Aug. 11, 1936. B. J. HASKINS 2,050,530

DISTRIBUTOR TESTER

Filed May 5, 1934 2 Sheets-Sheet 1

Fig. 1

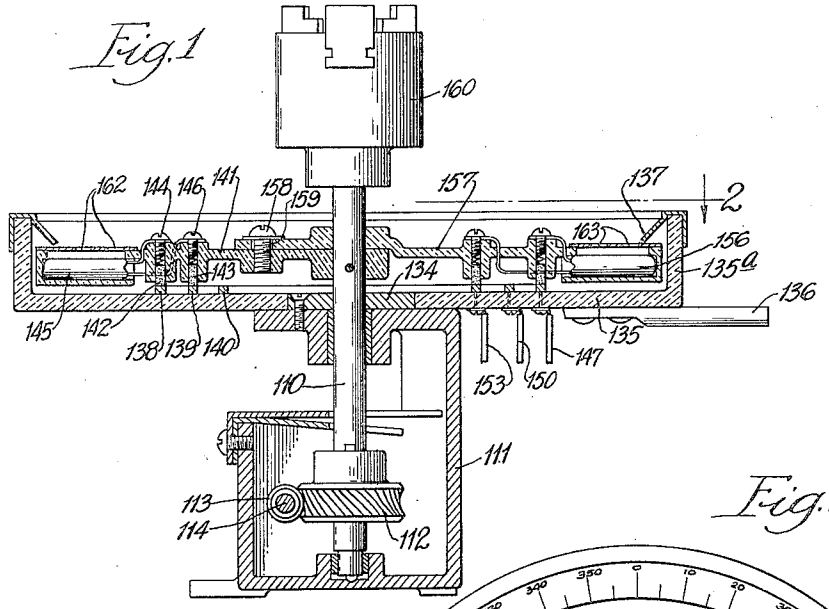


Fig. 2

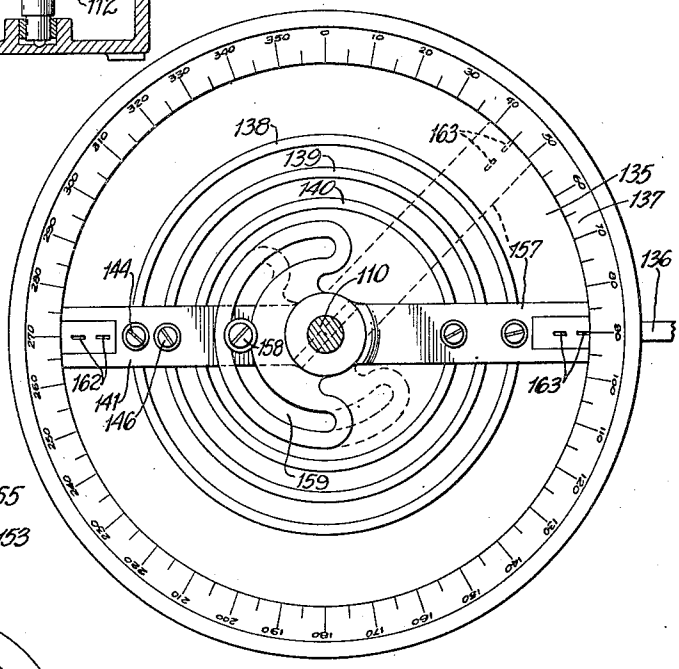
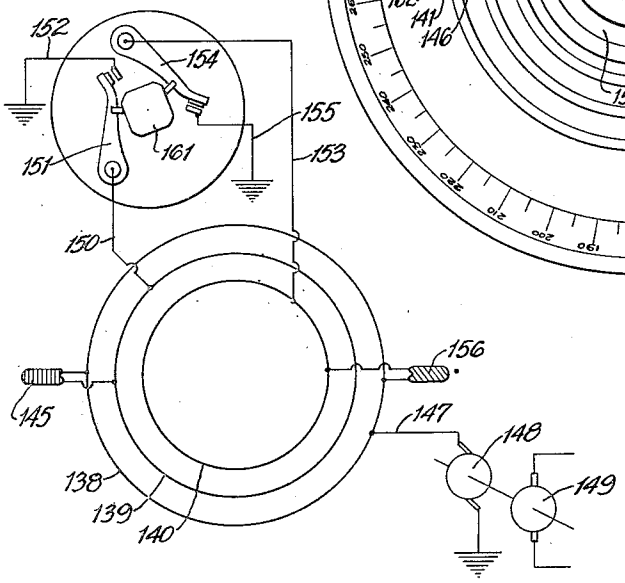


