Designation

The complete designation of a scale should consist of the word Scale, followed by the indication of its ratio as:

SCALE 1 : 1 for full size,

SCALE × : 1 for enlarged scales,

SCALE 1 : × for reduced scales.

The designation of the scale used on the drawing should be shown in the title block.

Recommended Scales

The recommended scales for use on technical drawings are given in Table 1.3. The scale and the size of the object in turn, will decide the size of the drawing.

Scale Specification

If all drawings are made to the same scale, the scale should be indicated in or near the title block. Where it is necessary to use more than one scale on a drawing, the main scale only should be shown in the title block and all the other scales, adjacent to the item reference number of the part concerned or near the drawings.

Table 1.3 Recommended scales

Category	Recommended Scales		
Enlarged scales	50:1 5:1	20:1 2:1	10:1
Full size			1:1
Reduced scales	1:2 1:20 1:200 1:2000	1:5 1:50 1:500 1:5000	1:10 1:100 1:1000 1:10000

1.4 Standard Conventions using SP-46 (1988)

Certain draughting conventions are used to represent materials in section and machine elements in engineering drawings. As a variety of materials are used for machine components in engineering applications, it is preferable to have different conventions of section lining to differentiate between various materials. The recommended conventions in use are shown in Fig.1.5. When the drawing of a component in its true projection involves a lot of time, its convention may be used to represent the actual component. Figure 1.6 shows typical examples of conventional representaion of various machine components used in engineering drawing.

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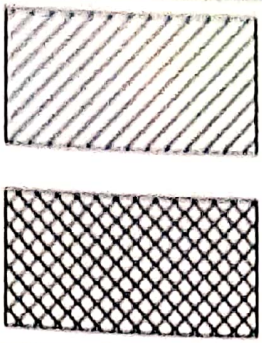
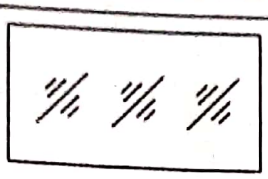
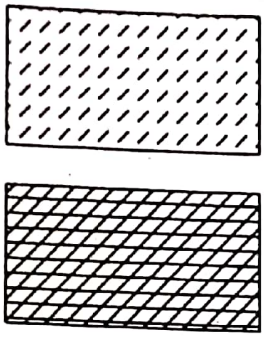
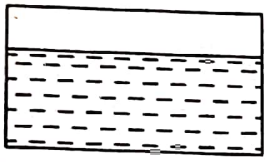
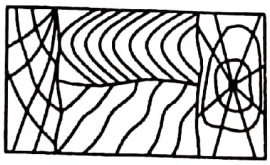
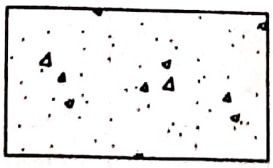
TYPE	CONVENTION	MATERIALS
METALS		STEEL, CAST IRON, COPPER AND ITS ALLOYS, ALLUMINIUM AND ITS ALLOYS ETC.
GLASS		GLASS
PACKING AND INSULATING MATERIAL		PORCELAIN, STONEWARE, ASBESTOS, FIBRE, FELT, SYNTHETIC RESIN PRODUCTS, PAPER, CORK,RUBBER, LEATHER, WAX, INSULATING & FILLING MATERIALS
LIQUIDS		WATER, OIL, PETROL ETC
WOOD		WOOD, PLYWOOD, ETC
CONCRETE		CONCRETE

