12. Aligning Parts in An Assembly

12.1. INTRODUCTION TO ASSEMBLY

Assembly drawings show how the components of a design fit together dimensions and other details are usually omitted in assembly drawings to enhance clarity. Several styles of assembly drawings are commonly used. Sometimes the assembly drawing is just an isometric view of the assembled device. But an exploded isometric view is often helpful to show the individual parts are assembled, as shown in Figure 12.1 for a pizza cutter. In some cases, a sectioned assembly, or cut-away view, shows how complicated devices are assembled. A cutting plane passes through the assembly and part of the device is removed to show the interior of the assembly. Numbers or letters can be assigned to individual parts of the assembly on the drawing and keyed to a parts list.

Finally a part list, or bill of materials, must be included with a set of working drawings. The parts list includes the part name, identification number, material, number required in the assembly, and other information such as catalog number for standard parts.

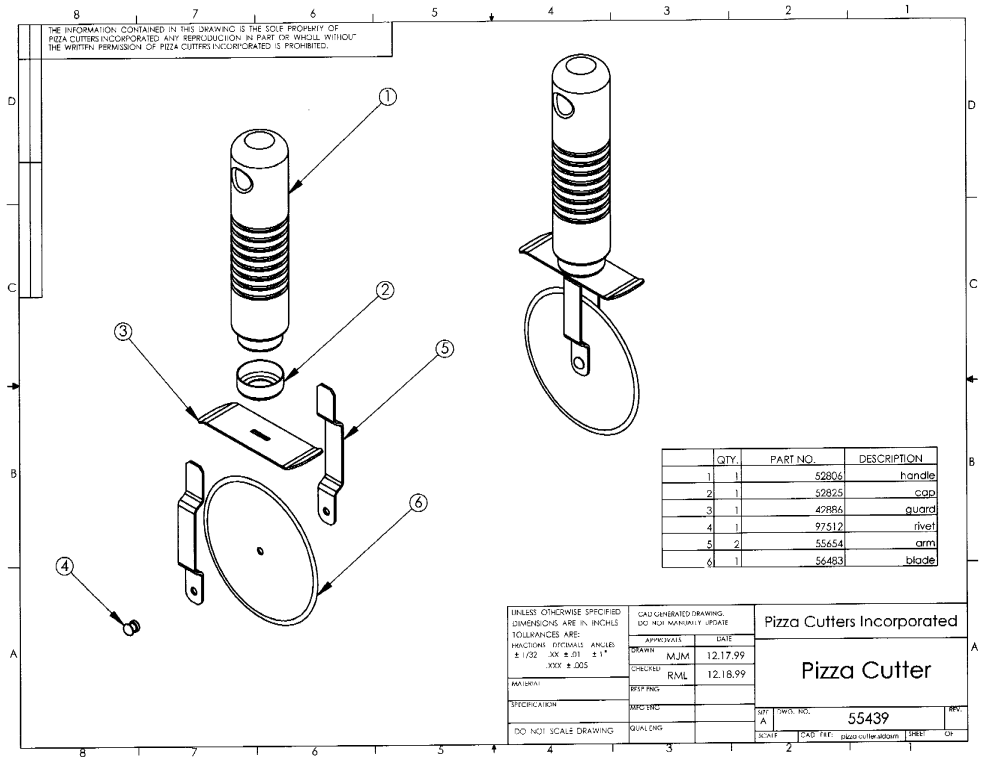


Figure 12.1 Assembly drawing of pizza cutter (from [2])

An assembly drawing shows all of the components of a design either assembled or in an exploded view. Many times assembly drawings include sections. Most dimensions new are omitted in assembly drawings. Individual parts are not dimensioned, but some dimensions of the assembled mechanism may be included. Hidden lines are seldom necessary in assembly drawings, although they can be used where they clarify the design. Leader lines attached to a ballooned letter or detail number, reference the parts of the assembly. The leader lines should not cross and nearby leader lines should be approximately parallel. Name rather

than number labels sometimes parts. The parts list may be on the assembly drawing; (usually on the right side or at the bottom) or it may be a separate sheet. The assembly drawing may also include machining or assembly information in the form of notes on the drawing.

Often assembly drawings include assembly sections. These are typically orthographic or pictorial section views of parts as put together in an assembly. Adjacent parts in assembly drawings are cross-hatched at different angles to make the separate parts clean. The assembly cross-section on the left side of Figure 12.2 shows the interior structure of tile pads of a pizza cutter and. The detail view in the upper right of Figure 12.2 shows the cross-section through the rivet to indicate how the parts are assembled. Usually standard parts such as fasteners, washers, springs, bearings, and gears are not cross-hatched.

