April 1, 1947. S. FRANKEL 2,418,114

RECTIFIER FILTER SYSTEM

Filed July 16, 1943

Fig. 1.

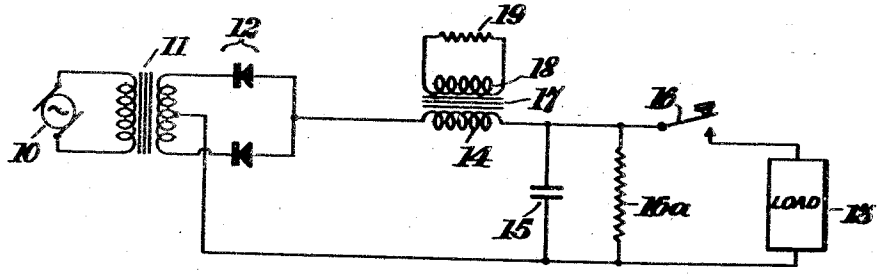
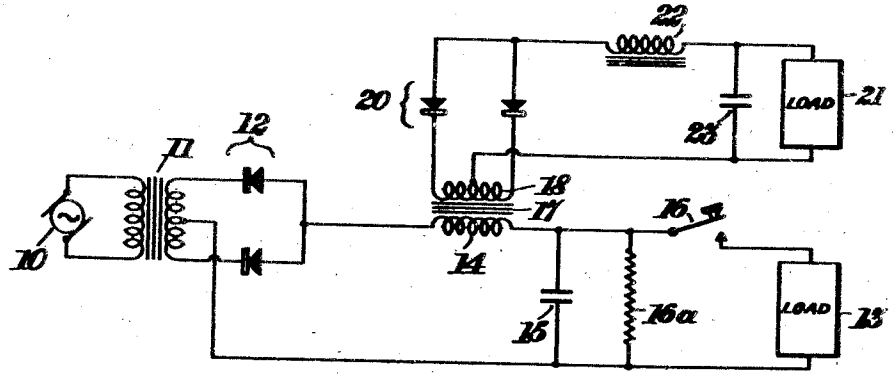



Fig. 2.

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## RECTIFIER FILTER SYSTEM

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4 Claims. (Cl. 175—363)

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This invention relates to rectifier filter systems in which a rectifier is coupled through a filter to a load. In order to obtain good rectifier voltage regulation the filter system must present a high input impedance; and consequently a choke or chokes having a correspondingly high inductance value must be employed. However, when the current drawn from the system changes substantially in a relatively short time, the electrical inertia of the filter inductance seriously affects the shape of the current output curve. This is especially serious in systems in which the filter output is used for telegraphic keying, in voice or television modulation, or in other arrangements in which the power is used in the form of pulses.

The main purpose of the invention is to provide an arrangement in which a rapidly changing current supply may be drawn from a rectifier filter system without serious distortion caused by the inertia of the filter inductance. This is in general accomplished by replacing the usual choke coil with the primary of a transformer whose secondary is shunted by a resistive load that is reflected in the primary and serves as an impedance to all frequency components of the rectifier and filter circuit except the steady direct current component.

A more specific purpose is to provide a system of this type in which the resistance load across the transformer secondary is utilized to obtain useful energy from the system which otherwise would be wasted. A feature of the invention is the utilization of the transformer secondary to supply energy to a second rectifier filter system. Other objects and advantages will appear from the following description, considered in connection with the accompanying drawing, in which,

Fig. 1 is a diagrammatic showing of a rectifier filter system embodying the invention and including a resistance shunted across the transformer secondary; and

Fig. 2 is a diagram of a similar system employing a second rectifier and filter system connected to the transformer secondary.

Alternating current from a suitable source, illustrated diagrammatically as generator 10, is applied through transformer 11 to a full wave rectifier 12 whose output is connected across a load 13 through a suitable filter system illustrated in its simplest form as including inductance 14 in series and capacitance 15 in shunt. The load is indicated as being of the pulsating type by including key 16 in series in the circuit, with a bleeder resistor 16a connected across capacitor 15. With this arrangement the load 13 will normally be a telegraph system; but of course the showing is purely diagrammatic and it is anticipated that the usual types of filter systems and load connections will be used.

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The inductance 14 constitutes the primary of transformer 17 whose secondary 18 is shunted by a suitable resistance, illustrated as consisting of resistor 19. It will be apparent that the resistance of said resistor will be reflected in the primary 14 and that the electrical inertia of the latter to rapidly changing currents will be that of a resistance rather than of the usual choke inductance.

However, there is a certain loss of electrical power in resistor 19; and an arrangement may be provided which will change this loss into a useful load while obtaining the advantages of employing a shunt secondary resistance. This feature is particularly applicable to conditions which are often encountered, in which another direct current supply of lower voltage that is less critical with respect to pulse loads is required. In an arrangement of this type illustrated in Fig. 2 a second full wave rectifier 20 is connected across the secondary 18 and the output of the latter rectifier is connected across another load 21 through an appropriate filter system illustrated by choke coil 22 and capacitance 23. In this arrangement, since it would ordinarily require both a choke in the main circuit and a transformer to provide the secondary supply, there is not only an improvement in the characteristic of the pulsating load and economy in the utilization of the current across the secondary of transformer 17, but also certain advantages in the required apparatus, since the transformer 17 replaces both a choke coil and a transformer.

While two embodiments of the invention have been illustrated, other modifications may be introduced without departing from the invention as set forth in the claims. For instance, various types of filter circuits may be utilized, and different types of load arrangements can be employed, as will be apparent to those skilled in the art.

What is claimed is:

1. A power supply system comprising a rapidly varying load, a source of alternating current, a rectifier, and a filter system connecting the rectifier and said load comprising a transformer having a primary connected in series as a filtering reactance and a resistive load connected across the secondary of said transformer, said resistive

load comprising a rectifier system having its input terminals connected to said secondary.

2. A rectifier filter system comprising a transformer, a rectifier and a load, said transformer having a primary connected in series as a filtering reactance between the output of said rectifier and said load, and a resistive load across the secondary of the said transformer in which said resistive load comprises a rectifier system having its input terminals connected to said secondary.

3. A rectifier filter system comprising a transformer, a rectifier and a load, said transformer having a primary connected in series as a filtering reactance between the output of said rectifier and said load, and a resistive load across the secondary of the said transformer, a capacitor and a resistor connected in shunt across the said first load, the said resistive load comprising a rectifier system having input terminals connected to said secondary.

4. A rectifier filter system as set forth in claim 2 in which said resistive load comprises a filter system.

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