

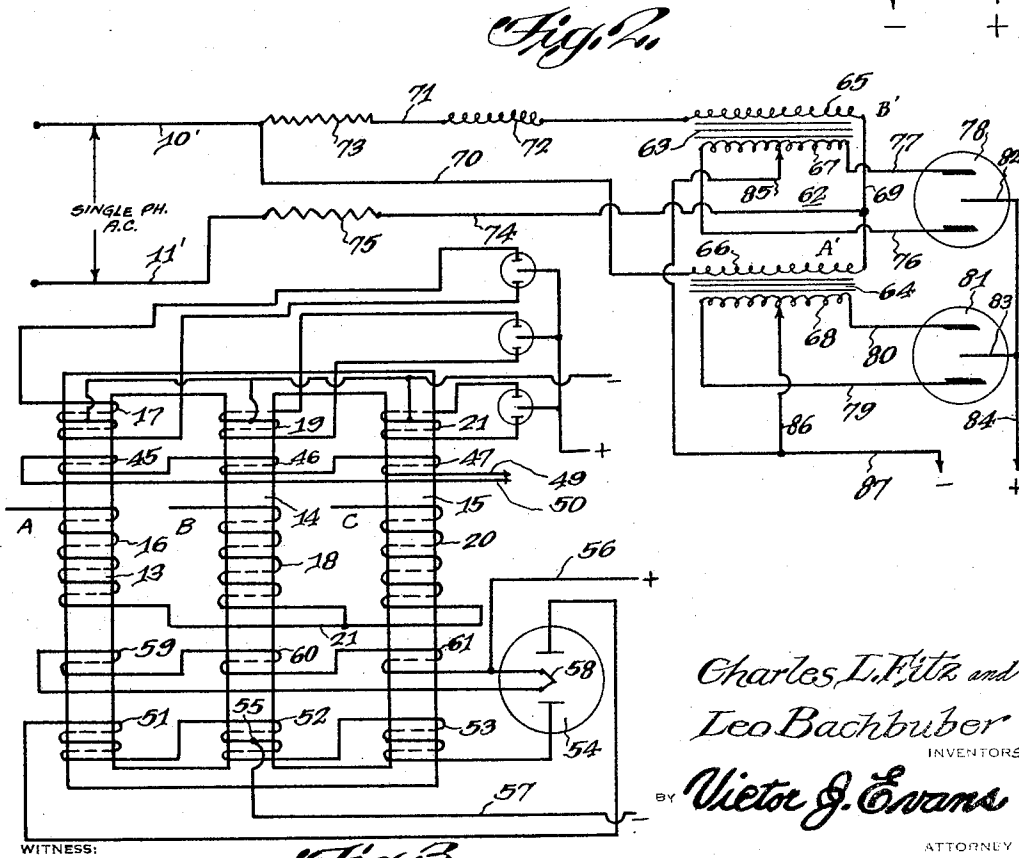
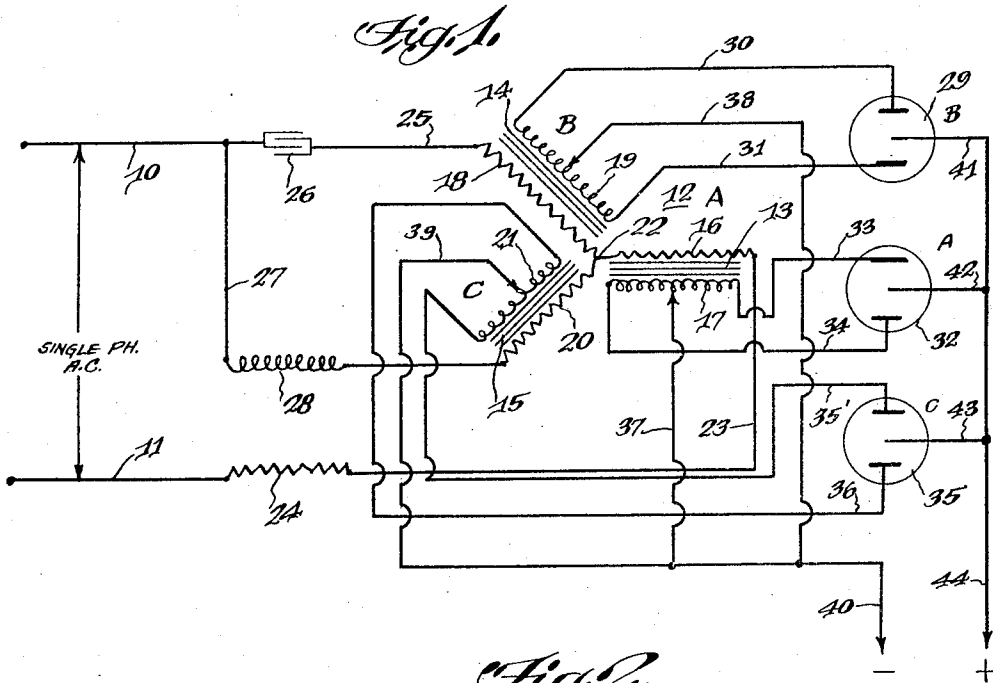
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RECTIFIER

