the air tank to the top position.
10. Lift the air tank drum slowly up keeping the valve in D position.

S.NO	Specimen Weight (g)	Type of Sand	Pressure(N/mm^2)	Permeability Number

PRECAUTIONS:-

1. Keep the instrument clean.
2. Lift the air drum only in D position to avoid any water entering the air passage.
3. For removal of the water tank completely from manometer use zero adjustment knob valves.

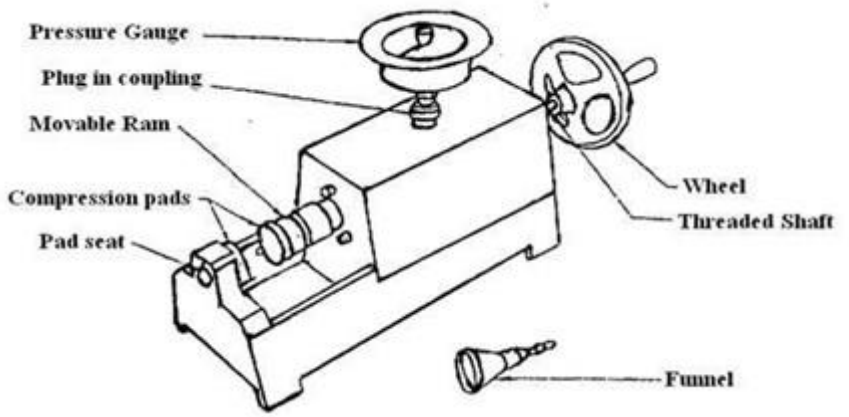
RESULT:-Permeability number of given sand is found.

UNIVERSAL STRENGTH MACHINE

AIM: - To determine the various strengths of prepared specimen.

APPARATUS:-

1. Hydraulic unit with loading assembly, quick releasing coupling.
2. Pressure gauge (low and high)
   Low gauge range 0-1600gms/cm^2
   High gauge range 0-13000gms/cm^2
3. Compression pads.
4. Oil filling funnel.



PROCEDURE:-

1. Take the instrument on plane platform.
2. Place the oil filling funnel in quick release coupling. Pour the oil in funnel rotate the wheel clockwise and anti-clockwise.
3. Repeat the procedure until the air bubbles do not appear in oil. Then remove the oil filling funnel and place the low pressure gauge.
4. Place the compression pads in its location. Put the cylindrical specimen in between two compression pads.
5. Rotate the wheel clockwise loading piston applying the load on the cylindrical specimen.
6. See at the pressure gauge pointer of the pressure gauge moves with reference pointer (red pointer).
7. When the specimen breaks the pointer of the pressure gauge will came back to its home position and reference pointer indicates compression strength of specimen.
8.

S.NO	Specimen Weight (g)	Type of Sand	Compression strength	Shear strength

PRECAUTIONS:-

Do not handle equipment without lab assistant's help.

RESULT: - The compression and shear strength of the moulding sand is found.

MOULD MAKING

AIM: -To make a green sand mould using the given pattern

TOOLS REQUIRED: - Cope& drag box, rammers, shovel, pattern, lifter, strike off bar, sprue pins, Vent pins.

MATERIALS REQUIRED: -Moulding sand, facing sand, Baking sand, Parting sand, water, Bentonite powder (Al_2O_3 $4SiO_2$ H_2O nH_2O), and coal dust.

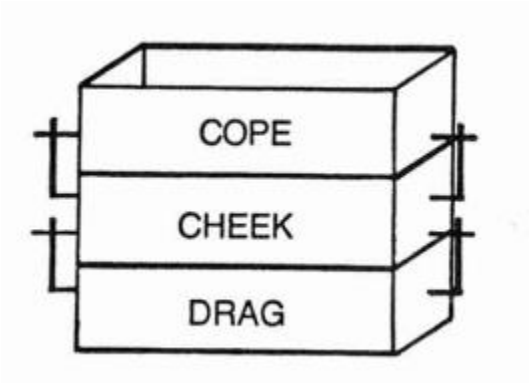
TERMINOLOGY OF CASTING:

Flask: A moulding flask is one which holds the sand mould intact. Depending upon the position of the flask, in the mould structure it is referred to by various names as drag cope and check. It is made up of wood for temporary applications or more generally of metal for long term use.

