Special Forming Process

There are a great variety of sheet metal forming methods, mainly using shear and tensile forces in the operation.

- Progressive forming
- Rubber hydroforming
- Bending and contouring
- Spinning processes
- Explosive forming
- Shearing and blanking
- Stretch forming
- • Deep drawing

Progressive forming

• Punches and dies are designed so that successive stages in the forming of the part are carried out in the same die on each stroke of the press.
• Progressive dies are also known as multi-stage dies.

Rubber forming

In bending and embossing of sheet metal, the female die is replaced with rubber pad

Hydro-form (or) fluid forming process

The pressure over rubber membrane is controlled throughout the forming cycle ,with max pressure up to 100 Mpi

As a result the friction at the punch-cup interface increases, this increase reduces the longitudinal tensile stresses in the cup and delays fracture

Spinning

Shaping thin sheets by pressing them against a form with a blunt tool to force the material into a desired form

Conventional spinning

A circular blank if flat or performed sheet metal hold against a mandrel and rotated ,while a rigid metal is held against a mandrel and rotated ,wile a rigid tool deforms and shapes the material over the mandrel.

Shear Spinning

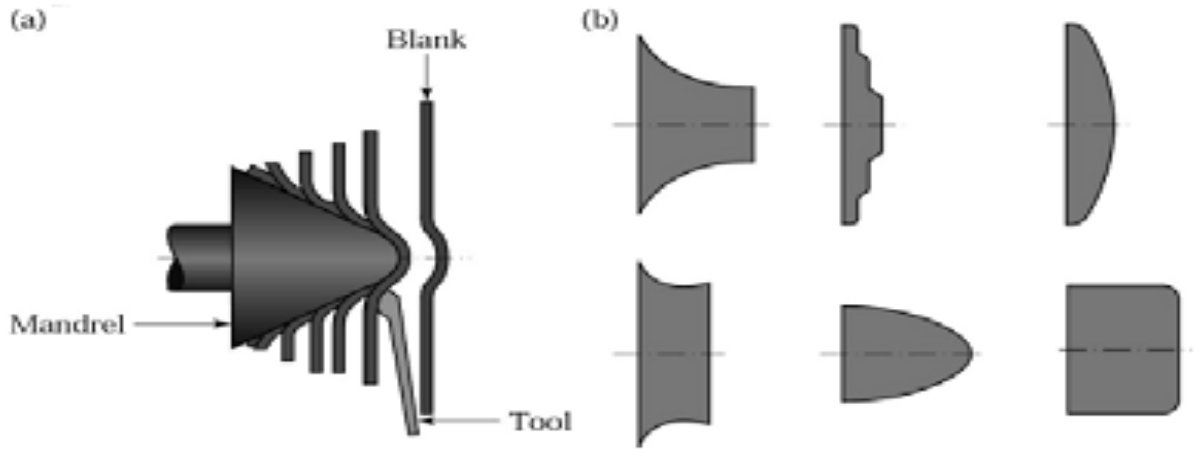
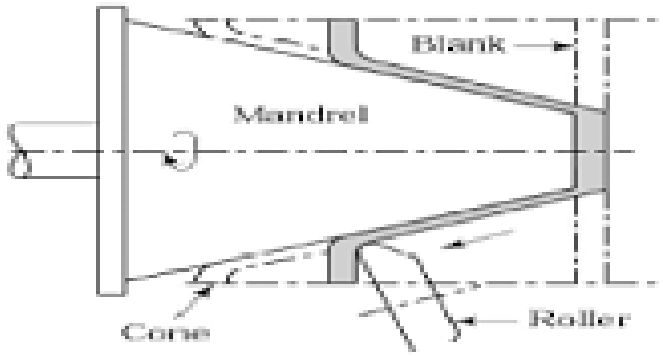


Fig .(a) Schematic illustration of the conventional spinning process (b) Types of parts conventionally spun.

All parts are antisymmetric

- Known as power spinning, flow turning, hydro-spinning, and spin forging
- Produces axisymmetric conical or curvilinear shape
- Single rollers and two rollers can be used
- It has less wastage of material
- Typical products are rocket-

motor casing and missile nose cones.