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RECTIFIER

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This invention relates to certain novel improvements in rectifiers and particularly to devices employed to change single phase alternating current into unidirectional current.

The salient object of our invention is to provide a device of this character in which the current of single phase circuit may be directed through a system of circuits arranged to change the phase of the impressed current so as to produce a substantially polyphase output current.

Another object of the invention is to provide a transformer hook-up upon which the output current may be impressed to change the value of the impressed voltage.

A further object of the invention is to so arrange the device that the output current may be led to current rectifiers, preferably of the full wave type, but other improved type may be employed.

A still further object of the invention is to arrange the device in such a manner that a multiplicity of voltages may be supplied by the device.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawing, showing the preferred form of construction and in which:

Fig. 1 is a schematic wiring diagram of one form of our invention as applied to produce a three phase system;

Fig. 2 is a view, similar to Fig. 1, showing the invention as used to produce a two phase system; and

Fig. 3 is a schematic view illustrating one form of construction for the invention as used to produce voltages of different values.

The particular adaption of our invention as shown in the drawing is for use in connection with any of the well-known types of radio receivers and while this is a preferred use it is to be understood that the invention is capable of many other uses, all of which are within the purview of our invention. In the mentioned use of our device; namely, in

connection with radio receivers, it is necessary that independent circuits for supplying voltages of different values be provided; such as, for example, a relatively high voltage for the plate circuits of the receiver, known as the B voltage, and a relatively low voltage for the filament circuits, or the so-called A voltage. Voltages and circuits other than those named are often required and it is to be understood that these may be provided in the manner pointed out hereinafter and that such additional circuits are within the scope of our invention.

As is well known alternating current may be symbolized by the sine wave, which represents two zero potentials and a maximum positive and a maximum negative and this is called a cycle. Polyphase is a term that is applied when a plurality of potentials are impressed in a cycle so as to produce more than the above named varied potentials. Thus in a so-called three phase circuit, a cycle comprises three maximum positives, three maximum negatives, and six zero potentials. The problem of producing uni-direction current from alternating current consists in altering the wave to eliminate or transpose all portions of the wave on one side of the zero line. Full wave rectifiers of the single phase type usually transpose one portion of the wave so as to produce two pulsations in the same direction and also to produce two zero potentials. In polyphase cycles the sine waves are disposed to occur at varied times which are expressed as angles and which are said to lead or lag in respect to a given wave and thus the sine waves intercross. Thus, if in a three phase cycle, one portion of the waves is transposed, the zero potentials may be eliminated and a substantially straight line current may be produced.

With the foregoing in mind and in accordance with the above named objects, we provide the following structure. Referring to Fig. 1 it may be seen that we utilize a single phase alternating current circuit comprising leads 10 and 11 which are connected to any suitable source of power such as an alternator. A transformer structure 12 is provided. The device as depicted in Fig. 1 is

adapted for use as a three phase device. The transformer structure 12 is, in the present instance, star or Y connected but if desired the well-known delta connection may be employed. The transformer structure 12 may be either a polyphase transformer or three single phase transformers, as is understood in the art.