Drag: lower moulding flask.

Cope: Upper moulding flask.

Check: Intermediate moulding flask used in three moulding.



Pattern: Pattern is a replica of the final object to be made with some modifications. The mould casting is made with the help of the pattern.

Parting Line: This is the dividing line between the two moulding flasks that makes up the sand mould. In split pattern it is also the diving line between the two halves of the pattern.

Bottom Board: This is a board normally made of wood which is used at the start of the mould making. The pattern is first kept on the bottom board sand is poured on it and then the ramming is done in the drag.

Facing Sand: It is specially prepared sand which is placed around the pattern which has superior properties with regards to refractoriness permeability etc. this will ensure better surface on the castings.

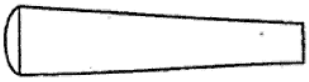
Coal Dust: The small amount of carbonaceous materials sprinkled on the inner surface of the moulding cavity to give better finish to castings.

Moulding Sand: It is the mixture of silica sand, clay and moisture in an appropriate proportion to get the desired results and it surrounds the pattern facing sand while making the mould.

Backing Sand: It is chat constitutes most of the refractory material found in the mould. This is made up of used and burnt sand.

Core: It is used for making hallow cavities in castings.

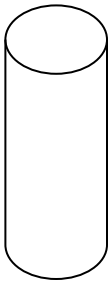
Sprue: The passage through which the molten metal from the pouring basin reaches the mould cavity. In many cases it controls the flow of metal into the mould.



Runner: The passageways in parting plane through which molten metal flow is regulated before they reach the mould cavity through the In – Gate.

Ingate: The actual entry point through which molten metal enter mould cavity.

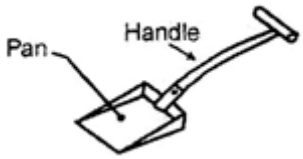
Riser: It is a reservoir of molten metal provided in the casting so that hot metal can flow into the casting when there is a reduction in volume of metal due to solidification.



Chill: Chill are metallic objects which are placed in the mould to increase the cooling rate of molten metal.

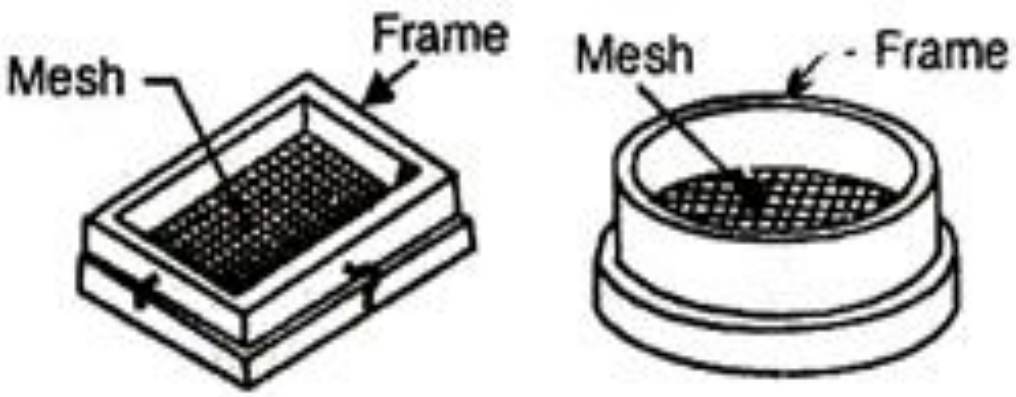
Shovel:

A shovel is used for mixing the sand with other ingredients. It is also used for handling the sand from one place to another in the foundry shop. It consists of a square metal pan fitted with a wooden handle.



Riddle:

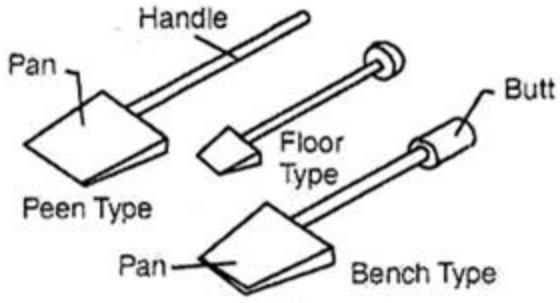
A riddle is used for cleaning the moulding sand. It removes the unwanted material like metal scrap, iron and other metal parts, pebbles etc.,



3.