Fig. 3



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Fig. 4

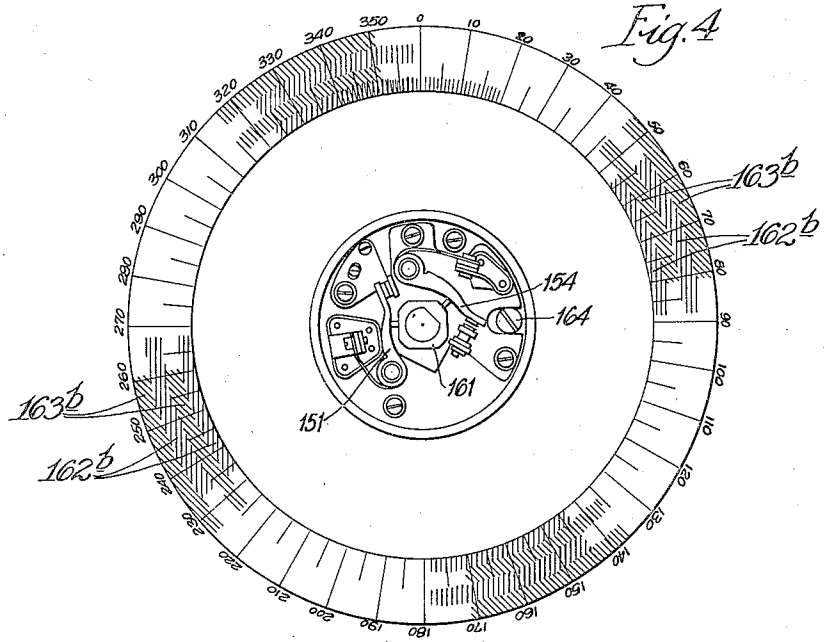
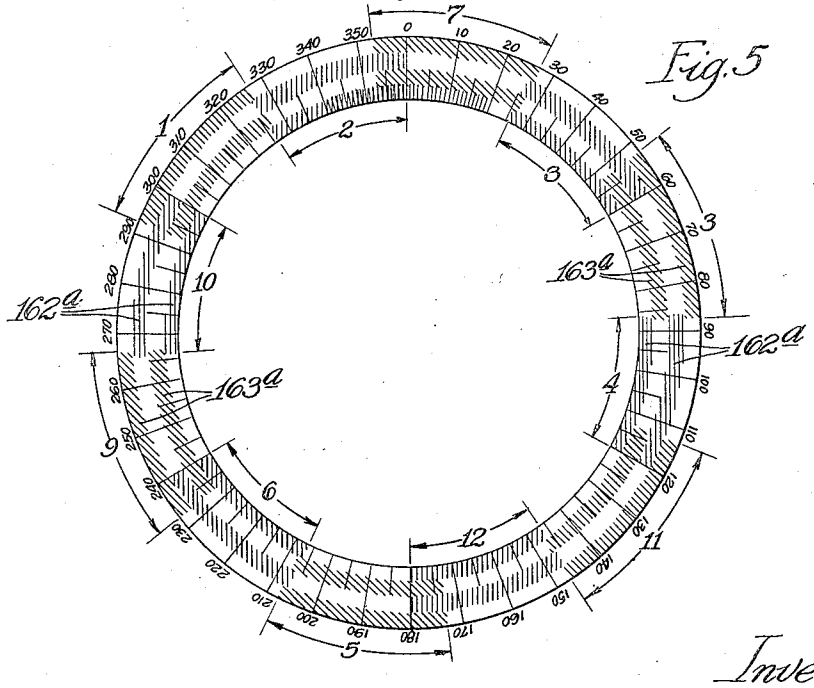


