A serrated wheel is connected to one end of the brass shaft. A special alloy solder that melts at a very specific temperature keeps the brass shaft mechanically connected to the brass tube (Figure 4–3). The serrated wheel keeps a set of spring-loaded contacts closed (Figure 4–4). An electric heater is placed around or close to the brass tube. The heater is connected in series with the motor. Motor current causes the heater to produce heat. If the current is great enough for a long enough period of time, the solder melts and permits the brass shaft to turn inside the tube, causing the contact to open. The fact that time must elapse before the solder can become hot enough to melt provides the delay for this overload relay. A large overload causes the solder to melt faster and causes the contacts to open quicker than a smaller amount of overload current.

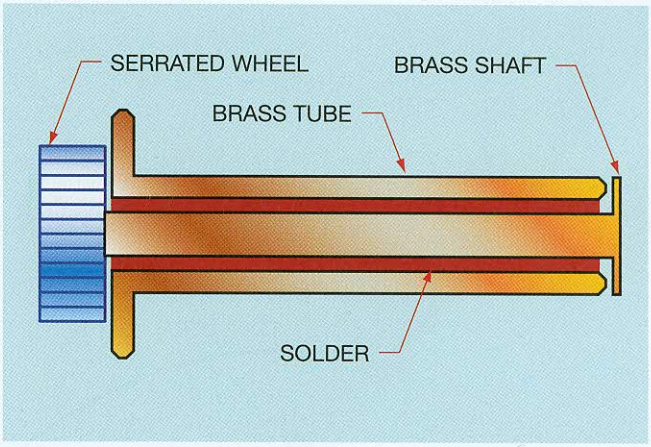


Figure 4–3 Construction of a typical solder pot overload.

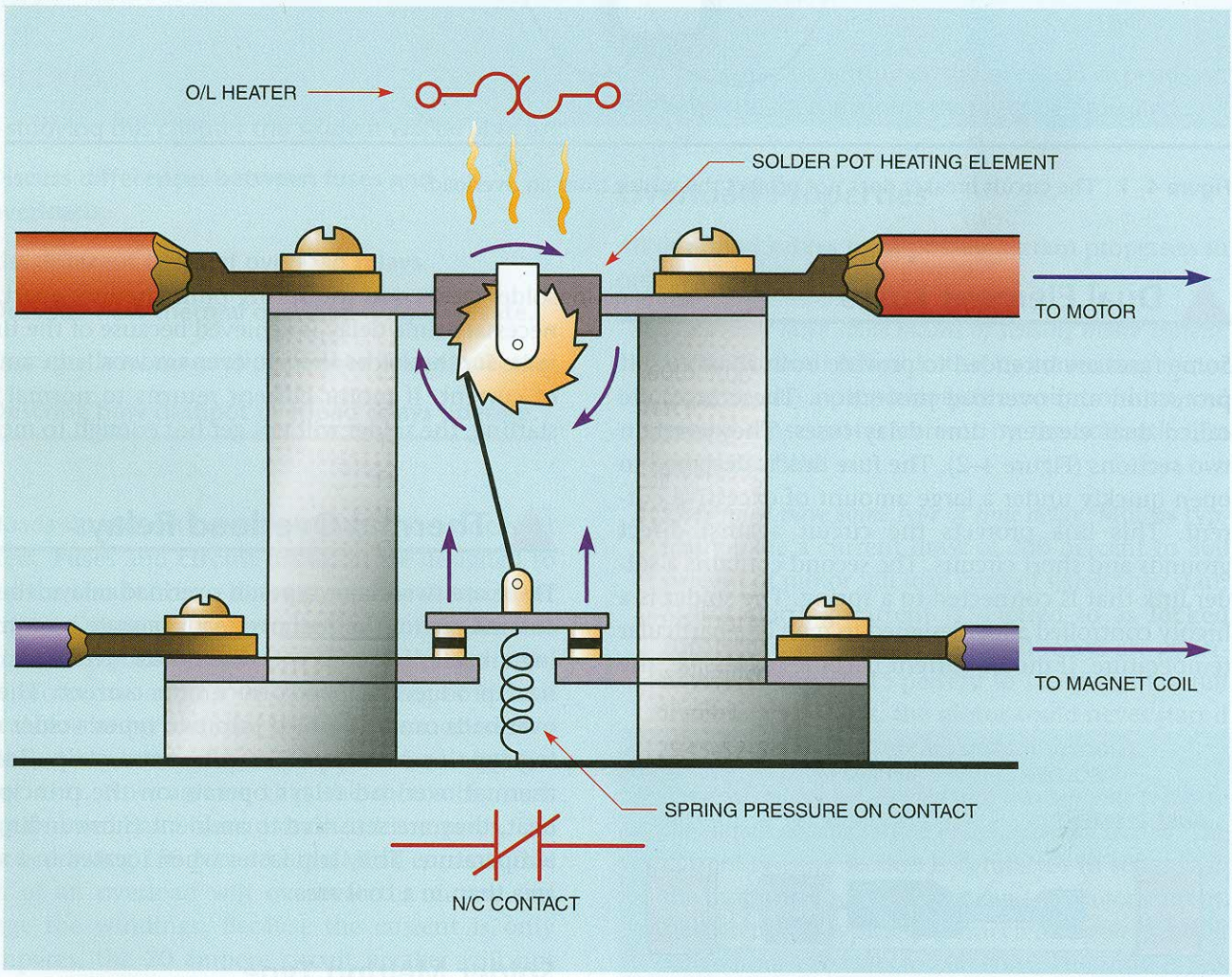
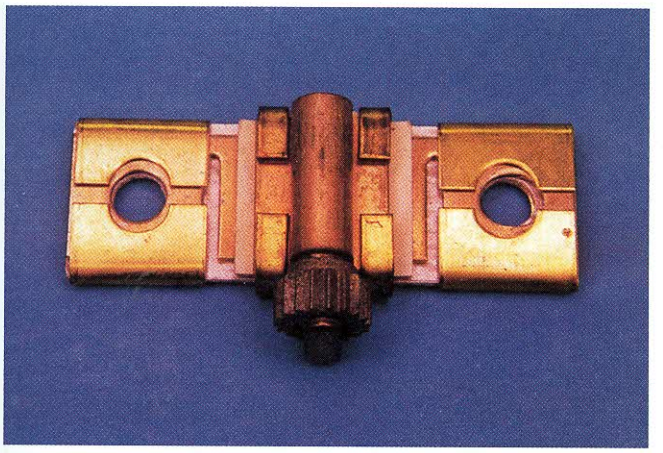