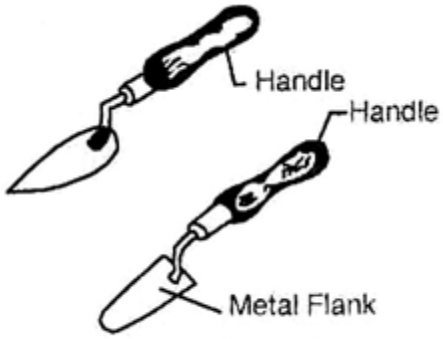
Rammers:

A rammer is a wood or metal tool used for ramming or packing the sand in the moulding box. It has two parts peen and butt. Rammers are available in different designs and constructions. The popular and widely used rammers are peen-rammer, bench-rammer, and floor-rammer etc.,



Trowels:

A trowel is used for finishing and repairing a mould. It consists of a metal-flat with different shapes and wooden handle. It is also used for smoothen the mould surfaces, shaping the square corners, finishing the parting surfaces. It is available in different shapes like rectangular, triangular, square, round etc.,



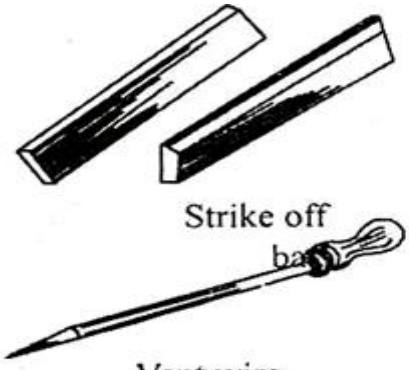
Trowel.

Strike-Off Bar:

A strike-off bar is used for striking off the excess sand from the mould to provide a smooth surface. It is a straight bar of wood or steel and usually have rectangular cross-section.

Vent Wire:

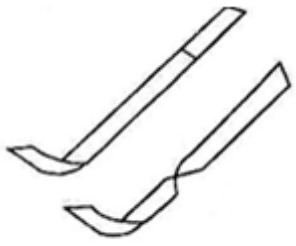
A vent wire is used to form vents or holes in the rammed sand to provide easy escape of gases or steam formed during pouring of molten metal. It is a circular or rectangular long needle tool, pointed edge at one end and handle at the other end



Vent wire.

Lifter:

A lifter is used for picking up the unwanted dust and damaged parts of the mould. It is a L-shaped steel tool with long holding shank and a small toe. It is available in thin sections of various width and lengths, according to the shape of the mould Fig. 4.1 (g).


Lifter.

Slick:

A slick is used for repair and finishing the mould surface after the removal of pattern. It is a double ended tool having a spoon on one end and a flat on the other end.

Gate Cutter:

A gate cutter is used for cutting the gate in the mould which acts as a passage for the hot metal. It is U-shaped piece of thin sheet metal.

Gate cutter.

Draw Screw:

