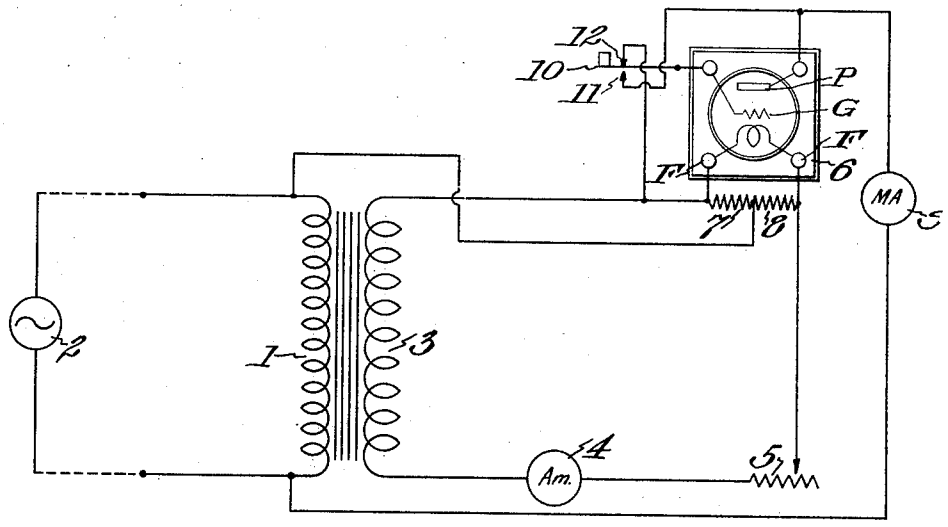
April 19, 1932. W. N. GOODWIN, JR 1,854,900

VACUUM TUBE TESTER

Filed Feb. 8, 1928



Inventor:

William N. Goodwin, Jr.,

By Byrnes Townsend & Brickenstein,

Attorneys

Patented Apr. 19, 1932 1,854,900

UNITED STATES PATENT OFFICE

WILLIAM NELSON GOODWIN, JR., OF NEWARK, NEW JERSEY, ASSIGNOR TO WESTON ELECTRICAL INSTRUMENT CORPORATION, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY

VACUUM TUBE TESTER

Application filed February 8, 1928. Serial No. 252,871.

This invention relates to vacuum tube testers, and particularly to apparatus for measuring the total emission of vacuum tubes.

In the usual apparatus for making this test, a rheostat and switch are included in the filament circuit for adjusting the filament current to a predetermined standard value, and the plate circuit includes a switch which is kept in open position until the filament current is adjusted. The grid and plate are connected to each other, and the plate circuit is completed to one terminal of the filament through a direct current milliammeter, a protective resistance and a source of plate current. Upon closing the switch both the plate and the grid are energized and the flow of plate current is indicated by the milliammeter.

Testing with apparatus of this type is open to the objection that the total emission current passes through the filament circuit, and the portion which passes through the ammeter is usually large enough to change the reading. This is disconcerting to the operator as he continues to adjust the filament rheostat to maintain a constant filament current as shown by the ammeter.

An object of the invention is to provide a total emission tester in which the flow of current in the plate circuit will not affect the reading of an ammeter located in the filament circuit. An object is to provide a total emission tester in which the plate circuit terminates at a point in the filament circuit which is at the voltage of the midpoint of the filament.

A further object is to provide a total emission tester in which a switch permits connection of the grid to the plate or to a point in the filament circuit.

These and other objects of this invention will be apparent from the accompanying drawings, in which the single view is a diagram of the electrical circuits representing one embodiment of the invention.

In the drawings the numeral 1 indicates the primary of a transformer which may be, and preferably is, designed for use on the ordinary alternating current lighting system, which source of power is indicated by the alternator 2. The secondary winding 3 is designed to supply adequate power for energizing the filament circuit of any of the types of tubes which are to be tested.

An ammeter 4 and an adjustable resistance 5 are included in the circuit connections between the ends of the secondary 3 and the filament terminals F, F of the tube socket 6 to permit adjustment of the filament current to the predetermined values employed for testing different types of tubes.

The filament terminal of the plate circuit is provided by the junction of two resistances 7, 8 which are connected between the filament terminals of the tube socket. The two resistances are of approximately equal value, and may take the form of separate resistance elements, or they may comprise the two sections into which a single resistance is divided by a midpoint tap. The junction of the resistances is connected to one side of the primary 1, and the plate circuit is completed by a connection from the other side of the primary to the plate terminal P through the milliammeter 9. The resistances are preferably of relatively high values to prevent short circuiting of the tube filament, and also to serve as protective resistances in the plate circuit.

The blade 10 of a double contact switch is connected to the grid terminal, one contact 11 of the switch being connected to the plate terminal P and the other contact 12 being connected to the filament circuit, as at one terminal F of the socket. The blade 10 is preferably biased, by its own flexure or by a spring, to engage the contact 12, which is connected to a filament terminal F.

To measure the total emission of a tube, power is supplied to the transformer and the resistance 5 is adjusted to bring the current, as indicated by ammeter 4, to the predetermined value which is appropriate for the type of tube which is being tested. The switch blade is then moved to engage the contact 12 to connect the grid with the plate, and the flow of current in the plate circuit is given by the reading of the milliammeter. Due to the fact that the plate circuit terminates at a point in the filament circuit which has the

voltage of the electrical midpoint of the filament, the flow of plate current will not affect the reading of the filament circuit ammeter. The plate current is led into the filament through the two resistors 7, 8 in parallel, thus forming a bridge circuit in which the other two arms are the two halves of the filament. When the bridge is balanced no portion of the plate current will flow through the filament supply circuit. The bridge could be accurately balanced by the use of resistances which bring the junction of the resistances exactly to the voltage of the electrical midpoint of the filament, but in actual practice it has been found that an accurate balance of the bridge is not necessary. Satisfactory results are obtained when the resistances are approximately equal.

So far as the testing of total emission is concerned, it is not necessary that the switch contact 12 be provided for placing the grid at the potential of one filament terminal. I prefer this construction, however, as it provides a means for testing the grid in addition to the total emission test.

While I have illustrated a simplified circuit arrangement for use with alternating current it will be apparent that the tester may be designed for use with direct current source such as batteries or a power line. If desired, the primary winding of the transformer may be tapped to permit adjustment of the plate voltage, but this regulation will not be necessary unless the source voltage fluctuates over a comparatively wide range.

Test sets embodying the principles of operation as above described may take various forms, and modifications may be made in the electrical circuits without departing from the spirit of my invention as set forth in the following claim.

I claim:

In tube testing apparatus, a tube socket having a resistor connected between the filament terminals thereof, a switch for alternatively connecting the grid terminal to the plate or a filament terminal, a transformer, circuit connections from the transformer windings to the plate terminal of the socket and to a point in said resistor corresponding in potential to the electrical midpoint of the filament, respectively, an electrical indicating instrument included in said circuit connections, and means including as series elements thereof an ammeter and an adjustable resistance for energizing the filament circuit from said transformer.

In testimony whereof, I affix my signature.

WILLIAM NELSON GOODWIN, JR.