

apparatus; or the actuator may be a diaphragm, bellows, or tube filled with a volatile liquid (Fig. 2) in such way that expansion and contraction with changes in temperature will operate the controlled apparatus by a direct mechanical, electric, or pneumatic connection.

A *room or wall thermostat* in its simplest form contains a single temperature-sensitive element which is so set that it maintains, by actuating the controlled system, a single temperature. A variation of this is the *two-temperature* or *dual thermostat* having two temperature-sensitive elements, one of which is set for a higher temperature than the other. Such a thermostat is used on day-night systems where the night temperature

enclosed in a tube to keep it from direct contact with the liquid. They are used in pipes, vats, and tanks, and are called *immersion thermostats*.

Sometimes *surface thermostats* are used in place of duct or immersion thermostats. These devices, so constructed as to respond to changes in temperature of the surface of the duct or vessel containing a fluid, are clamped or screwed to such surfaces in a manner which will provide as rapid as possible heat transfer between the surface and the sensitive element.

Other forms of thermostats are available for specialized purposes, but those described previously are the ones in general use for heating, ventilating and air conditioning systems.

Apparatus Sensitive to Relative Humidity

Devices which are responsive to changes in the relative humidity of the surrounding air, and which will motivate equipment to compensate for the changes, are called *humidistats* or *hygrostats*. These may vary considerably in their sensitive elements, but they all operate through connecting equipment which automatically causes humidifying apparatus to supply more or less moisture as required. Some of the more complicated ones contain essentially two thermostats, one working on a dry-bulb temperature and the other on a wet-bulb temperature; by proper interconnection of the parts they operate to maintain a definite relation between these two temperatures. Other devices use elements, directly sensitive to humidity, made of special wooden blocks, human hair, fiber, membranes, or strips of prepared paper. Hygrostats are available for use with both electric and pneumatic control systems.

Apparatus Which Operates Valves

Apparatus which is so mechanically or electrically equipped that it will open and close valves, and possibly give them intermediate positions in any pipe line of a heating, ventilating, or air conditioning system, is termed a *valve operator*. The function of a valve operator is, essentially, to move the plunger of a valve in a manner required by its type and construction. For instance, in a single-seat valve, the disc is moved against the seat and held there with sufficient pressure to prevent flow. A three-way valve, however, requires a valve operator that will place the double disc, as required, between the two seats. Each type of valve has special characteristics to which a valve operator must be adapted.

When a valve is used in shut-off service the valve operator simply opens the valve or closes it completely, as required. When the valve is to provide throttling service, a different type of valve operator is used so that the valve may be held at any intermediate position between open and closed. Valve operators use as their power source either compressed air (pneumatic system), electricity (motor-driven type or solenoid type), or a volatile liquid (direct-connected type).

Apparatus Which Operates Dampers

Apparatus which is so mechanically or electrically equipped as to open and close dampers, and possibly give them intermediate positions, in accordance with the purposes of the system using the dampers is termed

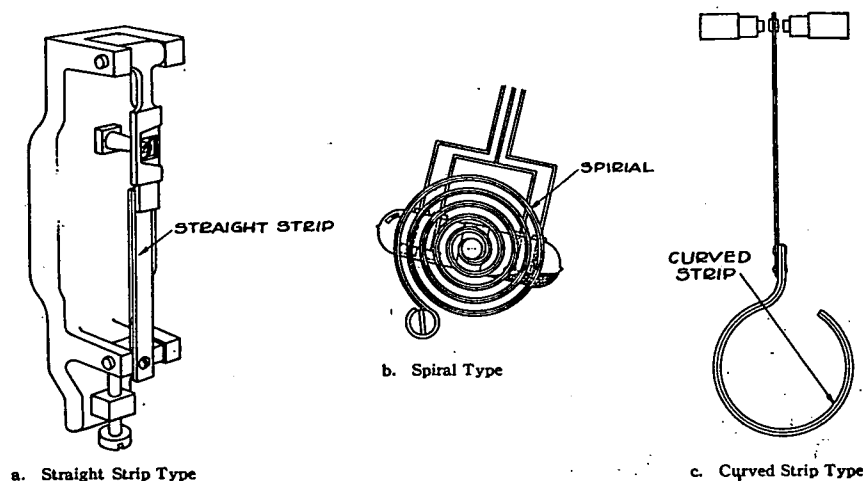


FIG. 1. TYPICAL BI-METALLIC THERMOSTATIC ELEMENTS

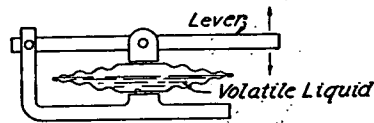


FIG. 2. DIAPHRAGM TYPE THERMOSTAT

is to be lower than that maintained during the daytime hours. Switching the control from one element to the other is accomplished by an external or an internal switch, which can be operated manually or by a time device.

Duct type thermostats are used in systems where the equipment must respond to changes in the temperature of the air passing through a duct. In their usual form, these thermostats are so constructed that their switching mechanism is outside the duct, while the temperature-sensitive element projects inside into the air stream.

Thermostats which operate in liquids have the same general construction as duct thermostats except that the sensitive element is usually