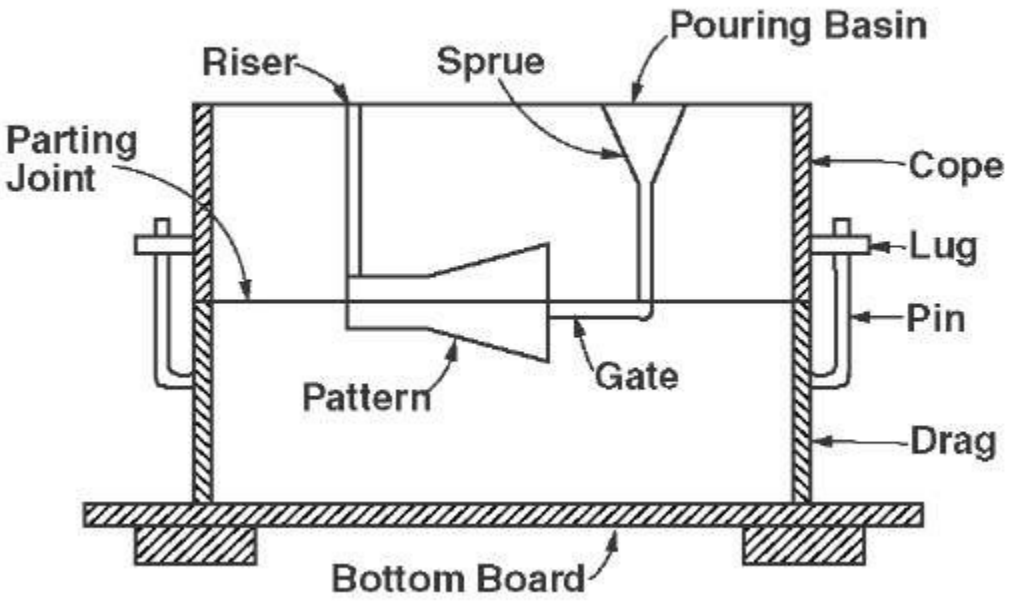
A draw screw is used for drawn out the pattern embedded in the moulding sand. It is a pointed steel rod, with a loop at one end. Wooden mallet is used for striking the draw screw, also called draw spike.

Draw screw.

Mallet:

A mallet is used to loosen the pattern in the mould so that it can be removed easily. It is used together with draw spike.

Mallet.



MOULDING DIAGRAM

PROCEDURE:-

1. First a bottom board to be placed either on the moulding platform or the floor making surface ever.
2. Keep the drag-portion molding flask upside down on the bottom board and sprinkle the facing sand
3. Keep the drag part of thePattern at the center of the flask on the board.
4. Sprinkle the facing sand on to the surface of pattern
5. Fill the drag with foundry sand and ram the sand gently till the flak is filled to top then even the surface with strike of bar
6. Turn the drag to its right portion so that the pattern faces upward direction
7. Clean the surface of pattern and sprinkle the fresh facing sand.
8. Place the cope box on the drag and clamp
9. Place the sprue pin and riser pin in appropriate positions on to the surface of drag
10. Fill the cope with foundry sand with care in order to maintain the positioning of sprue pin and riser pin as done in case of drag and even the surface of drag.
11. Remove sprue pin and riser pin
12. Make vent holes based on cope side of mold box
13. Lift the cope and keep next to drag.
14. Blow out loose sand if any from the surface of drag

15. Remove pattern from drag and clean mold cavity.
16. Cut runners and gates on from sprue and drag impressions on the drag surface and blow out the loose sand(OPTIONAL POINT: Keep the core in its place in mold cavity of the casting needs any hole or hollow portion)
17. Reposition the cope on to drag and clamp.
18. Mould is ready for pouring the casting operation(To pour the molten metal)

PRECAUTIONS:-

1.The mating surface should be as smooth as possible.

2.Care should be taken while lifting the pattern so as do not disturb the slides.

3.Pattern, runner and riser should not be distributed when cope box is lifted.

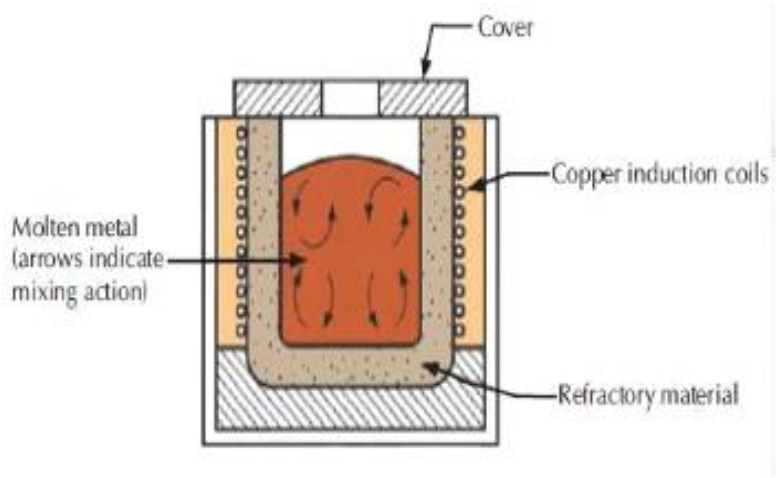
4.The sand in the box is rammed tightly and uniformly.

