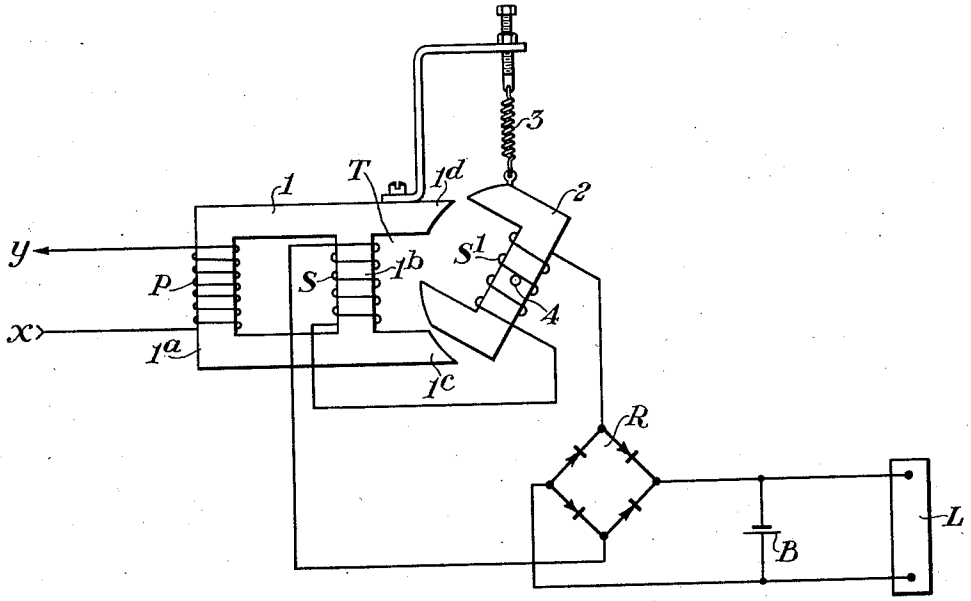
Jan. 16, 1940. J. M. PELIKAN 2,187,523

ELECTRICAL REGULATING APPARATUS

Filed May 13, 1936



INVENTOR
John M. Pelikan.
BY A R Kinsell
HIS ATTORNEY

Patented Jan. 16, 1940

2,187,523

UNITED STATES PATENT OFFICE

2,187,523

ELECTRICAL REGULATING APPARATUS

John M. Pelikan, Crafton, Pa., assignor to The Union Switch & Signal Company, Swissvale, Pa., a corporation of Pennsylvania

Application May 13, 1936, Serial No. 79,519

2 Claims. (Cl. 171—119)

My invention relates to electrical regulating apparatus, and particularly to apparatus of the type involving a direct current load supplied with power from a source of alternating current through a rectifier.

One object of my invention is the provision, in apparatus of the type described, of means for automatically stabilizing the output of the rectifier.

The accompanying drawing is a diagrammatic view showing one form of apparatus embodying my invention.

Referring to the drawing, the reference character L designates a variable load which is supplied with current through a rectifier R by means of a reactive type regulating transformer T embodying my invention. The rectifier R may be of any suitable type but as here shown, this rectifier is a full-wave rectifier of the well-known copper oxide variety.

The regulating transformer T in the form here shown comprises a stationary core member 1 of magnetizable material, and a movable core member 2 which is also of magnetizable material. The stationary core member 1 is preferably laminated for obvious reasons, and comprises two parallel legs, one of which, 1^a, is surrounded by a primary winding P and the other of which, 1^b, is surrounded by a secondary winding S. The primary winding P is constantly supplied with alternating current from the terminals X and Y of a suitable source of alternating current, not shown in the drawing.

