May 2, 1933. B. J. HASKINS 1,906,466

CONDENSER TESTER

Filed May 26, 1930

Fig. 1

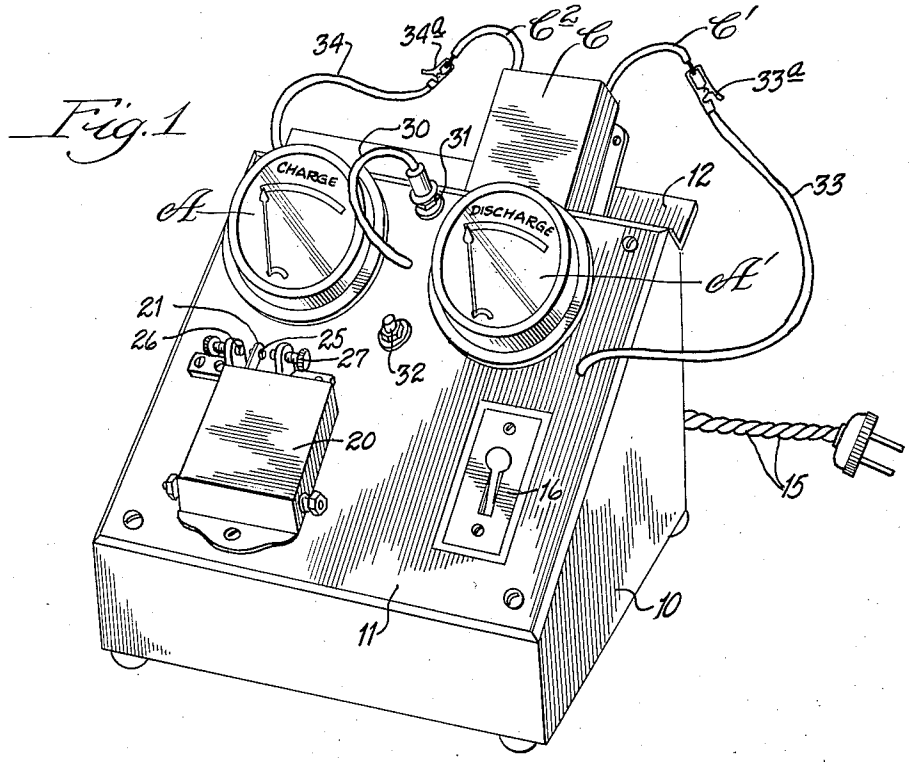


Fig. 2

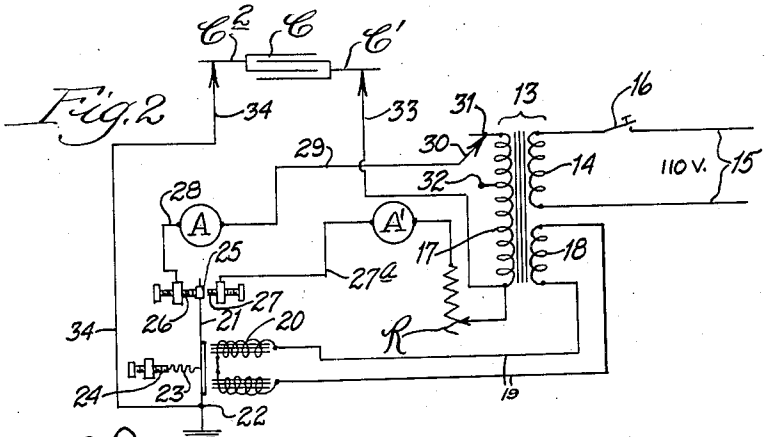
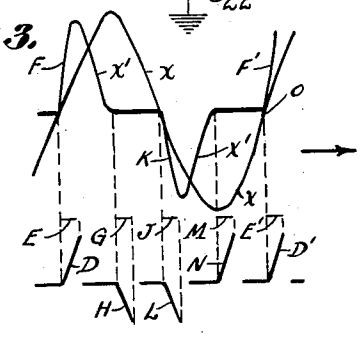


Fig. 3.



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UNITED STATES PATENT OFFICE

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CONDENSER TESTER

Application filed May 26, 1930. Serial No. 455,705.

This invention relates to condenser testers, and is particularly adapted for testing condensers for ignition and radio purposes.

An object of this invention is to provide a tester which will show the charge and discharge amperages on the same condenser under conditions of rapid charge and discharge.

Another object is to provide a tester which will show these amperages at substantially the same time.

Another object is to show these values of charge and discharge visually.