Fig. 5



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2,050,530

DISTRIBUTOR TESTER

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Application May 5, 1934, Serial No. 724,171

4 Claims. (Cl. 177—311)

This is an improvement on my co-pending application for Distributor tester, Serial No. 660,157, filed March 9, 1933. In the apparatus of that application a single neon tube lights up during the time current flows through either of two breakers on a distributor of the type now commonly used where two breakers are employed, and which operate alternately. With certain types of engines having eight or more cylinders there may be an intentional overlap in the timing of the two breakers, each operating on its own spark coil, or when not designed for that purpose, such an overlap may occur due to improper setting of the distributor points. In either case a single neon tube will not show when breakers open and close.

An object of this invention is to provide means for visually showing simultaneously, and preferably on a single graduated scale, the periods during which current flows through each breaker and showing these periods in such a way that the observer can readily read the points at which contact is made and broken in each breaker without confusion due to the overlap.

Another object is to provide means for shifting one set of such indications relative to the other on the scale for better comparison of the timing of one set of breaker points relative to the other, all under conditions similar to those under which the distributor operates in an automobile engine.

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 drawings, in which—

Figure 1 is a vertical section through a device embodying the invention;

Fig. 2 is a plan view of the dial on the line 2 of Fig. 1;

Fig. 3 is a wiring diagram of the connections;

Fig. 4 is a top plan view of the distributor showing the breaker points of the double breaker type, and the graduated dial showing the angles of contact made by the breaker points in an 8 cylinder engine under certain conditions; and

Fig. 5 is a similar graduated dial for a 12 cylinder V-type engine distributor having a double breaker and a six lobe cam.

The embodiment illustrated in Figs. 1 to 4 inclusive comprises a shaft 110 mounted in suitable bearings in a housing 111, the shaft carrying a worm wheel 112 which meshes with a worm 113 on a shaft 114 which is driven by a motor, not shown. The speed of this motor may be regulated in any well known manner, and a tachometer, not shown, may be placed adjacent the motor so that the speed of the shaft 110 may be readily read by an operator.

The housing 111 carries a circular block 134 which is secured concentrically with the shaft 110 and provides a bearing about which a disk 135 may rotate. The disk is preferably provided with a handle 136 for moving it back and forth, as will later be explained. This disk is preferably made of insulating material, such as a phenolic condensation product, and carries an annular metal scale 137 which is preferably carried upon the upper edge of a flange 135a which extends upwardly from the disk 135. The disk also carries a series of selector rings 138, 139 and 140 which are concentric with the shaft which are secured thereto in any desired manner.

Over these an arm 141 of insulating material is secured to the shaft and carries two brushes 142 and 143 which are spring-pressed to bear against the rings 138, 139, respectively, as the arm rotates. The brush 142 connects through its metal spring with a screw head 144 which connects through a lead with a red neon tube 145 which preferably operates at about 90 volts, the return from the tube being through a lead which connects with a screw 146 which makes contact with the spring which bears upon the brush 143. The collector ring 138 connects through a lead 147 with a suitable direct current generator 148 which is driven by a motor 149, the other side of the generator being grounded. The collector ring 139 is connected through a lead 150 with a breaker arm 151 on the distributor to be tested, the stationary contact being connected through a lead 152 to ground, thereby completing the circuit to the generator. The collector ring 140 connects through a lead 153 with a breaker arm 154 on the distributor, the stationary contact connecting through a lead 155 with the ground back to the generator.