RESULT:-Mould is ready for pouring to obtain a casting.

MELTING AND CASTING - DEMONSTRATION

AIM: -To observe the melting of metals to prepare the casting.

MATERIAL REQUIRED AND APPARATUS: - Electric melting furnace, Ladle, Metal for melting, duly prepared flask type mold with cavity for desired mold box, location pins and chaplets for positioning the core de-slag powder.



PROCEDURE:-

1. Preparation of core using core box as done for mold cavity. The only difference is the core sand should have more strength to with stand the forces exerted by molten metal/alloy
2. Preparation of mold cavity of desired product
3. Placing of core in the mold cavity and secure its position using location pins and chaplets
4. Move the duly prepared mold box to melting area and kept nearer to the furnace to facilitate the pouring of molten metal with ease
5. Melting Procedure For Aluminium Alloys:-

The charge materials, chemicals should be free from moisture, oil, and corrosion powder and should be preheated before charging. The calculation of charge should be done considering the melting loss of each element in the melting furnace for final desired analysis.

1. The furnace crucible should be clean and red hot for charging.

2. Aluminium alloys get readily oxidized and form dross, using proper covering top with flux and chemicals help to reduce this. Different proprietary chemicals are available for different alloys.

3. Melting should be done under steady conditions without agitation. Stirring is done to reduce gas pickup.

4. Once melting is complete, degassing using solid chemicals like hexachloro-ethane which evolves chlorine by purging with nitrogen or argon gas is done to remove the dissolved hydrogen. Hydrogen is evolved from moisture.

$$3H_2O+2Al \rightarrow Al_2O_3+6H$$

Hydrogen absorbed by liquid metal causes serious porosity in casting during solidification.

Degassing should be done in the temperature range 700 to 750^0 C

5. Liquid metal after degassing is treated with sodium containing chemicals to improve mechanical properties.

6. Liquid metal once ready should not be super heated. Agitated or kept long in the furnace which will cause dressing and gas pickup. Dross should be skimmed properly before pouring.

7. Alloys containing magnesium should be melting carefully as it is highly reacting. Special fluxes and chemicals like sulphur are used to inhibit the reactivity and prevent spontaneous ignition, melting loss and dross.

8. Pouring the molten metal in to the mold cavity and keep a check the molten metal fills the cavity and come out from riser to confirm the mold cavity is full and the metal in riser will compensate the shrinkage during the solidification

9. After the metal cools and solidifies the mold has to be dismantled, take out the casting, cut out the riser sprue, gate, ingate portions and remove the core sand from the central hole of stepped pulley. Finally machine the component to the correct dimensions

Casting Defects:-

1. Improper chemical analysis: Incorrect charge, calculations, including wrong estimates of melting losses, metal recovery, excessive losses due to improper fluxing and slogging operations, improper covering of non-

Ferrous melt causes this defect.

2. Gassy metal/hydrogen pickup/pinhole porosity: unclean melting causes formation and absorption of hydrogen into liquid metal. As casting solidifies, the absorbed hydrogen losses solubility and forms cavities inside casting.

3. Oxygen absorption

Excessive oxygen furnace operations in atmosphere following oxidation during melting cause this defect. It also causes loss of costly metal added in the charge.

4. Slag inclusions

Improper fluxing and slag removal slag particles to be mixed in the metal being poured. Careless pouring, lip pouring for alloys with fluid slag causes slag particles to enter casting.

5. Cold shut, misrun, unfilled castings

Low pouring temp, delay in pouring, due to many folds being poured, loss of heat from ladle, due to improper covering failure of ladle opening in the bottom pouring cause premature solidification of metal causing defects.

6. Sand fusion, metal penetration, rough surface

Excessive pouring temp of liquid causes damage to the casting surface by attacking mould surface.

7. Sand erosion sand inclusions

Uncontrolled high pouring rate from ladle into mould leads to erosion of mould/core.

PRECAUTIONS:-

1. The furnace crucible should be clean and red hot for charging.

2. Charge material should be free from oil, moisture etc.

3. Melting must be done under steady condition to reduce gas pickup.

RESULT:-Melting and casting process of a component is learned