Another object is to provide such a tester which will operate off an alternating current power line.

These and other objects, as will hereinafter appear, are accomplished by this invention, which is fully described in the following specification and shown in the accompanying drawing, in which—

Figure 1 is a perspective view of a complete tester embodying the invention;

Fig. 2 is a wiring diagram of the same; and

Fig. 3 is a graph of the sine wave representing the alternating current voltage applied to the condenser being tested, and of the current flowing into and out of the condenser as shown by an oscillograph record.

The embodiment illustrated comprises a condenser tester having a body 10, preferably of sheet metal, having a top panel 11 made of any suitable insulating material, upon which are mounted two alternating current milliammeters A and A′. The back of the body 10 is preferably provided with a shelf 12, upon which may be placed a condenser C to be tested.

Referring now to Fig. 2, there is a transformer 13 having a primary 14 connecting through flexible cords, or the like, 15, with any suitable source of alternating current, such as a 110 volt A. C. lighting circuit. In this line is placed an operating switch 16 which is located on the panel 11, and which remains closed only while so held.

The transformer 13 is provided with two secondaries 17 and 18. The secondary 18 is connected through leads 19 with a buzzer type of relay 20, having an armature 21 pivotally mounted at 22, and which is normally drawn away from the coils of the buzzer by means of a tension spring 23, the tension of which is adjusted by means of a screw 24. The outer end of the armature 21 carries a contact button 25 which is adapted to swing back and forth, and to be limited in its movements in either direction by means of adjusting screws 26 and 27, with which the button 25 also makes electrical contact.

The adjusting screw 26 connects through a lead 28 with the milli-ammeter A, and thence through a lead 29 with a flexible connection 30 (see Fig. 1), which is adapted to make contact with either of the posts 31 and 32, which are tapped in on the transformer secondary 17 so as to provide two normal working voltages, such as 350 volts and 500 volts. More such taps may be used if desired.

The other end of the secondary 17 of the transformer connects through a variable resistance R, and through the milli-ammeter A′ with the adjusting screw 27 of the buzzer. The same end of the secondary 17, which is connected with the resistance R, is also connected through an insulated flexible lead 33, which is preferably provided with a suitable clip 33^a for making connection with a flexible lead C′ of the condenser C. The other condenser lead C^2 likewise connects with an insulated flexible lead 34 having a clip 34^a. This lead 34 connects at 22 with the armature 21, and is grounded at this point on the body 10 and on the buzzer case 20 as a safety measure.

The operation of the condenser tester is as follows: With the lead 15 connected to a suitable source of alternating current, and the operating switch 16 closed, the transformer 13 will operate in a well known manner to energize the secondaries 17 and 18, so as to produce alternating voltages therein. The secondary 18 is connected to the buzzer 20, and the two are so proportioned as to cause the armature 21 to vibrate at twice the frequency of the applied alternating current voltage from the outside source.

The armature 21 is normally drawn to the left so as to cause the button 25 to remain in electrical contact with the adjusting screw

26, thereby closing the circuit from the upper end of the secondary 17 through the lead 29, to the ammeter A, the armature 21 to the lead 34, through the condenser C, thence through the lead 33, back to the other end of the secondary 17.

Thus it will be seen that during this part of the cycle in which the button 25 is in contact with the adjusting screw 26, current will flow in one direction from the secondary 17 to the condenser C, thereby charging the same. During this period the milli-ammeter A will register the charging current flowing in milli-amperes.

At the same time, however, current flowing from the secondary 18 to the buzzer 20 will cause the armature 21 to be drawn to the right, thereby breaking connection between the button 25 and the adjusting screw 26, and an instant later making connection between the button 25 and the adjusting screw 27, which is connected through a lead 27^a with the milli-ammeter A'. When the button 25 makes contact with the screw 27 the condenser C is discharged through the lead 33, the resistance R, the milli-ammeter A', the screw 27, the armature 21, and the lead 34. The milli-ammeter A' reads the strength of this discharge current in milli-amperes.

Referring to Fig. 3, the sine curve X represents the voltage in the line 33, 34 when the buzzer was held shut and no condenser C was in the circuit. The curve X' shows the actual voltage in the line with a condenser C in the circuit, as shown, and the buzzer released and functioning normally.

The lower portion of this figure shows the flow of current in charging and discharging the condenser. Thus, the upwardly extending portion D represents the charging current and corresponds to the line E which represents the time of closure of the contacts 25, 26, and corresponds also to the ascending portion F of the voltage curve. The charging voltage F is seen to "lead" the normal sine curve voltage X, and this is due to the fact that the condenser C is in circuit, the action of a capacity to lead the voltage being well known.