Fig.1.5 Conventional representation of material in section

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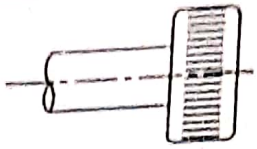
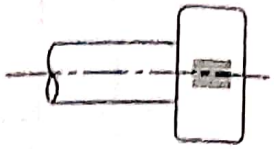
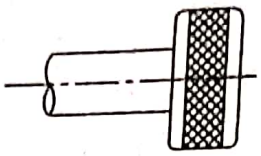
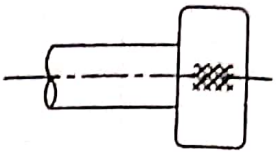
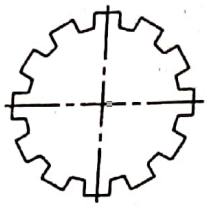
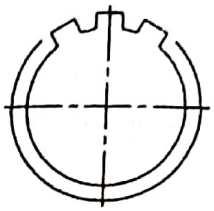
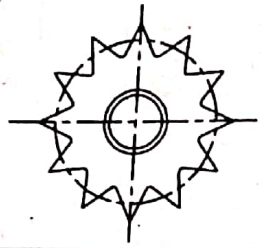
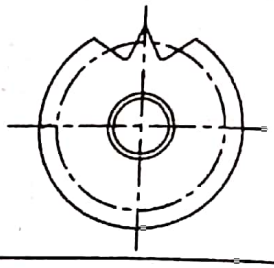
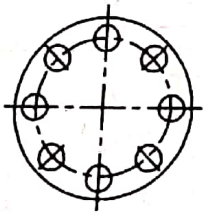
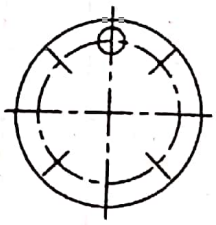
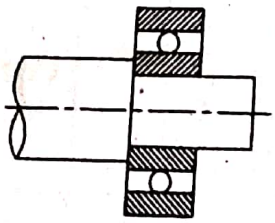
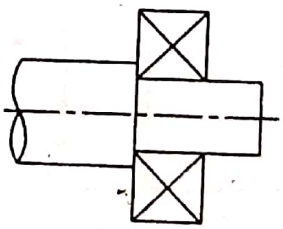
Machine Components

When the drawing of a component in its true projection involves a lot of time, its convention may be used to represent the actual component. Figure 1.6 shows typical examples of conventional representaion of various machine components used in engineering drawing.

Title	Subject	Convention
Straight knurling		
Diamond knurling		
Splined shafts		
Chain wheel		
Holes on circular pitch		
Bearings		

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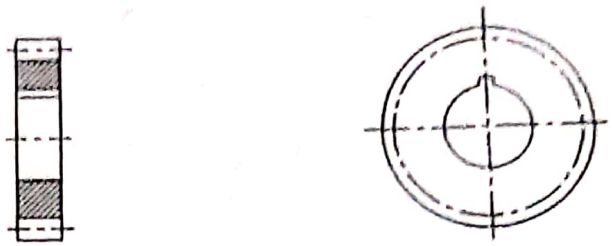
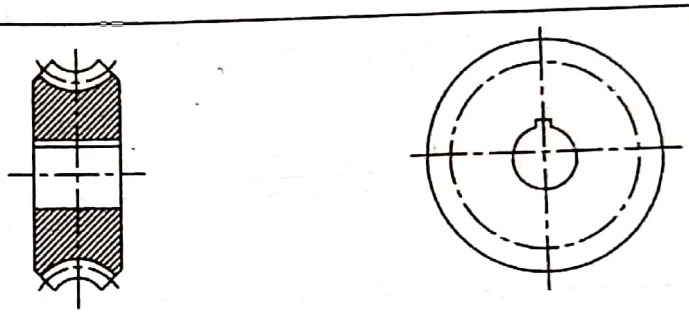
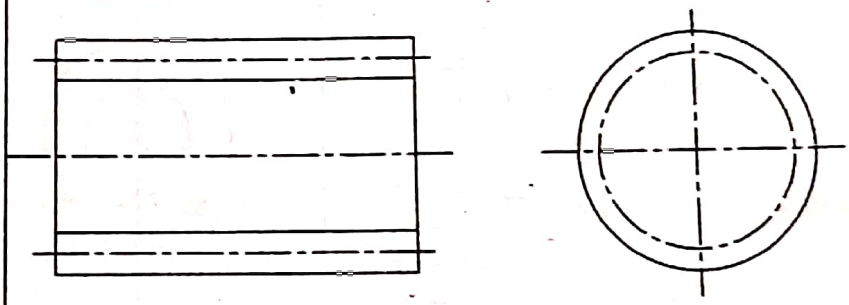
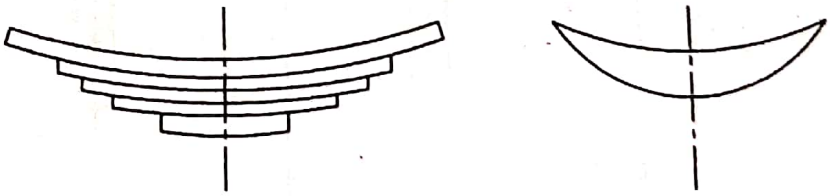
Title	Convention
Spur gear	
Bevel gear	
Worm wheel	
Worm	
Semielliptic leaf spring	

