

series limiting resistors are required if the transformer winding resistance and reactance are too low to limit the current to a suitable value.

High-Vacuum Rectifiers

High-vacuum rectifiers depend entirely upon the thermionic emission from a heated filament and are characterized by a relatively high internal resistance. For this reason, their application usually is limited to low power, although there are a few types designed for medium and high power in cases where the relatively high internal voltage drop may be tolerated. This high internal resistance make them less susceptible to damage from temporary overload and they are free from the bothersome electrical noise sometimes associated with other types of rectifiers.

Some rectifiers of the high-vacuum full-wave type in the so-called receiver-tube class will handle up to 275 ma. at 400 to 500 volts d.c. output. Those in the higher-power class can be used to handle up to 500 ma. at 2000 volts d.c. in full-wave circuits. Most low-power high-vacuum rectifiers are produced in the full-wave type, while those for greater power are invariably of the half-wave type, two tubes being required for a full-wave rectifier circuit. A few of the lower-voltage types have indirectly heated cathodes, but are limited in heater-to-cathode voltage rating.

Mercury-Vapor Rectifiers

The voltage drop through a mercury-vapor rectifier is practically constant regardless of the load current. It ranges from 10 to 15 volts, depending upon the tube type. Rectifiers of this type, however, have a tendency toward a type of oscillation which produces noise in nearby receivers, sometimes difficult to eliminate. R.f. filtering in the primary circuit and at the rectifier plates as well as shielding may be required. As with high-vacuum rectifiers, full-wave types are available in the lower-power ratings only. For higher power, two tubes are required in a full-wave circuit.

Rectifier Ratings

All rectifiers are subject to limitations as to breakdown voltage and current-handling capability. Some tube types are rated in terms of the maximum r.m.s. voltage that should be applied to the rectifier plate. This is sometimes dependent on whether a choke- or capacitive-input filter is used. Others, particularly mercury-vapor and semiconductor types, are rated according to maximum *peak inverse voltage* (p.i.v.)—the peak voltage between anode and cathode while the rectifier is not conducting.

Rectifiers are rated also as to maximum d.c. load current, and some may carry peak-current ratings in addition. To assure normal life, all ratings should be carefully observed.

Operation of Hot-Cathode Rectifiers

In operating rectifiers requiring filament or cathode heating, as shown in Fig. 12-3, care should be taken to provide the correct filament voltage at

the tube terminals. Low filament voltage can cause excessive voltage drop in high-vacuum rectifiers and a considerable reduction in the inverse peak-voltage rating of a mercury-vapor tube. Filament connections to the rectifier socket should be firmly soldered, particularly in the case of the larger mercury-vapor tubes whose filaments operate at low voltage and high current. The socket should be selected with care, not only as to contact surface but also as to insulation, since the filament usually is at full output voltage to ground. Bakelite sockets will serve at voltages up to 500 or so, but ceramic sockets, well spaced from the chassis, always should be used at the

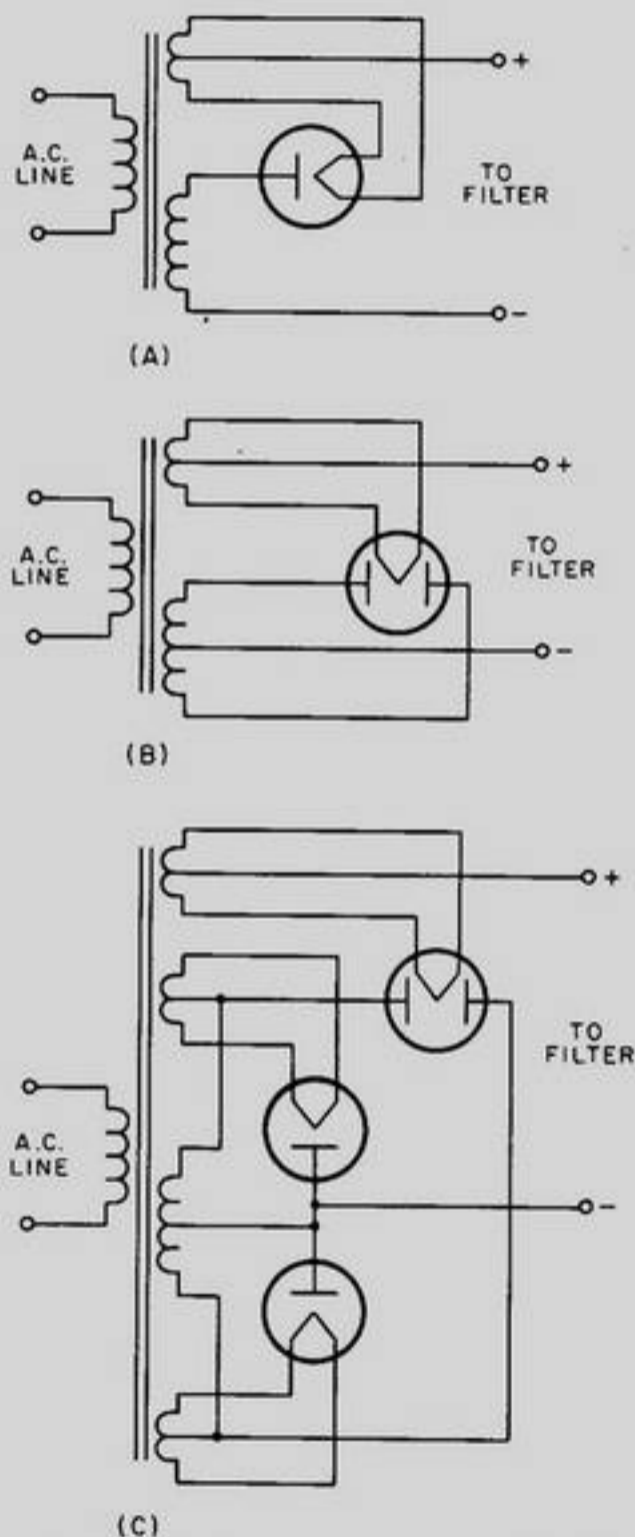


Fig. 12-3—The fundamental rectifier circuits of Fig. 12-1 redrawn for use with hot-cathode rectifiers. In many applications the filament transformer would be separate from the high-voltage transformer, and in many applications the full-wave rectifier in a single envelope would be replaced by two half-wave rectifiers. Low-voltage bridge circuits sometimes use rectifiers with indirectly-heated cathodes that have high heater-to-cathode voltage ratings; this reduces the number of cathode-heating windings required for the power supply.