Figure 4–4 Melting alloy thermal overload relay. Spring pushes contact open as heat melts alloy allowing ratchet wheel to turn freely. Note electrical symbols for heater and normally closed contact.



Figures 4–5A Melting alloy type overload heaters.

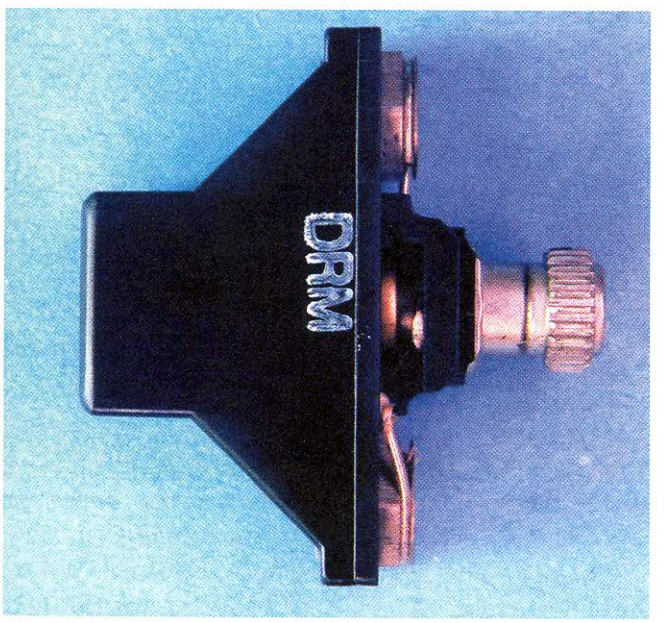


Figure 4–5B Typical melting alloy type overload relay.

Manufacturers construct overload heaters differently, but all work on the same principle. Two different types of melting alloy heater assemblies are shown in Figures 4–5 A and B. A typical melting alloy type overload relay is shown in Figure 4–6. After the overload relay has tripped, it is necessary to allow the relay to cool for 2 or 3 minutes before it can be reset. This cool-down time is necessary to permit the solder to become hard again after it has melted.

The current setting can be changed by changing the heater. Manufacturers provide charts that indicate what size heater should be installed for different

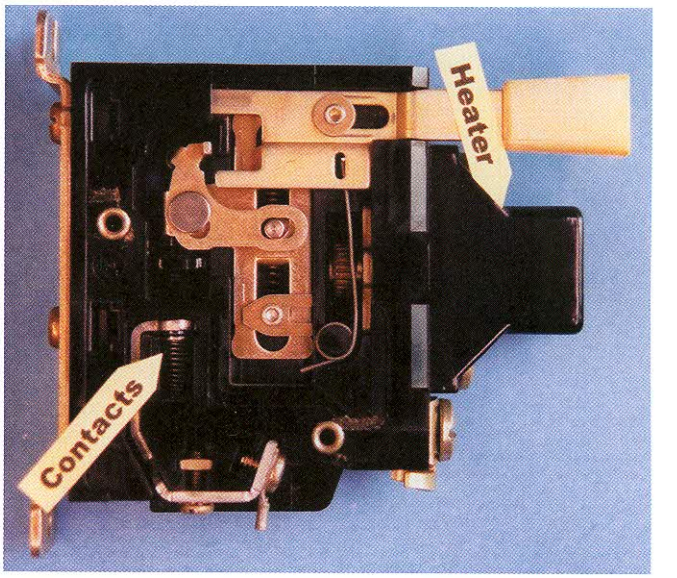


Figure 4–6 Typical melting alloy type overload relay.

amounts of motor current. It is necessary to use the chart that corresponds to the particular type of overload relay. Not all charts present the information in the same manner. Be sure to read the instructions contained with the chart when selecting heater sizes. A typical overload heater chart is shown in Figure 4–7.

Bimetal Strip Overload Relay

The second type of thermal overload relay is the bimetal strip overload. Like the melting alloy type, it operates on the principle of converting motor current into a proportionate amount of heat. The difference is that the heat causes a bimetal strip to bend or warp. A bimetal strip is made by bonding together two different types of metal that expand at different rates (Figure 4–8). Because the metals expand at different rates, the strip bends or warps with a change of temperature (Figure 4–9). The amount of warp is determined by:

1. The type of metals used to construct the bimetal strip.
2. The difference in temperature between the two ends of the strip.
3. The length of the strip.

The overload heater heats the bimetal strip when motor current flows through it. The heat causes the