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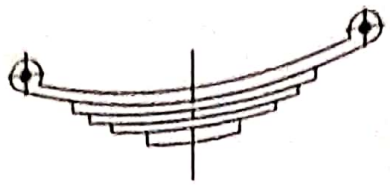
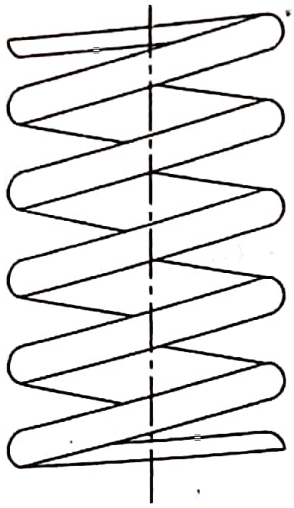
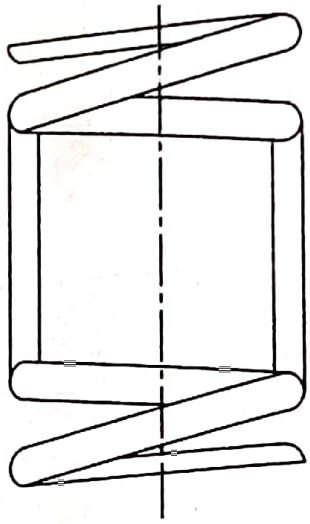
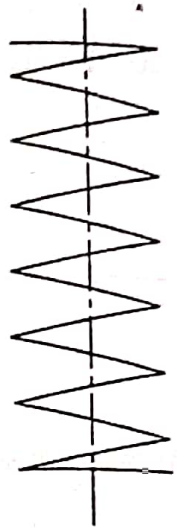
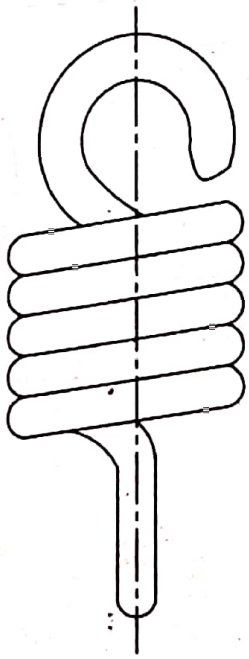
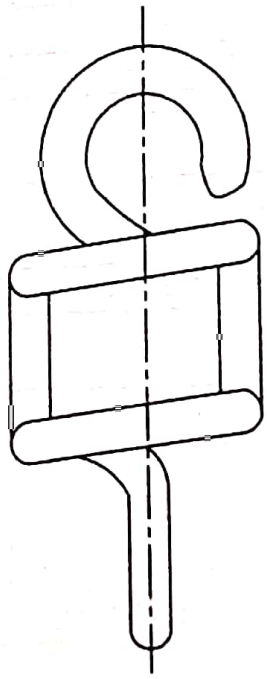
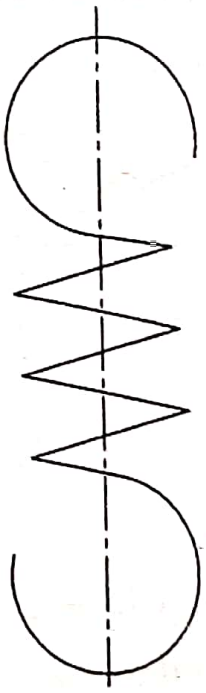
Subject	Convention	
Semielliptic leaf spring with eye		

	Subject	Convention	Diagrammatic representation
Cylindrical compression spring			
Cylindrical tension spring			

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1.5 Long and Short Break in Shaft, Pipe and Rod

The portions of the objects which are very long may be shown interrupted by thin wavy lines or by thin straight lines with zig-zags. The two portions at the interruption are drawn close to each other.