In the present instance the transformer structure 12 includes three cores, 13, 14, and 15. Associated with the core 13 in the well-known manner, is a primary winding 16 and a secondary winding 17 and with core 14 is primary winding 18 and secondary winding 19, while with core 15 is the primary winding 20 and the secondary winding 21. As stated, the transformer structure 12 is star connected and therefore one end of the windings 16, 18, and 20 are interconnected as indicated at 22.

The open end of winding 16 is connected to lead 11 by a conductor 23 in which a resistance 24 is provided. The open end of winding 18 is connected to lead 10 by a conductor 25 in which a condenser 26 is provided. The open end of winding 20 is connected to lead 10 by a conductor 27 in which an inductance 28 is provided.

Assuming the potential passing resistance 24 to be the mid curve in a three phase cycle, or phase A, the potential passing through conductor 25, due to the characteristics of the condenser 26, will lead in phase, with respect to the potential in phase A and thus produce phase B. The potential in conductor 27 will be caused to lag the potential in phase A, due to the characteristics of inductance 28, and thus produce phase C. The values or angle of lead and lag will be controlled by the appurtenance causing the variation. Thus a substantially three phase cycle is produced from single phase. Due to inherent structural difficulties, the curve variation will not be truly three phase, but will be close enough to produce the desired action.

The secondary 19 is connected to the anodes of a rectifying device 29 of approved form by wires 30 and 31. The secondary winding 17 is similarly connected to rectifier 32 by wires 33 and 34 and the secondary winding 21 is connected to a rectifier 35 by wires 35' and 36. A conductor 37 is attached to the midpoint of winding 17, a conductor 38 is attached to the midpoint of winding 19, and a conductor 39 is attached to the midpoint of winding 21. The conductors 37, 38, and 39 are attached to the negative output conductor 40. A conductor 41 is connected to the delivery terminal of rectifier 29, a conductor 42 is connected to the delivery terminal of rectifier 32, and a conductor 43 is connected to the delivery terminal of rectifier 35. The conductors 41, 42, and 43 are connected to the positive output wire 44.

In operation, when the potential in phase B is receding from the crest, the potential

in phase A is ascending, and therefore, when the potential in phase B drops to a predetermined low point the effectiveness therefore will be superseded by the potential in phase A. The same is true between phase A and C and C and B. Therefore the input into wire 44 will be unidirectional and of a substantially constant amount. The negative potential is derived as stated. Thus a substantially direct current is obtained.

The structure just described is one in which but a single voltage is derived from the device. In Fig. 3 various methods of securing different voltages are shown. The above described hook-up is depicted as well as the following.

Secondary windings 45, 46, and 47 are shown in association with cores 13, 14, and 15. One end of winding 45 is connected to one end of winding 46 and the other end of winding 46 is connected to one end of winding 47. The free ends of windings 47 and 45 are connected to output wires 49 and 50 which are directed to a suitable point either for rectification or use. The windings 45, 46, and 47 are obviously connected in series while in the foregoing description the windings were connected in parallel.

Three secondary windings 51, 52, and 53 are associated with the cores 13, 14, and 15 respectively. These windings are connected in series and the ends thereof are connected to a suitable rectifier 54, which, as depicted, is of the filament type. The midpoint of the windings is tapped as at 55 and the negative lead 57 is connected thereto. The positive lead 56 is connected as shown. The filament 58 derives current from the secondary windings 59, 60, and 61. Thus, a plurality of voltages may be derived from the device for use in connection or with radio receivers. It is to be understood that the foregoing connections need not be strictly adhered to for any of the foregoing may be used throughout and the different hook-ups described are shown merely for purposes of illustration.

The foregoing description relates to three phase connections but a two phase cycle may also be used as shown in Fig. 2. While this will not give a current as smooth and unvarying as three phase, it will obviously be better than one phase.

