

Fig. 12-9—Ripple-reduction factor for various values of L and C in filter section. Output ripple = input ripple \times ripple factor.

tion factor from Fig. 12-9 will be applied to the 0.9% from the preceding section; $0.9 \times 0.09 = 0.081\%$ (if the second section has the same LC product as the first).

CHOKE-INPUT FILTERS

With thermionic rectifiers better voltage regulation results when a choke-input filter, as shown in Fig. 12-10, is used. Choke input permits better utilization of the thermionic rectifier, since a higher load current usually can be drawn without exceeding the peak current rating of the rectifier.

Minimum Choke Inductance

A choke-input filter will tend to act as a capacitive-input filter unless the input choke has at least a certain minimum value of inductance called the **critical value**. This critical value is given by

$$L_{crit} \text{ (henries)} = \frac{E \text{ (volts)}}{I \text{ (ma.)}}$$

where E is the output voltage of the supply, and

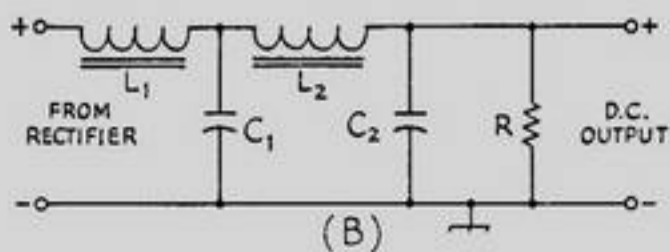
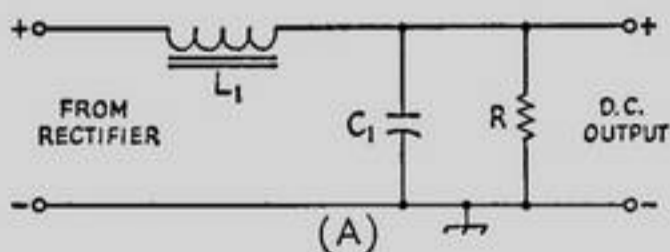


Fig. 12-10—Choke-input filter circuits. A—Single-section. B—Double-section.

I is the current being drawn through the filter.

If the choke has at least the critical value, the output voltage will be limited to the average value of the rectified wave at the input to the choke (see Fig. 12-1) when the current drawn from the supply is small. This is in contrast to the capacitive-input filter in which the output voltage tends to soar toward the peak value of the rectified wave at light loads. Also, if the input choke has at least the critical value, the rectifier peak current will be limited to about twice the d.c. current drawn from the supply. Most thermionic rectifiers have peak-current ratings of three to four times their maximum d.c. output-current ratings. Therefore, with an input choke of at least critical inductance, current up to the maximum output-current rating of the thermionic rectifier may be drawn from the supply without exceeding the peak-current rating of the rectifier.

Minimum-Load—Bleeder Resistance

From the formula above for critical inductance, it is obvious that if no current is drawn from the supply, the critical inductance will be infinite. So that a practical value of inductance may be used, some current must be drawn from the supply at all times the supply is in use. From the formula we find that this minimum value of current is

$$I \text{ (ma.)} = \frac{E \text{ (volts)}}{L_{crit}}$$

Thus, if the choke has an inductance of 20 h., and the output voltage is 2000, the minimum load current should be 100 ma. This load may be provided, for example, by transmitter stages that draw current continuously (stages that are not keyed). However, in the majority of cases it will be most convenient to adjust the bleeder resistance so that the bleeder will draw the required minimum current. In the above example, the bleeder resistance should be $2000/0.1 = 20,000$ ohms.

From the formula for critical inductance, it is seen that when more current is drawn from the supply, the critical inductance becomes less. Thus, as an example, when the total current, including the 100 ma. drawn by the bleeder, rises to 400 ma., the choke need have an inductance of only 5 h. to maintain the critical value. This is fortunate, because chokes having the required inductance for the bleeder load only and that will maintain this value of inductance for much larger currents are very expensive.

Swinging Chokes

Less costly chokes are available that will maintain at least critical value of inductance over the range of current likely to be drawn from practical supplies. These chokes are called **swinging chokes**. As an example, a swinging choke may have an inductance rating of 5/25 h. and a current rating of 200 ma. If the supply delivers 1000 volts, the minimum load current should be $1000/25 = 40$ ma. When the full load current of 200 ma. is drawn from the supply, the inductance