Long shafts, rods, etc., may be shown interrupted as shown in Fig.1.7 The break for the circular shaft is indicated by a thin free hand S-shaped curve with one of its portion forming a closed hatched loop as shown Fig.1.7(a). The breaks for pipes of circular cross section are indicated as shown in Fig.1.7(b). The break for rods of square or rectangular cross section is indicated by two thin wavy lines with space inbetween them hatched as shown in Fig.1.7(c).

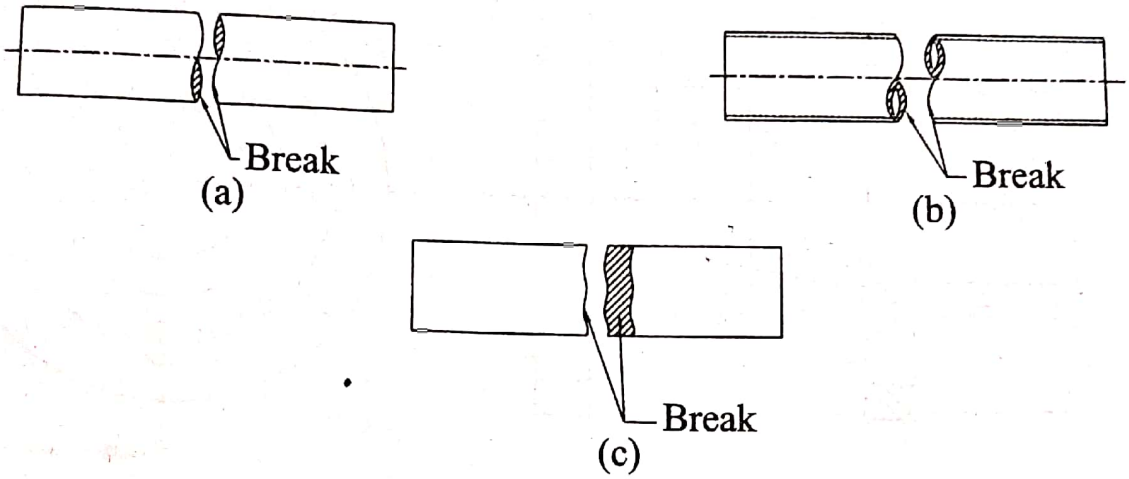

Fig.1.7 Representation of long shaft, pipe and rod

1.6 Various Sections

Orthographic views when carefully selected, may reveal the external features of even the most complicated objects. However, there are objects with complicated interior details and when represented by hidden lines, may not effectively reveal the true interior details. This may be overcome by representing one or more of the views 'in section'.

A sectional view is obtained by imagining the object, as if cut by a cutting plane and the portion between the observer and the section plane being removed.. Some standard conventions in drawing full section, half section, partial section, rotated section, aligned section, etc., as recommended by the Bureau of Indian Standards are to be adopted..

1.6.1 Full Section

A sectional view obtained by assuming that the object is completely cut by a plane is called a full section or sectional view. Figure 1.8 shows the view from the right of the object shown in Fig. 1.8*a*, in full section. The sectioned view provides all the inner details, better than the

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unsectioned view with dotted lines for inner details (Fig. 1.8b). The cutting plane is represented by its trace in the view from the front (Fig. 1.8c) and the direction of sight to obtain the sectional view is represented by the arrows.