In Fig. 2 the line wires 10' and 11' are connected to suitable source of single phase alternating current. A transformer structure 62 is provided which includes two transformers having cores 63 and 64. Primary windings 65 and 66 are associated with the cores 63 and 64 in the well known manner as are secondary windings 67 and 68. One end of each of the primary windings 65 and 66 are connected as at 69.

A lead 70 connects the free end of winding 66 to wire 10'. A conductor 71 connects the free end of winding 65 to wire 10' and

an inductance 72 and a resistance 73 are provided in conductor 71. A conductor 74 is connected to the common wire 69 and a resistance 75 is provided in this conductor.

5 The leads 76 and 77 of the secondary winding 67 are connected to the anodes of a rectifier 78 and the leads 79 and 80 of winding 68 are similarly connected to a rectifier 81. The output lead 82 of rectifier 78 and the out-
10 put lead 83 of rectifier 81 are connected to the positive output lead 84. A lead 85 is connected to the midpoint of winding 67 and lead 86 is connected to the midpoint of winding 68 and these leads are connected to the
15 negative output wire 87.

The potential in lead 74 may represent phase A' and the potential in phase B', in lead 71, will be caused to lag behind phase A' due to the characteristics of the appurtenances in this lead. The rectifying devices 78 and 81 will act to transpose part of the wave and thus a unidirectional current is obtained in the output which will be nearly a straight line potential for as the potential
20 in phase A' drops from the crest the potential in phase B' is ascending and when the potential in phase A' reaches a predetermined low point the potential in phase B' will supersede it, and the reverse is true of
25 phase B' and phase A'.

Therefore a unidirectional current embodying the characteristics described is obtained.

From the foregoing it is apparent that we
35 have provided a device which will very effectively eliminate the pulsations so characteristic of rectified single phase alternating current. Further, the device will be simple in construction and operation and expensive
40 devices now required for rectifying alternating current will be eliminated.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable
45 of variation and modification, without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the
50 scope of the appended claims.

Having thus described our invention what we claim as new and desire to protect by Letters Patent is:

55 1. A transformer structure comprising a core structure, primary windings associated with said core structure, conductors connected to a source of single phase alternating current, one of said conductors having a con-
60 denser therein, means for connecting said last named conductor to the free end of one of said primary windings, means for interconnecting said last named conductor and the free end of another of said primary wind-
65 ings, said last named means having an induc-

tance therein and being connected to said last named conductor ahead of said condenser, the other of said conductors having a resistance therein and being connected to the free end of another of said primary windings, 70 secondary windings associated with said core structures and said primary windings, said secondary windings having the ends thereof connected to the anodes of rectifying devices, the output leads of said rectifying devices be- 75 ing connected to a common conductor to provide the positive terminal for a unidirectional current supply, a negative conductor for said unidirectional current supply connected to the midpoints of said secondary windings, 80 other secondary windings connected in series with each other and to the anodes of a rectifying device, a filament for said last named rectifying device, windings associated with said core structure for supplying current to the filament of said rectifying device, a con- 85 ductor connected to the output of said rectifying device for supplying a positive unidirectional current, and another conductor connected to the midpoint of one of said last 90 named secondary windings for supplying a negative unidirectional current.

2. A translating system for obtaining from a single phase alternating current source a smooth direct polyphase current, and for ob- 95 taining different potentials from the polyphase current, comprising a transformer structure including interconnected primaries connected to the current source, and means in the primaries for effecting phase displace- 100 ment of the current supplied thereto, means for rectifying the secondary currents into unidirectional current and for combining the pulses thereof into overlapping pulses, sec- 105 ondaries connected in series with each other and to the anodes of a rectifying device, and other secondaries for supplying current to the filament of said rectifying device, a con- ductor tapped from the mid-point of one of said first-named windings for supplying a 110 negative direct current, and another conductor connected to the output of said rectifying device for supplying a positive direct current.

In testimony whereof we affix our signa- 115 tures.

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