The movable core member 2 is also preferably laminated and, as here shown, is substantially C-shaped. It is pivotally supported near its center on a pivot pin 4 and cooperates with a pair of projections 1^c and 1^d which are provided on the stationary core member 1 adjacent the opposite ends of the leg 1^b to form around the leg 1^b a variable reluctance shunt or leakage path for the flux which is set up in the stationary core member by energization of the primary winding P. The movable core member 2 carries an auxiliary winding S^1 which is connected in series with the secondary winding S between the input terminals of the rectifier R in such manner that the electromotive forces which are induced in the auxiliary winding and the secondary winding are subtractive, and the movable core member is biased by means of a spring 3 to such a position that the electromotive force which is impressed on the input terminals of the rectifier, due to the sum of the electromotive forces which are induced in the auxiliary and secondary windings when the potential which is impressed on the primary winding P has its normal value, will cause the desired load current to flow.

With the regulating apparatus constructed in the manner described, it will be apparent that when the movable core member 2 occupies a position in which the reluctance of the leakage path is high, the auxiliary winding S^1 will function largely as a reactor, whereas when the movable core member 2 is rotated to a position in which the reluctance of the leakage path is low, the auxiliary winding will then function more nearly as another secondary winding. It will also be apparent that if the load current increases, due either to a decrease in load resistance or an increase in the potential which is impressed on the primary winding P, a redistribution of the flux will take place in the core 1, which redistribution will tend to cause more flux to traverse the leakage path, and I have found that this redistribution of flux will cause an increased magnetic pull to be exerted on the movable core member, which increased pull, in turn, will cause the movable core member to rotate, in opposition to the bias of the spring 3 to a new position in which a balance of forces is reached. I have also found that as the movable core member rotates, this rotation will cause a further redistribution of the flux in the core member in such manner that the output of the transformer will tend to decrease, and that by properly proportioning the parts the load current may be maintained at a substantially constant value. I have further found that the relative number of turns in the two windings S and S^1 is not critical, but that, the best results appear to be obtained when the auxiliary winding S^1 has approximately one-third as many turns as the secondary winding S.

If desired, a battery B may be floated across the load in such manner that the normal load current and a small charging current sufficient to maintain the battery in its fully charged condition is normally supplied by the rectifier, but that, if the load current increases beyond the normal value for any reason, the battery will supply the excess current. With this arrangement, it will be apparent that the regulating transformer will function to prevent variations in the output of the rectifier due to variations in the voltage which is impressed on the primary winding P.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within

the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A regulating transformer comprising a stationary core member provided with a primary and a secondary winding, a movable core member which forms a leakage path for shunting flux away from said secondary winding, an auxiliary winding disposed on said movable core member and adapted to be connected in series with said secondary winding for supplying current to a load, said movable core member being responsive to the force due to the flux which threads said movable core member when current flows in said auxiliary and secondary windings to move toward a position in which the leakage path formed thereby has a minimum reluctance, and biasing means automatically exerting on said movable core member a force which opposes said first mentioned force and which urges said movable core member toward a position of higher reluctance than said minimum reluctance, the parts being so proportioned that as the first mentioned force acting on said movable core member changes due to changes in load conditions said biasing means will cause said movable core member to automatically move to different positions in each of which a balance is obtained between said two forces, to thereby maintain the load current substantially constant.

2. A regulating transformer comprising a stationary core member provided with a primary and a secondary winding, a movable core member which forms a leakage path for shunting flux away from said secondary winding, an auxiliary winding disposed on said movable core member and adapted to be connected in series with said secondary winding for supplying current to a load, said movable core member being responsive to the force due to the flux which threads said movable core member when current flows in said auxiliary and secondary windings to move toward a position in which the leakage path formed thereby has a minimum reluctance, and biasing means automatically exerting on said movable core member a force which opposes said first mentioned force and which urges said movable core member toward a position of higher reluctance than said minimum reluctance, the parts being so proportioned that as the first mentioned force acting on said movable core member changes due to variations in the voltage impressed on said primary winding said biasing means will cause said movable core member to automatically move to different positions in each of which a balance is obtained between said two forces, to thereby maintain the load current substantially constant.

JOHN M. PELIKAN.