It may be noted that, in order to obtain a sectional view, only one half of the object is imagined to be removed, but is not actually shown removed anywhere except in the sectional view. Further, in a sectional view, the portions of the object that have been cut by the plane are represented by section lining or hatching. The view should also contain the visible parts behind the cutting plane.

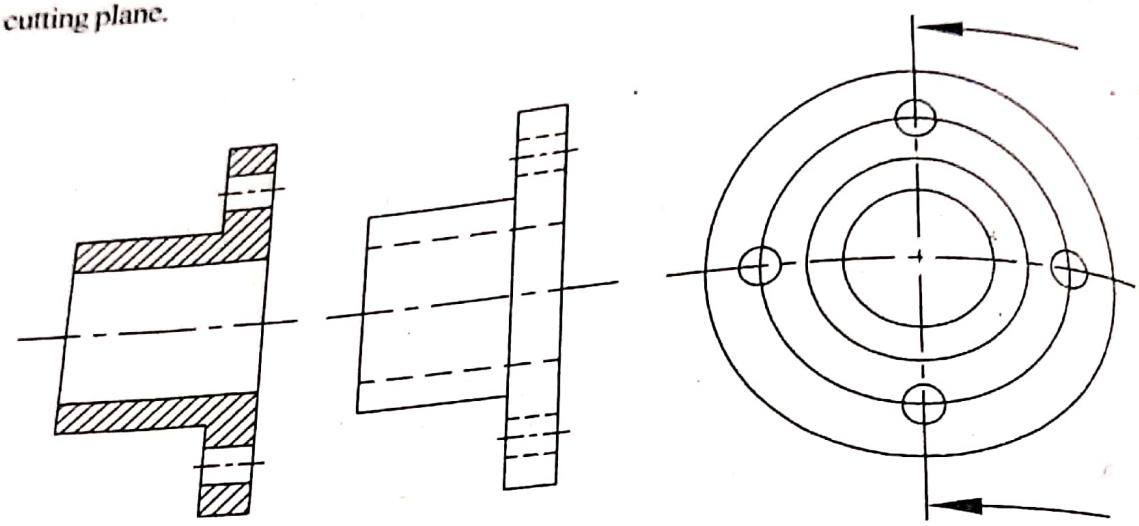

Fig. 1.8 Sectioned and unsectioned views

1.6.2 Half Section

A half sectional view is preferred for symmetrical objects. For a half section, the cutting plane removes only one quarter of an object. For a symmetrical object, a half sectional view is used to indicate both interior and exterior details in the same view. Even in half sectional views, it is a good practice to omit the hidden lines. Figure 1.9 shows an object with the cutting plane in position for obtaining a half sectional view from the front, the top half being in section. Figure shows the half sectional view from the front. It may be noted that a centre line is used to separate the halves of the half section.

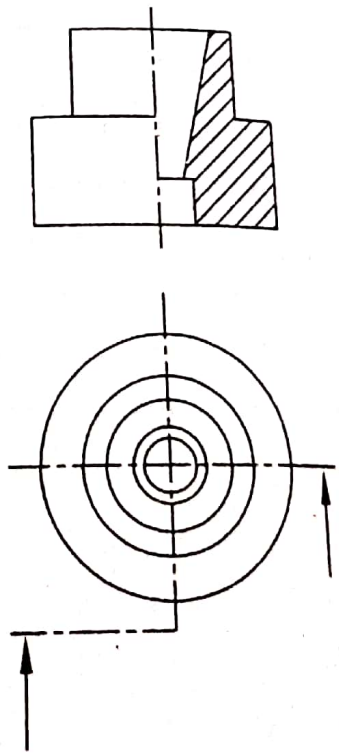

Fig. 1.9 Half section

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1.6.3 Different Types of Half Sections

Any one of the three principal views, viz., front view, or top view, or side view of the object may be shown in half section about its horizontal or vertical axis depending on the portion of the interior details of the object to be shown in section. For example, the front view of the object may be shown in half section about its vertical axis of symmetry as shown Fig.1.10 or about its horizontal axis as shown in Fig.1.12. The half section shown in Fig.1.10 is in front view with right half section. Similarly the half section may be shown in front view with left half in section as shown in Fig.1.11 . The half section shown in Fig.1.12 is in front view with top half section. It can also be shown in front view with bottom half in section as in Fig.1.13. The half section in Fig.1.14 is in top view with front half in section. Similarly it can also be shown in top view with rear half in section as in Fig.1.15.

