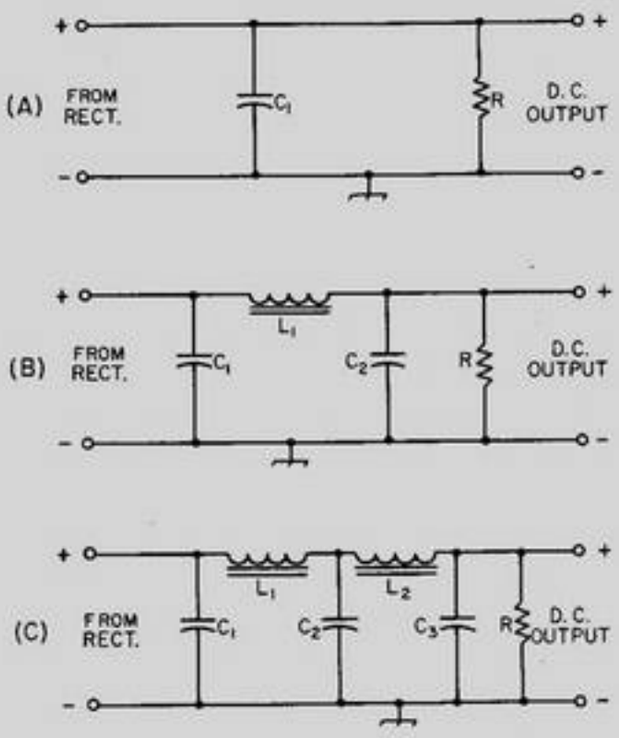

Fig. 12-5.—Capacitive-input filter circuits. A—Simple capacitive. B—Single-section. C—Double-section.

to be held to a low level. The dynamic regulation of a power supply is improved by increasing the value of the output capacitor.

When essentially constant voltage, regardless of current variation is required (for stabilizing an oscillator, for example), special voltage-regulating circuits described elsewhere in this chapter are used.

Bleeder

A bleeder resistor is a resistance connected across the output terminals of the power supply. Its functions are to discharge the filter capacitors as a safety measure when the power is turned off and to improve voltage regulation by providing a minimum load resistance. When voltage regulation is not of importance, the resistance may be as high as 100 ohms per volt. The resistance value to be used for voltage-regulating purposes is discussed in later sections. From the consideration of safety, the power rating of the resistor should be as conservative as possible, since a burned-out bleeder resistor is more dangerous than none at all!

Ripple Frequency and Voltage

The pulsations in the output of the rectifier can be considered to be the resultant of an alternating current superimposed upon a steady direct current. From this viewpoint, the filter may be considered to consist of shunting capacitors which short-circuit the a.c. component while not interfering with the flow of the d.c. component, and series chokes which pass d.c. readily but which impede the flow of the a.c. component.

The alternating component is called the ripple. The effectiveness of the filter can be expressed in terms of per cent ripple, which is the ratio of the r.m.s. value of the ripple to the d.c. value in terms of percentage. For c.w. transmitters, the output ripple from the power supply should not exceed 5 per cent. The ripple in the output of supplies for voice transmitters should not exceed 1 per cent. Class B modulators require a ripple reduction to about 0.25%, while v.f.o.'s, high-gain speech amplifiers, and receivers may require a reduction in ripple to 0.01%.

Ripple frequency is the frequency of the pulsations in the rectifier output wave—the number of pulsations per second. The frequency of the ripple with half-wave rectifiers is the same as the frequency of the line supply—60 cycles with 60-cycle supply. Since the output pulses are doubled with a full-wave rectifier, the ripple frequency is doubled—to 120 cycles with 60-cycle supply.

The amount of filtering (values of inductance and capacitance) required to give adequate smoothing depends upon the ripple frequency, more filtering being required as the ripple frequency is lowered.

Transformer Winding Resistance

The effective transformer winding resistance is given by

$$R_{tr} = N^2 R_{pri} + R_{sec}$$

where N is the transformer turns ratio, primary to secondary (voltage ratio at no load), and R_{pri} and R_{sec} are the primary and secondary resistances respectively. In the case of a full-wave rectifier circuit, N is the ratio of primary to

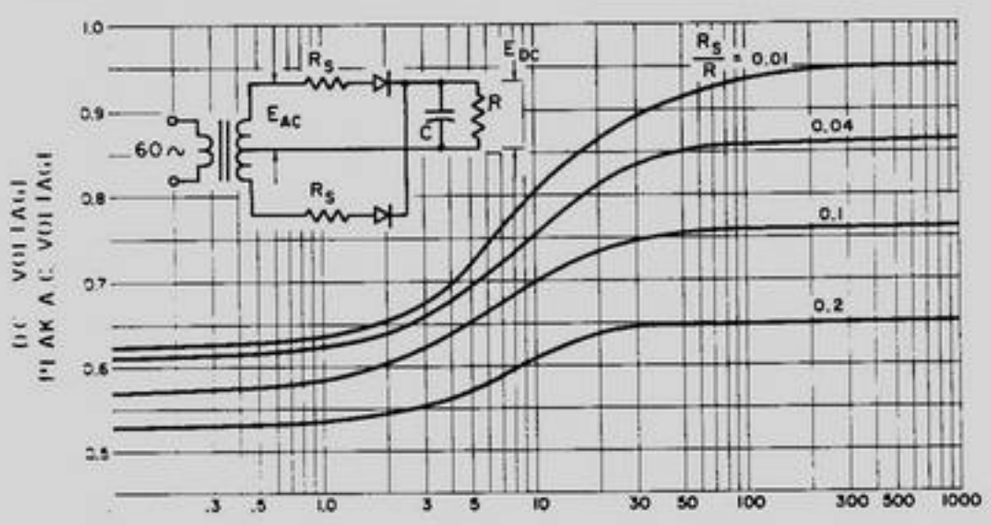

Fig. 12-6—D.c. output voltages from a full-wave rectifier circuit as a function of the filter capacitance and load resistance. R_s includes transformer winding resistance and rectifier forward resistance. For the ratio R_s/R, both resistances are in ohms; for the RC product, R is in thousands of ohms.