discharge temperature from falling below a minimum point. Thermostat T_3 may also be arranged to act as a low limit during the cooling cycle if the conditions of the installation make it desirable.

Thermostat T_4 installed in the inlet to the conditioner controls damper motor M_1 which in turn regulates the relative quantity of outdoor and return air admitted to the system. This damper action may be provided with a minimum setting of the outdoor air damper so that a minimum fixed requirement of outdoor air will be insured for ventilating purposes.

Humidity control H_3 measures the outdoor air relative humidity and prevents the outdoor air damper from opening beyond its minimum

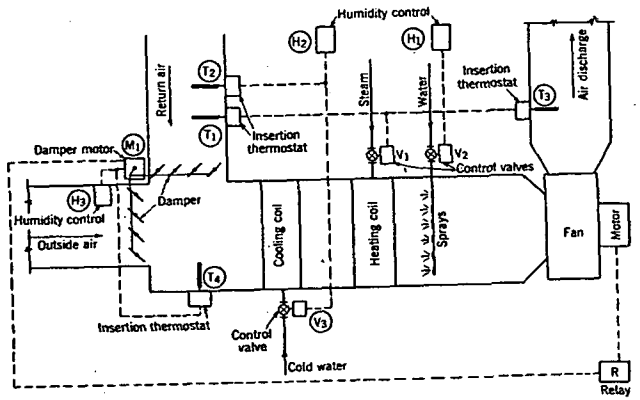

FIG. 6. DIAGRAM OF COMPLETE AUTOMATIC CONTROL ALL YEAR AIR CONDITIONING SYSTEM

position whenever the outdoor air relative humidity exceeds a predetermined point.

When the fan is stopped, relay R positions damper motor M_1 so as to close the outdoor air damper.

Thermostat T_1 must be set at a lower temperature than thermostat T_2 in order that each may assume command upon the fall or rise respectively of the temperature of the return air. As an example, T_1 might be set at 72 F and T_2 at 76 F. When the temperature of the return air approaches 72 F, it would indicate that a change had taken place from the cooling to the heating cycle and when the return air approaches 76 F, it would indicate that a change has taken place from the heating to the cooling cycle.

UNIT SYSTEMS

A unit system provides for the same functions as a central fan system except that the actual conditioning is usually done within the space being conditioned instead of at some central location outside of the space. The

automatic control problems, therefore, become exactly the same as for central fan conditioning systems except that compactness, ease of installation and control cost often assume somewhat more importance.

Because of the usual segregated location of unit equipment throughout a building and its consequent lack of competent supervision, complete automatic control is essential to its satisfactory operation.

Unit Heaters

In its simplest form, unit heater control consists of a room thermostat the function of which is to start the unit heater motor when heat is required and shut it off when the demand is satisfied. With this limited control, it is possible in some instances that, with no steam available at the heater, the operation of the fan at the command of the thermostat would cause objectionable drafts. To prevent this occurrence, limit controls are available which will prevent the operation of the fan at the command of the room thermostat except when steam is available, as determined by the temperature of the steam or return pipe or the pressure of the steam supply.

In some cases it is desirable to operate the unit heaters continuously for circulation of air where, due to the type of installation, cold drafts will not result therefrom. In such instances the room thermostat regulates the supply of steam to the unit through a control valve in the steam supply line and the unit heater motor operation is manually controlled.

Where several unit heaters serve a limited area, they may be grouped for purposes of automatic control, and several heaters placed in operation at the command of one thermostat. By properly grouping the units which will operate together, the benefit of zone control can often be obtained with a minimum of control equipment. Where such group operation is utilized, the thermostat and limit control usually function through a relay, as the combined load of the several motors may exceed the current capacity of the thermostatic control device.

Cooling Units

The recommended form of temperature control for the cooling unit contemplates the continuous operation of the cooling unit fan with automatic two position regulation of the compressor or cooling coil as determined by a room thermostat or by a temperature controller measuring the temperature of the return air as it is taken into the cooling unit. Such operation insures continuous circulation of the air in the room served by the cooling unit, and in addition to providing the cooling effect due to the moving air, this circulation overcomes the tendency of air to stratify. Thus, as this temperature tends to rise, the temperature controller will open the valve supplying either refrigerant or cold water to the cooling unit coil or start the compressor.

Cooling units may also be controlled by arranging the room thermostat to start and stop the fan motor or by a combination of motor and refrigerant control.

A humidity controller may be used in conjunction with the thermostat as a high limit control to permit the cooling and dehumidifying of the air