A neon tube 156, say of a green color, and having similar brushes contacting rings 138, 140, is carried by an adjustable arm 157, this arm being movable about the shaft 110 and secured in adjusted position by means of a screw 158 which passes through a slot 159. Thus the arm 157 may be fixed at 180° from the arm 141, or it may be moved forward or backward from that position by loosening the screw 158 to any desired position within the range of the adjustment, after which the screw 158 is tightened, thereby locking the two arms in fixed relation. The purpose of this adjustment will later be explained.

The shaft 110 carries a chuck 160, the jaws of which may grasp the lower end of the shaft of a distributor, not shown, to be tested, and which has been removed from the automobile for this purpose. The arm for holding the distributor body while being tested also is not shown, but is fully shown and described in the co-pending application above referred to. The shaft of the distributor carries a cam 161 (Fig. 3) which operates the breaker arms 151, 154. As this cam rotates each breaker closes and opens four times for each revolution of the shaft. At the same time the arms 141, 157 rotate and as each breaker arm closes current flows therethrough from the generator 148, thereby causing either the tubes 145 or 156 to glow continuously while the current passes therethrough. Narrow slits 162, 163 are provided above the tubes 145 and 156, respectively, and these are spaced apart in axial alignment so that the inner slit 163 substantially occupies the space between the slits 162 when these arms are rotated.

If now we operate this apparatus with a six lobe cam and drive the shaft at a rotative speed of twenty revolutions per second, or more, we will generate a series of light bands, one of which, 162^a, is red, while the other, 163^a, is green, and to the eye they will assume substantially the appearance of stationary light bands of Fig. 5, assuming that the breakers are properly set with a period of "make" amounting to 34° of arc in each instance. The appearance of these light bands will depend upon a number of variables, such as the number of lobes of the cam, the various adjustments of the cam timing apparatus, the relative positions of the arms 141, 157, the colors of the neon tubes employed, etc.

By moving the disk 135 about the shaft by means of the lever 136 the light bands will remain stationary, while the disk with its graduated dial may be turned to any desired position for better examination of any part of the light band. Each one of these separate bands represents the time during which current would flow through the primary of the spark coil. If some of these bands are longer than other bands of the same color it means that the lobes of the cam are unequally formed, or that the shaft is bent. If the bands of one color, however, are all longer than those of the other color it indicates that the breaker arms are unequally adjusted.

For the above test care must be taken to see that the slits 162, 163 are set exactly 180° apart. For certain purposes it is desirable to shift the arm 157 with respect to the arm 141. Thus with a four lobe cam with a double breaker, as shown in Fig. 3, which is used on an 8-cylinder engine, the arm 157 might be shifted 45° to the dotted line position of Fig. 2. With the uniform timing of all the cylinders the red and the green bands 162^b, 163^b, respectively, then ought to start and stop at exactly the same positions, the green and the red bands, however, alternating as we pass radially outward from the shaft. If, however, one of these was set to open and close relatively earlier than the other, and if both occupied the same cam angle on the graduated dial they would give an appearance similar to Fig. 4. By superposing the two bands in this way a clearer indication of the actual error may sometimes be obtained than by leaving them spread out in their regular order, as when the two indicator arms are 180° apart.

To correct for this error an eccentric screw 164 on the distributor is moved to shift one of the breaker arms with respect to the other while the shaft is in rotation, the distributor itself remaining stationary and held above the indicator so as to be readily adjusted. Each breaker arm can also be adjusted for the length of time during which current flows as shown by the length of its bright band, as described in my co-pending application. Thus the timing of the distributor can be made quickly and accurately by an inexperienced person by the use of this simple apparatus.

This type of indicator can be used for showing graphically the relative timing of twin ignition where two sets of spark plugs are connected to two ignition coils, each of which is supplied with primary current through separate breaker arms operated by a single cam. Thus Fig. 4 might also be an indicator diagram showing flashes produced by the double breaker of a twin ignition system on a four cylinder engine, the red stripes showing the timing of one breaker arm, while the green stripes show the timing of the other with the arms 141 and 157 set 180° apart, and the breaker arms 151 and 154 also set 180° apart. In Fig. 4 they are shown about 135° apart.

