

elements an automatic control panel, a thermostat, and a master hand switch. All heaters should be designed with a safety thermal trip wired in series with the magnet coil of the control panel and with the hand switch and thermostat. A typical wiring diagram is shown in Fig. 6. This applies to a single phase power supply, but for 3 phase the only difference is to have a 3 pole panel and a heater arrangement for 3 phase connection.

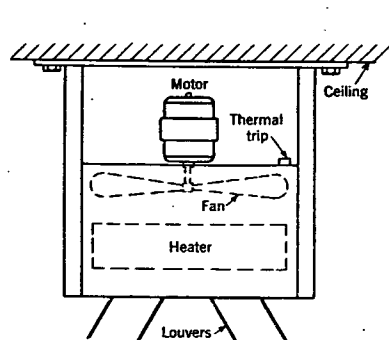


FIG. 3. CEILING MOUNTED UNIT HEATER

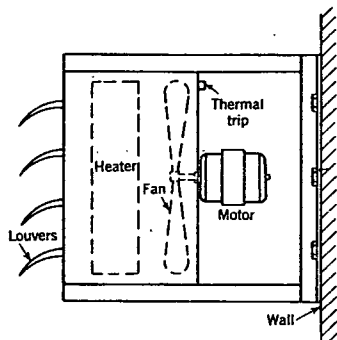


FIG. 4. WALL MOUNTED UNIT HEATER

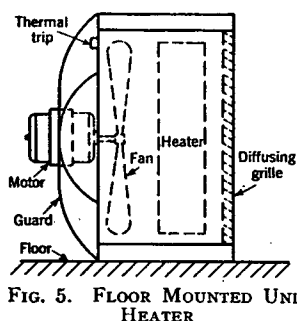


FIG. 5. FLOOR MOUNTED UNIT HEATER

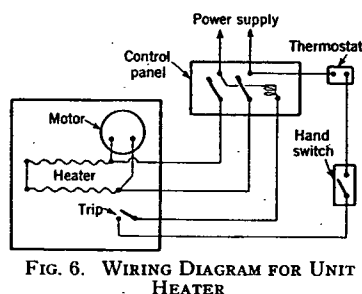


FIG. 6. WIRING DIAGRAM FOR UNIT HEATER

Portable unit heaters are useful for temporary work, such as drying out damp rooms, or for warming rooms during construction.

CENTRAL FAN HEATING

Electric heating elements can be used for the prime source of heat in a central fan electric heating system or in the heating phase of a complete air conditioning system. They can be used in the same manner as steam served heating units for tempering, preheating or reheating the air at the main supply fan location and as booster heaters at the delivery terminals of the duct system. In the humidification phase of air conditioning electric heating elements can be used to provide moisture by the evapori-

zation of water, or for controlling air washer dew-point temperatures when mounted as preheating units on the intake side of the air washer. See Chapter 21.

In coordinating the input of heat energy and the volume of air circulation, a basic difference between electric heating and steam heating enters into the problem. Steam is approximately a constant-temperature source of heat for any given pressure as a change in air volume flowing over steam coils does not greatly affect the temperatures of the delivered air. The amount of steam condensed (heat input) varies in proportion to the air volume, but the surface temperature of the steam coils remains about the same. Electric heat is quite different, having a constant input of energy. If the volume of air flow over electric heating elements is changed, and no change is made in the electrical power connections, there will be a corresponding change in the temperature of the air delivered.

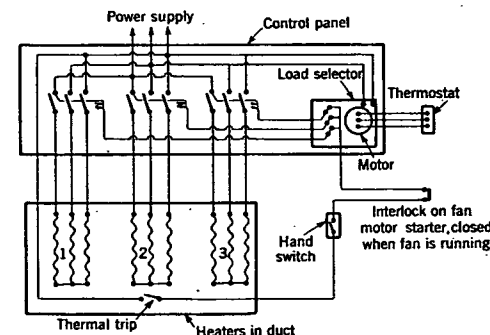


FIG. 7. WIRING DIAGRAM OF A MODULATING CONTROL FOR A FAN SYSTEM

This occurs because the electrical energy input remains constant and the surface temperature of the heating elements will vary as is necessary to force the air to accept all the heat. With electric heat the total heat is constant unless some compensating action is performed by control. Automatic modulation to vary the electrical heat input and synchronize it properly with the air flow has been successfully applied to central fan systems. Electric booster heaters are often useful in balancing a system in which the air has been heated with steam coils.

A typical wiring diagram of an automatic modulating system for central fan heating is indicated in Fig. 7.

ELECTRIC STEAM HEATING

Electric steam heating differs from fuel heating only in the use of *electric boilers* to generate steam. Electric steam boilers are entirely automatic and are well adapted to intermittent operation. Small electric boilers usually have heating elements of the enclosed metal resistor type immersed in the water. Boilers of this construction may be used on either direct or alternating current since the heat is delivered to the water by