The side views may also be shown in half section. The half section shown in Fig. 1.16 is in left view with front half in section. Similarly it may be shown in half section in right view with front half in section as shown Fig.1.17. Similarly the left or right view may be shown with rear half in section.

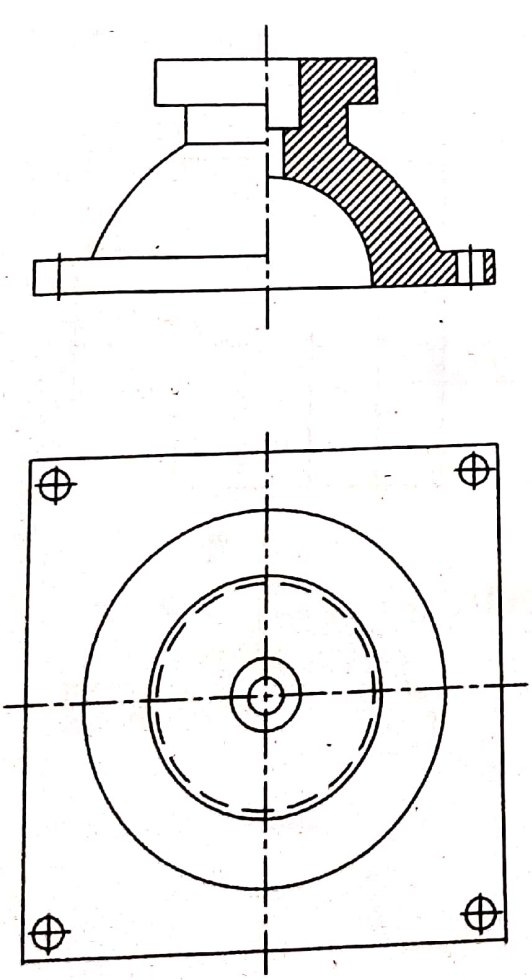

Fig.1.10. Front view with Right half section

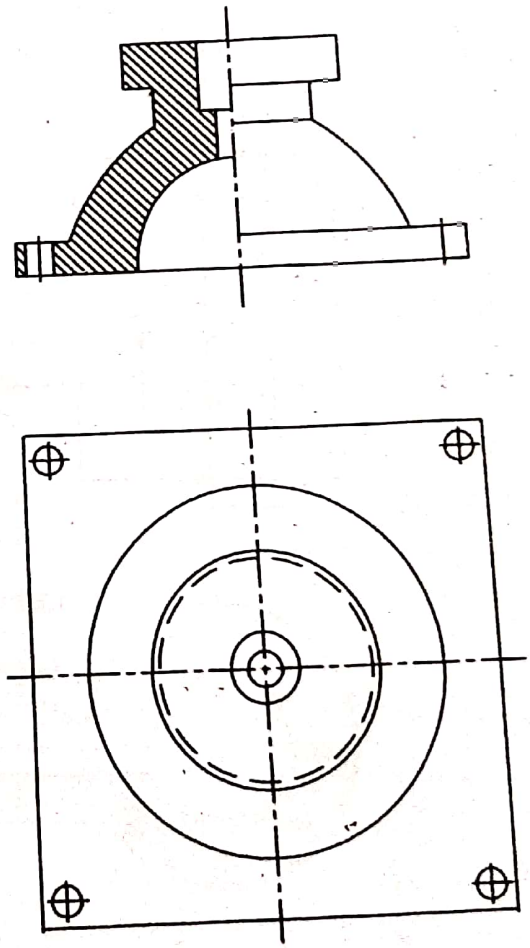

Fig.1.11 Front view with Left half section

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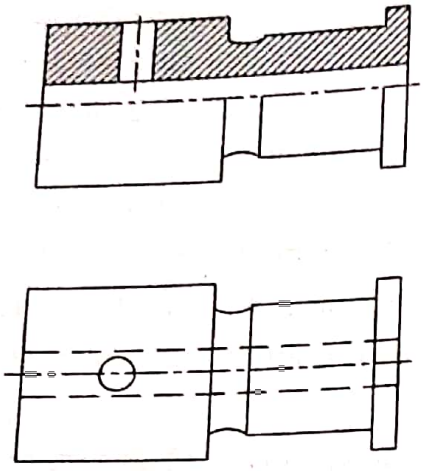