In this figure the two sparks do not occur at the same point by several degrees. The relative timing of the two sparks may be effected by turning the eccentric screw 164 while the operator observes the colored bands. Thus for certain purposes it may be desired to set the two sparks to occur say 3° apart. This can be done very readily by first adjusting the lengths of the two bands as fully explained in my co-pending application, and then adjusting the screw 164 until the ends of red and green stripes or bands corresponding to the points of opening the breaker points are 3° apart as read on the graduated scale. The colored bands of Fig. 5 show the ignition set to give unequal spacing for the sparks of the twelve cylinder engine.

I claim:

1. A distributor tester for automobile ignition systems having cam-operated double breaker points, said tester comprising means for rotating the shaft of the distributor under test, a graduated dial, two spaced indicator means mounted for rotation with respect to said graduated dial, means connecting said indicators for rotation with the distributor shaft, each of said indicator means including an opaque member having a plurality of radial slots in axial alignment, a neon tube behind the slots, and means for electrically connecting each tube in series with its corresponding pair of breaker points for continuously lighting the neon tube while its breaker points are closed for indicating on the graduated dial the angles of closure of the breaker points while the distributor shaft and indicators are in rotation, the slots of the two indicators being spaced at different distances from the axis so that the bands produced by the neon tube and slot of one indicator lie between the bands produced by the tube and slots of the other indicator where they overlap.

2. A distributor tester for automobile ignition systems having cam-operated double breaker points, said tester comprising means for rotating the shaft of the distributor under test, a graduated dial, two spaced indicator means mounted for rotation with respect to said graduated dial, means connecting said indicators for rotation with the distributor shaft, each of said indicator means including an opaque member

having a plurality of radial slots in axial alignment, a neon tube behind the slots, and means for electrically connecting each tube in series with its corresponding pair of breaker points for continuously lighting the neon tube while its breaker points are closed for indicating on the graduated dial the angles of closure of the breaker points while the distributor shaft and indicators are in rotation, the slots of the two indicators being spaced at different distances from the axis so that the bands produced by the neon tube and slot of one indicator lie between the bands produced by the tube and slots of the other indicator where they overlap, the light from one neon tube being of a different color from the light from the other neon tube.

3. A distributor tester for automobile ignition systems having cam-operated double breaker points, said tester comprising means for rotating the shaft of the distributor under test, a graduated dial, two spaced indicator means mounted for rotation with respect to said graduated dial, means connecting said indicators for rotation with the distributor shaft, each of said indicator means including an opaque member having a plurality of radial slots in axial alignment, a neon tube behind the slots, means for electrically connecting each tube in series with its corresponding pair of breaker points for continuously lighting the neon tube while its breaker points are closed for indicating on the graduated dial the angles of closure of the breaker points while the distributor shaft and indicators are in rotation, the slots of the two indicators being spaced at different distances from the axis so that the bands produced by the neon tube and slot of one indicator lie between the bands produced by the neon tube and slots of the other indicator where they overlap, and means for angularly adjusting one indicator with respect to the other so as to facilitate comparison of bands produced by the two indicators.

4. A distributor tester for automobile ignition systems having cam-operated double breaker points, said tester comprising means for rotating the shaft of the distributor under test, a graduated dial, two spaced indicator means mounted for rotation with respect to said graduated dial, means connecting said indicators for rotation with the distributor shaft, each of said indicator means including an opaque member having a radial slot, a neon tube behind the slot, means for electrically connecting each tube in series with its corresponding pair of breaker points for continuously lighting the neon tube while its breaker points are closed for indicating on the graduated dial the angles of closure of the breaker points while the distributor shaft and indicators are in rotation, and means for angularly adjusting one indicator with respect to the other so as to vary the relative positions of the indications on the graduated dial.

BUTLER J. HASKINS.