desired moisture content. Proportioning control of the water and two-position control of the steam is recommended to maintain constant temperature.

2. Control by varying the solution temperature so that the moisture content of the discharge air remains constant regardless of load variation. Basically, this control is similar to the constant solution temperature control with the addition of a hygrostat or wetbulb controller controlling the water valve from space conditions. In order to secure a constant discharge drybulb temperature, a coil is provided with proportioning valve controlled by a proportioning thermostat in the unit discharge.

CONTROL FOR CENTRAL FAN SYSTEMS

Automatic temperature control for central fan heating, cooling, ventilating and air conditioning systems involves the proper application of various types of controlling instruments and associated regulators such as valves, dampers and damper operators, relays and other auxiliary equipment

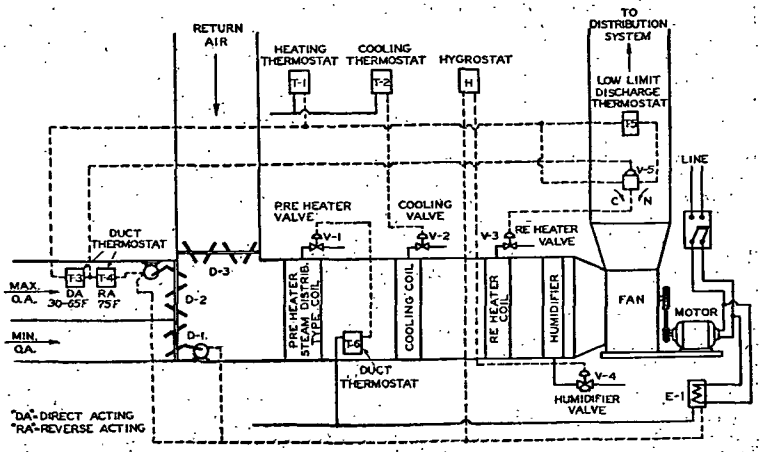

FIG. 1. CONTROL DIAGRAM FOR YEAR 'ROUND AIR CONDITIONING SYSTEM

which are described in earlier sections of this chapter. In central fan systems the conditions required dictate the type of built-up control system to be used. Otherwise, some arrangement of available *package* equipment probably would be used. For that reason, it is impossible to state in detail the control apparatus which will be required in even the most representative applications.

In general, in so far as automatic temperature and humidity control equipment is concerned, central fan systems may be divided into certain broad classifications, as follows:

1. Heating
2. Humidifying
3. Ventilating and Atmospheric Cooling
4. Cooling and dehumidifying
5. Control of Zone Temperatures
6. Year-round air conditioning with automatic change-over
7. Constant temperature and humidity

The apparatus which enters into the automatic maintenance of temperatures and humidities for central fan systems which are designed to produce each of the effects listed in items 1 to 7, is indicated in the following paragraphs:

1. In *heating control*, there are three considerations to be borne in mind: (1) to control space temperature, (2) to prevent drafts, (3) to guard against freezing. Usually in central fan systems, suitable thermostats operate valves in the steam or hot water supply to heating coils or face dampers across such coils and bypass dampers around them. If the heating coils are sub-divided into two or more groups, such as preheaters and reheaters, a duct thermostat following the preheaters, and located in the entrance to the chamber between the groups of coils, controls the preheaters, but it is essential that the preheater coils be of the steam distributing type. Similarly, a duct thermostat in the fan discharge, where any effect of stratification has been dissipated, operates the valves and dampers associated with the reheaters. In some cases, where there is more than one bank of preheaters, the practice is to place

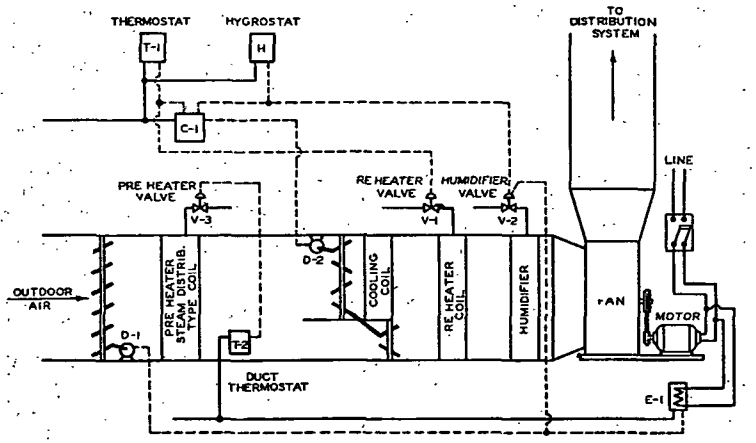

FIG. 2. CONSTANT TEMPERATURE AND HUMIDITY CONTROL FOR YEAR 'ROUND SYSTEM USING 100 PER CENT OUTDOOR AIR

a freeze protection thermostat in the outdoor air intake to control the valve on the first bank of heaters, which is designed so that the heat-rise through it will not cause overheating. A room thermostat in the heated space may serve as the controlling instrument, with a thermostat in the fan discharge serving to prevent the delivery of air at a temperature which might cause drafts. If desired, similar action may be obtained from a thermostat in the return air connection. When there is only one heating coil, a limit thermostat in the fan discharge accomplishes the control, in conjunction with a thermostat in the heated space or in the return air.

2. *Humidity control* may be obtained by means of a hygrostat, usually located in the conditioned space or in the return air. Such controlling instruments may operate steam supply valves to humidifiers, mixing valves to control the temperature of the water to sprays, or a system of dampers to regulate the quantity of air passed through the humidifying chamber or bypassed around it. The control of humidity according to dew-point temperature is sometimes accomplished by means of a thermostat in the outlet of the humidifying chamber. However, the setting of the dew-point thermostat may have to be changed as the humidity in the conditioned space varies.

3. The *control of ventilating* and *cooling* by the use of outdoor air consists of an arrangement of dampers, usually determining the relative quantities of outdoor air and return air which are to be delivered to the conditioned space. The damper positions are regulated by proper types of thermostats, located in the minimum outdoor