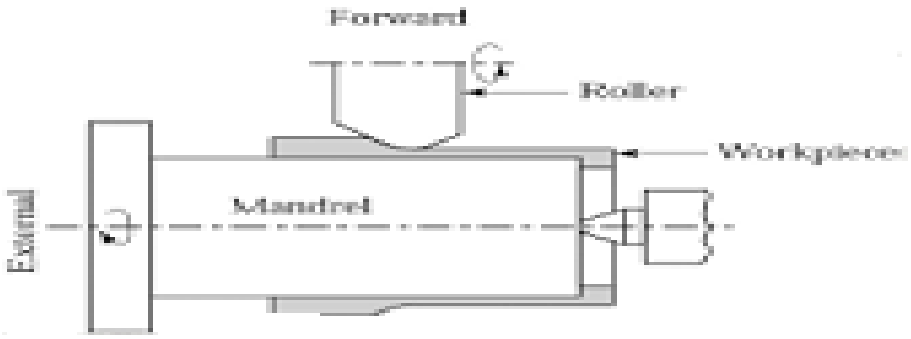


Tube spinning

Thickness of cylindrical parts are reduced by spinning them on a cylindrical mandrel rollers

Parts can be spun in either direction

Large tensile elongation up to 2000 % are obtained within certain temperature ranges and at low strain rates.



Advantages

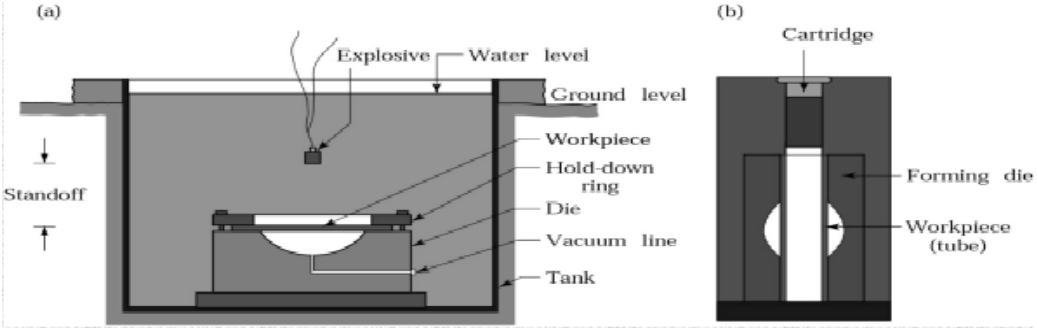
Lower strength is required and less tooling costs
Complex shapes with close tolerances can be made
Weight and material savings
Little or no residual stress occurs in the formed parts

Disadvantages

Materials must not be super elastic at service temperatures
Longer cycle times

Explosive forming

Explosive energy used s metal forming
Sheet-metal blank is clamped over a die
Assembly is immersed in a tank with water
Rapid conversion of explosive charge into gas generates a shock wave .the pressure of this wave is sufficient to form sheet metals



Beading

The periphery if the sheet metal is bent into the cavity of a die

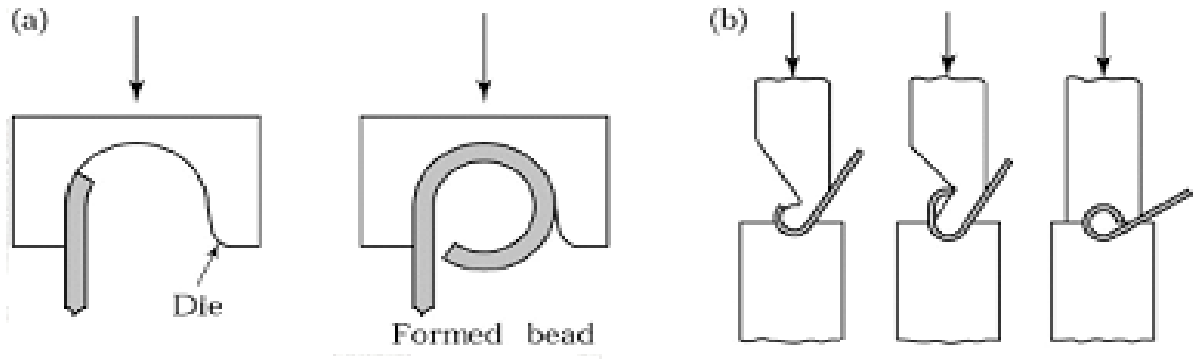


Fig .(a) Bead forming with a single die (b) Bead forming with two dies,in a press brake

