Joining dissimilar materials

Metals, plastics and wood can be joined to each other in three main ways:

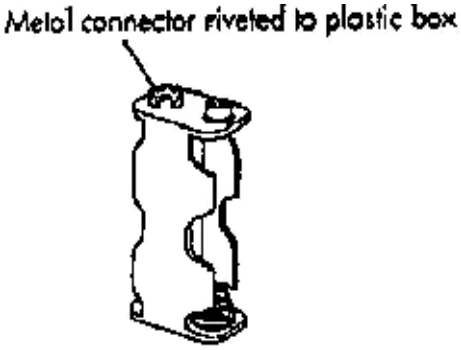
- fastenings
- mechanical fitting
- adhesive bonding.

Fastenings

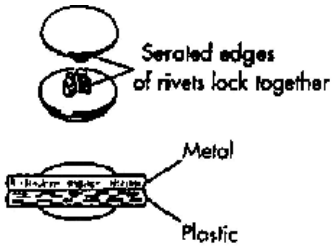
A variety of fastenings are used to join different materials together. These include: nuts and bolts, machine screws, self-tapping screws, special clips and rivets.

Screws are commonly used to join dissimilar materials. The steel blade of the pencil sharpener shown is secured, for example by a self-tapping screw.

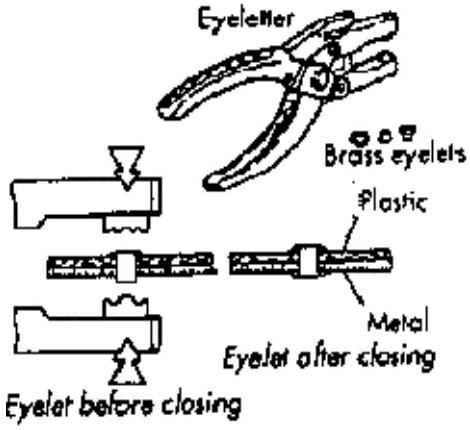
Riveting is used to join metals and plastics, as in the battery holder shown below.



Plastic clips are used to join sheet plastics to metal frames.

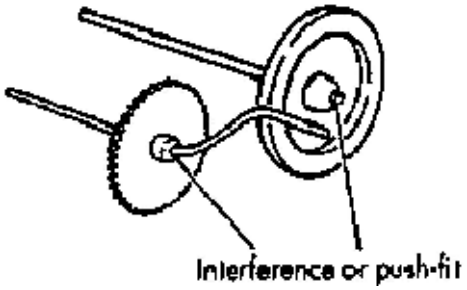


All of these joining methods are available in school. It is often the case that equipment and fittings intended for other purposes can be used. For example, *eyeletter* tools were originally used for inserting brass reinforcement rings in card labels. They can be used for riveting thin sheet materials together.



Mechanical fitting

Mechanical fitting involves locking two different materials or components together. A common example of this is an *interference fit* where one part pushes tightly into a hole moulded into or drilled in another material. Plastic gears and wheels are often fitted to shafts in this way.



Adhesive bonding

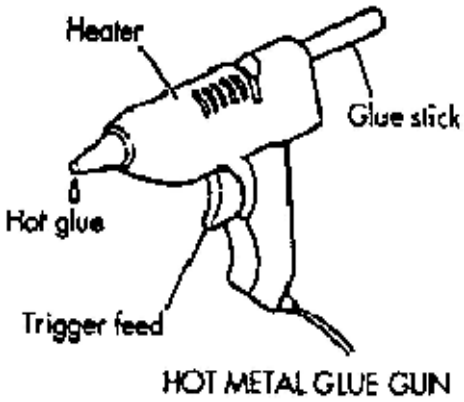
There is no single adhesive that will join all materials, but high-strength adhesive joints between different materials are a feature of many commercial products. Adhesive tapes are now used commonly in aircraft and vehicles to join parts together. The following adhesives can give good results in school providing that the surfaces coming together are clean and the surface area of the join is large.

Tape adhesive

Widely available double-sided adhesive tape is a thin plastic film covered on each side with adhesive. More specialised tape adhesives consist of a thick adhesive film on a waxed backing strip. Tapes can be used where there is a large surface area and where the surfaces are very smooth as in metal to plastics.

Hot-melt glue

Hot-melt glue is a plastics material which is passed through a heated chamber in a hot-melt glue gun. It comes out of the glue gun nozzle with the consistency of hot sticky treacle but solidifies very quickly. It will glue wood, metal and plastics to each other but can be messy and is often not permanent. If it chills on cold metal it does not adhere well. Hot-melt glue guns must only be used under supervision.



Epoxy resin

This adhesive is mixed together from two parts and is commonly available as Araldite. It will bond metal, wood and plastics (with exceptions such as polythene). It is usually not permanent unless the joint has a large surface area.

Note:
Adhesive bonding of different materials is more likely to be successful in industry because special techniques are used to prepare the surfaces prior to joining.