In this case the small rivet holding the blade onto the arms of the pizza cutter is too small to see in the orthographic views. The region of interest near the rivet is circled in the left-most projection of the pizza cutter, and a note directs the reader to a magnified detail view in the tipper right part of the drawing. The cross section of the rivet is clearly visible in this detail view.

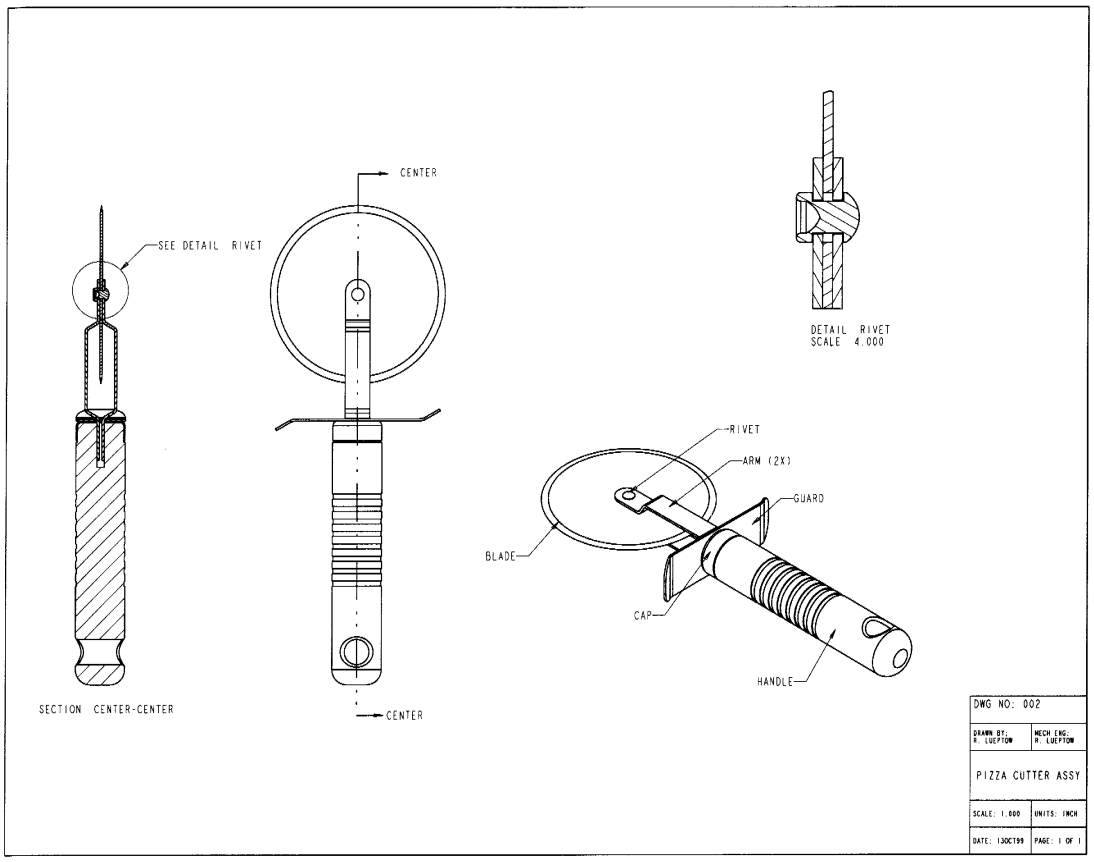


Figure 12.2 Sectional drawing of pizza cutter (from [2])

12.2. ASSEMBLY DRAWING

When a machine is designed, such as a lathe, an assembly drawing is prepared to show the general arrangement of the machine. This drawing should show the finished product with all parts assembled in their correct relative positions. An assembly drawing may include overall dimensions and functional and fitting dimensions. An assembly drawing shows how each part of a design is put together. (Figure 12.3) If

the design depicted is only part of the total assembly, it is referred to as a subassembly. An assembly drawing normally consists of:

- All the parts, drawn in their operating position.
- A parts list or bill of materials **(BOM)** showing the detail number for each part, the quantity needed for a single assembly, the description or name of the part, the catalog number if it is a standard part, and the company part number.
- Leader lines with balloons, assigning each part a detail number, in sequential order and keyed to the list of parts in the parts list.
- Machining and assembly operations and critical dimensions related to these function.