The straight horizontal line G represents the time the contacts 25, 27 are in engagement during which the condenser C is discharged, the discharge current being shown at H. On the contact 25 again engaging the fixed contact 26, as shown by the horizontal line J, voltage on the condenser is again built up with opposite polarity as shown by the line K, the current flowing in being represented by the current line L. Discharge again occurs when the contact 25 again strikes the contact 27, and this is shown by the horizontal line M and the discharge current line N. The horizontal line E' corresponds to E, and the voltage line F' of a new cycle to the line F.

The lines of Fig. 3 are made from oscillograph records which were made under actual working conditions, as above described. The charging currents D, L, as read on the ammeter A are here shown to be substantially equal to the discharge currents H, N, as read on the ammeter A'. These meters are damped alternating current ammeters and show values both of which bear the same relation to the maximum amperage. Thus a comparison of the two readings gives an indication of the efficiency of the condenser under test, but do not show momentary values at any given point in the curve.

The resistance R is so chosen and adjusted as to make the discharge amperage substantially equal to the charging current for one of the charging voltages, say 500 volts. This will be true for all size condensers of the same type within the testing range of the instrument. When used on the 350 volt charging line, the discharge current will be less than the charging current. Thus, at 500 volts the charge and discharge voltages are substantially equal, and this fairly approximates the conditions under which condensers are discharged in use on an automobile engine.

Before these instruments leave the factory the resistance R is adjusted for a given type of condenser, so that the readings of the ammeters A and A' bear a certain relation to each other, after which the adjustment of the resistance R is not changed. With this condenser tester is supplied a chart showing the relative readings of the ammeters A and A' for various types of condensers which are operating at normal efficiency at the operating voltages used.

Another purpose of the resistance R is to limit the discharge current and hold it within the capacity of the discharge ammeter used. For the same reason the secondary 17 is wound for a limited output current so as to prevent damage to the instrument if, for example, the condenser punctures during test. Otherwise, the heavy charging current flowing through the shorted condenser might burn out the ammeter A.

While I have shown and described but a single embodiment of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made which do not depart from the spirit and scope of my invention as disclosed by the appended claims.

I claim:

1. A condenser tester comprising means for repeatedly and rapidly charging a condenser from a source of electric current, means for reading the strength of the charging current, means for repeatedly and rap-

idly discharging the condenser between successive charges, and means for simultaneously reading the strength of the discharge current.

2. A condenser tester comprising means for repeatedly and rapidly charging a condenser from a source of electric current, means for reading the strength of the charging current, means including a buzzer for disconnecting the condenser from the current source and for repeatedly and rapidly discharging the condenser through a resistance, and means for simultaneously reading the strength of the discharge current.

3. A condenser tester comprising an alternating current means for charging a condenser, means for reading the strength of the charging current, a member movable to break the charging current and to connect the condenser to a discharge path through a suitable resistance, said member being moved from charge to discharge position in one-fourth of a cycle of the impressed alternating current, and means for reading the strength of the discharge current.

4. A condenser tester comprising an alternating current means for charging a condenser, means for reading the strength of the charging current, a member movable to break the charging current and to connect the condenser to a discharge path through a suitable resistance, said member being moved at twice the frequency of the impressed alternating current, and means for reading the strength of the discharge current.

5. A condenser tester comprising an alternating current means for charging a condenser, means for reading the strength of the charging current, a member movable to break the charging current and to connect the condenser to a discharge path through a suitable resistance, said member being moved by a buzzer mechanism actuated by a current fluctuating at twice the frequency of the impressed alternating current, and means for simultaneously reading the strength of the discharge current.

6. A condenser tester comprising an alternating current means for charging a condenser, means for reading the strength of the charging current, a member movable to break the charging current and to connect the condenser to a discharge path through a suitable resistance, said member being moved by a buzzer mechanism actuated by an alternating current induced by the impressed alternating current and at twice the frequency of the impressed alternating current, and means for simultaneously reading the strength of the discharge current.

7. A condenser tester comprising an alternating current means for charging a condenser, means for reading the strength of the charging current, a member movable to break the charging current and to connect the condenser to a discharge path through a suitable resistance, said member being moved from charge to discharge position in one-fourth of a cycle of the impressed alternating current and from discharge position to charging position in the next one-fourth of said cycle, and means for reading the strength of the discharge current.

In testimony whereof, I have hereunto set my hand this 19th day of May, 1930.

BUTLER J. HASKINS.