Hemming

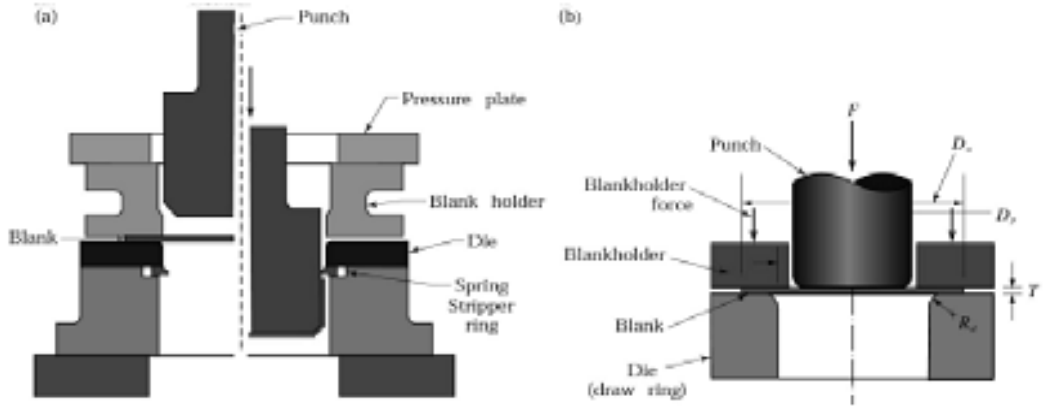
- The edge of the sheet is folded over itself
- This increases stiffness of the part
- The metal strip is bent in stages by passing it through a series of rolls

Seaming

Joining two edges of sheet metal by hemming.Specifically shaped rollers used for watertight and airtight joints

Deep drawing

- Punch forces a flat sheet metal into a deep die cavity.
- Round sheet metal block is placed over a circular die opening and held in a place with blank holder & punch forces down into the die cavity



Flanging

Flanging is a process of bending the edges of sheet metals to 90o
Shrink flanging – subjected to compressive hoop stress.
Stretch flanging –subjected to tensile stresses

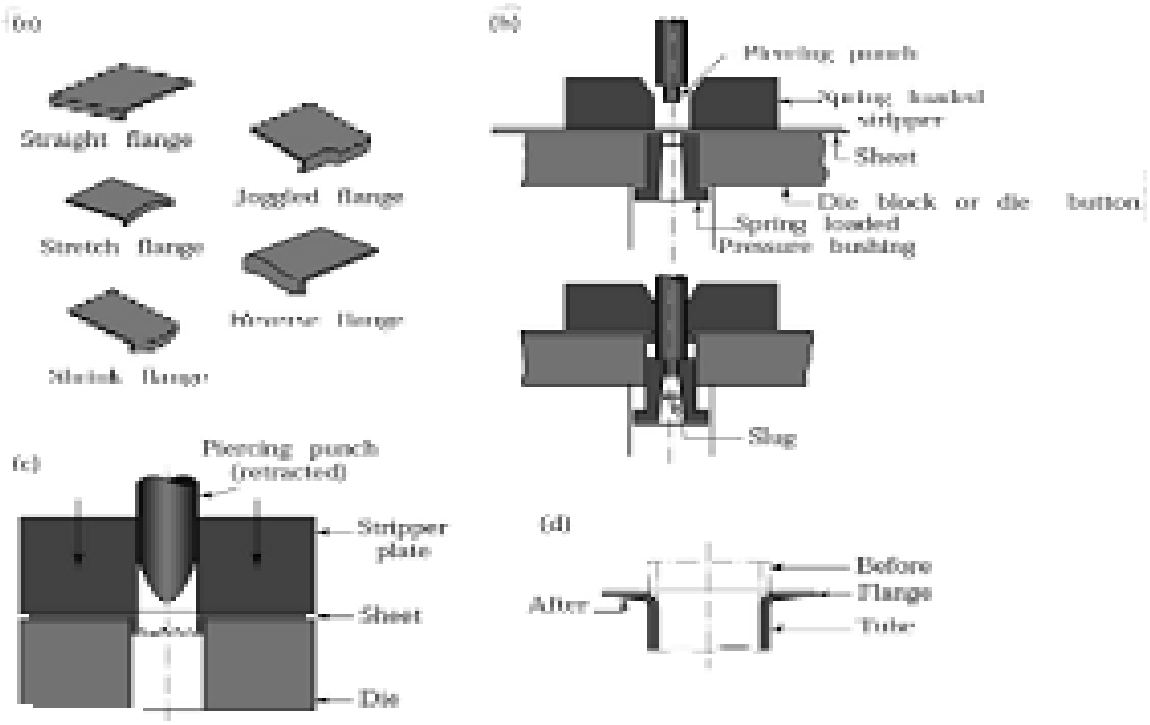


Fig .Various flanging operations (a) Flanges on a flat sheet. (b) Dimpling. (c) The piercing of the sheet metal to form a flange.
In this operation,a hole does not have to be prepunched before the bunch descends .Note however,the rough edges along the circumference of the flange. (d) The flanging of a tube; note the thinning of the edges of the flange

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