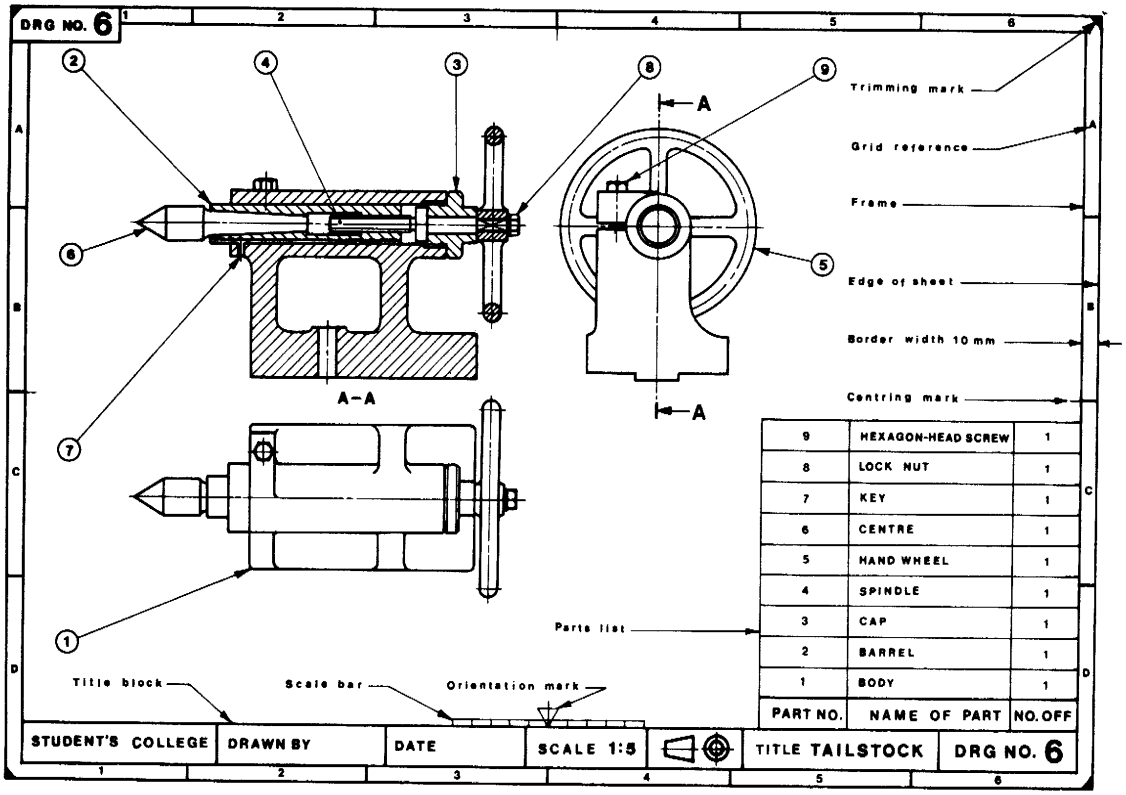


Figure 12.3. Assembly drawing with explanatory notes

12.3. EXPLODED ASSEMBLIES

When components are added to an assembly, they are placed in their functional orientation and location. Often, this state of viewing an assembly can be confusing and less descriptive. Within the technical language of engineering drawing, assembly drawing is used to display the location of assembled components. To make the assembly drawing legible, the assembly can be exploded to separate components (Figure 12.4)