Fig.1.12 Front view with top half in section

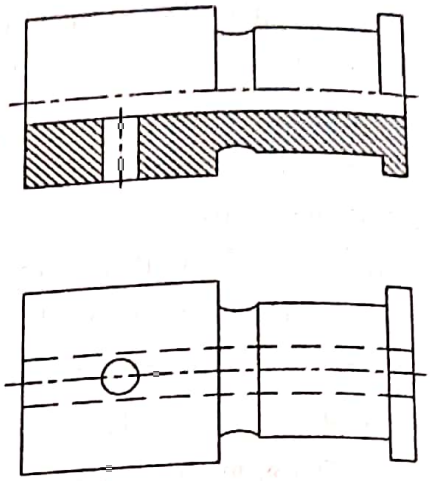

Fig.1.13 Front view with bottom half in section

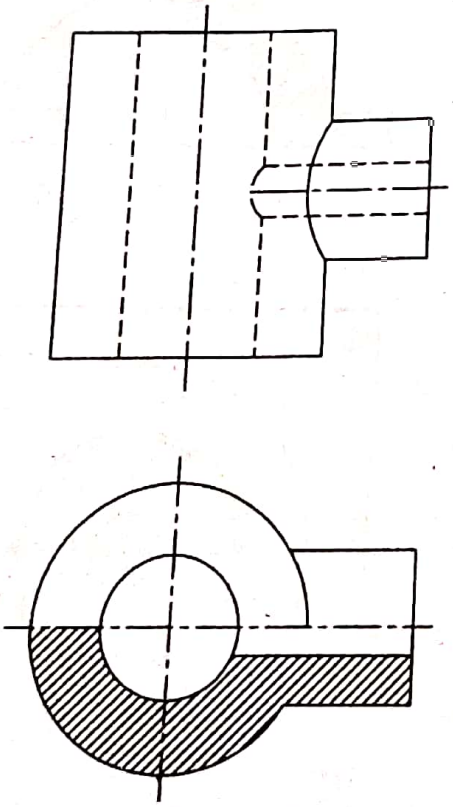

Fig.1.14 Top view with front half in section

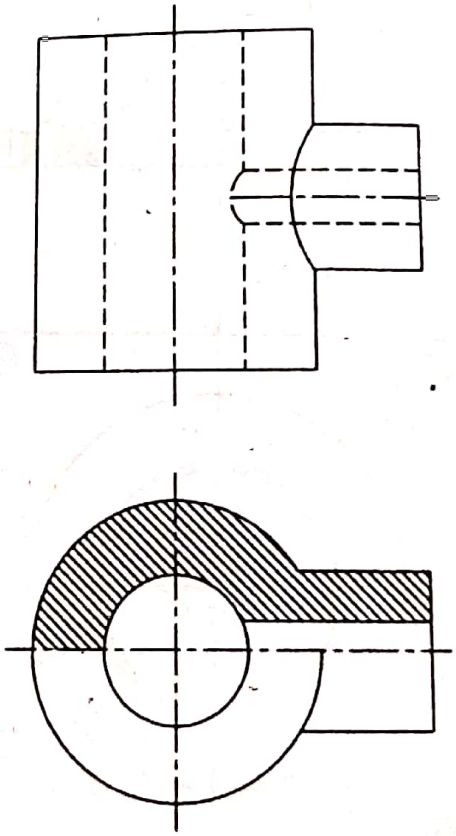

Fig.1.15 Top view with rear half in section

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