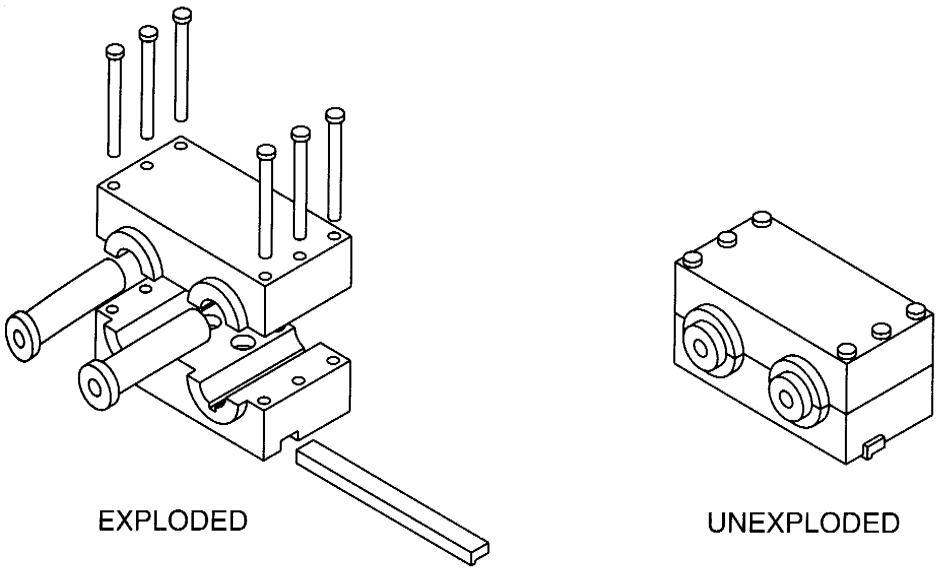


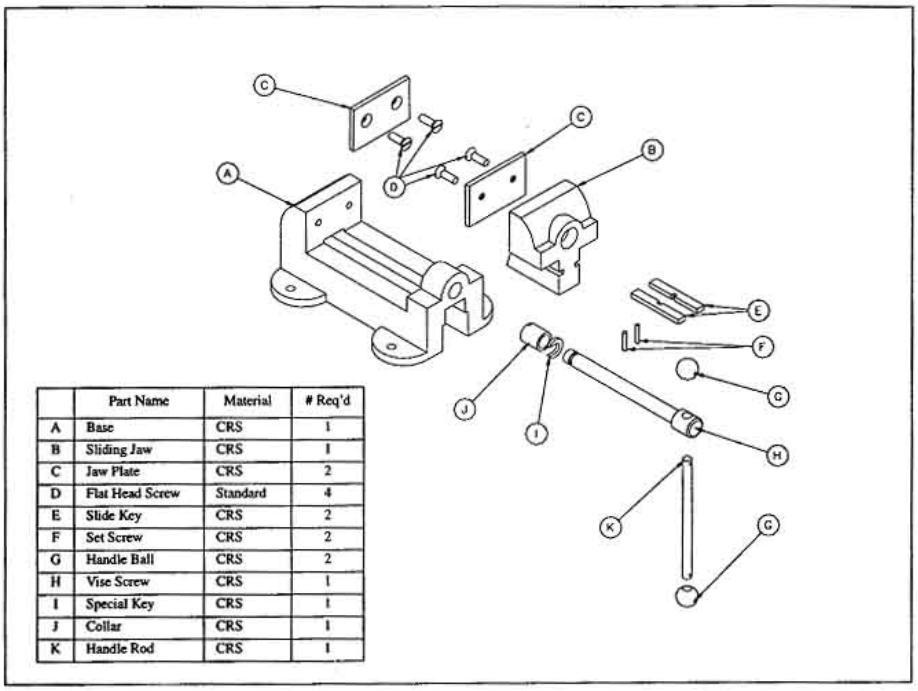
Figure 12.4. Exploded and unexploded assemblies

12.4. BILL OF MATERIALS (OR PART LIST)

When all parts in an assembly drawing have to be identified, each single part is usually labelled by means of a reference number, which may be its detail-drawing number or an independent item number. The separate parts comprising the assembly are located in the drawing by leaders radrating from the circles, or 'balloons', which contain the relevant reference numbers and are usually listed in a parts list. For small assemblies the parts list is placed next to the title block on the drawing, for large assemblies it is usually on a sheet separate from the drawing.

A typical parts list might include the following:
(a) the part number,
(b) the name or description of the part,
(c) the material from which the part is to be made,
(d) the quantity required.

Most assembly drawings contain a bill of materials, which consists of a table listing all parts in the assembly, as well as the quantity of each part required to put the assembly together. If you were to set our assembling a system, you could look at the bill of materials and easily determine how many screws, how many nuts etc. you need to gather in order to assemble the system. Figure 12.5 shows an assembly drawing in exploded configuration for a system, along with the associated bill of materials.



	Part Name	Material	# Req'd
A	Base	CRS	1
B	Sliding Jaw	CRS	1
C	Jaw Plate	CRS	2
D	Flat Head Screw	Standard	4
E	Slide Key	CRS	2
F	Set Screw	CRS	2
G	Handle Ball	CRS	2
H	Vise Screw	CRS	1
I	Special Key	CRS	1
J	Collar	CRS	1
K	Handle Rod	CRS	1

Figure 12.5. Exploded assembly drawing with bill of materials

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