July 10, 1951 P. O. STEWART 2,560,259

METHOD OF TESTING AUTOMOTIVE DISTRIBUTORS

Filed April 17, 1951

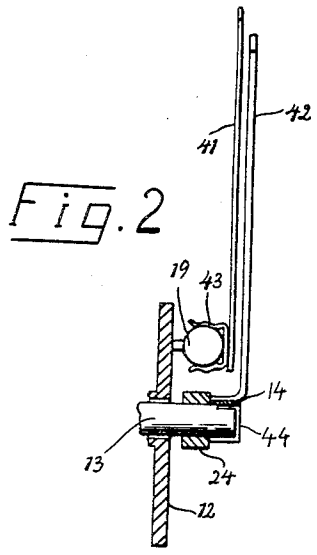


Fig. 2

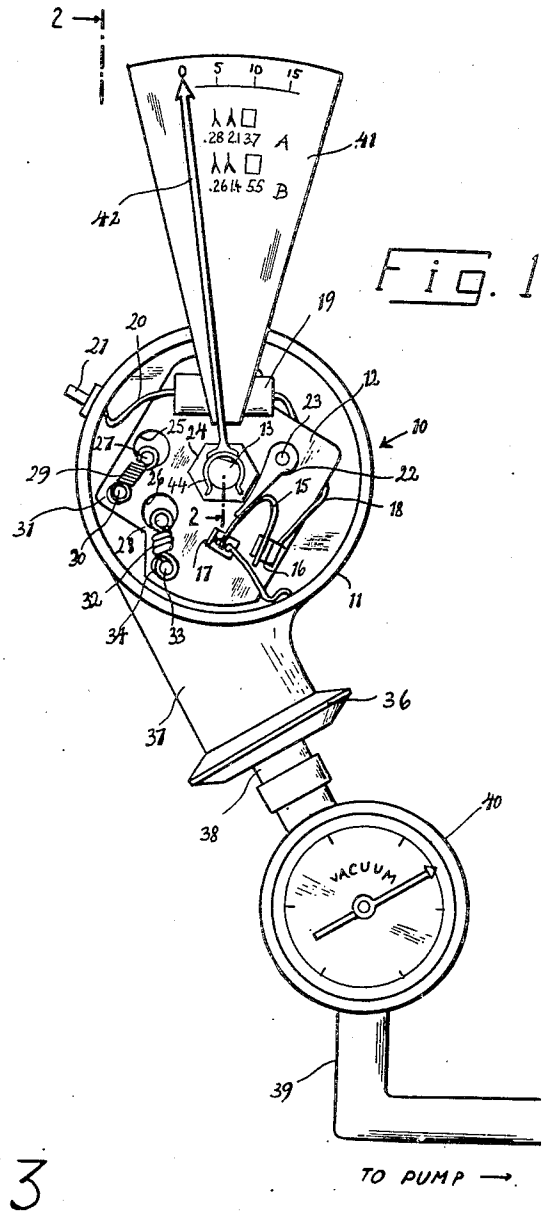


Fig. 1

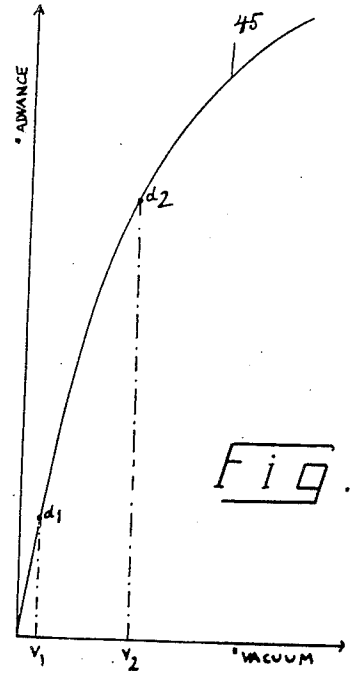


Fig. 3

INVENTOR.
PATTERSON O. STEWART

BY Karl F. Ross
AGENT

Patented July 10, 1951

2,560,259

UNITED STATES PATENT OFFICE

2,560,259

METHOD OF TESTING AUTOMOTIVE DISTRIBUTORS

Patterson O. Stewart, Bronxville, N. Y.

Application April 17, 1951, Serial No. 221,434

1 Claim. (Cl. 73—118)

1

The present invention relates to a method of checking the operation of automotive distributors, more particularly of distributors in which the advance of the spark is controlled by vacuum-operated means. This application is a continuation-in-part of my co-pending application Ser. No. 81,473, filed March 15, 1949.

The invention is primarily designed for use with a more recent type of distributor system in which the movement of a breaker plate, carrying the circuit breaker which is operated by a cam mounted on the distributor shaft, is effected exclusively by a vacuum connection to the carburetor, in accordance with a predetermined law which in turn is a function of the tension of a pair of control springs. It should be understood, however, that the invention may be employed with some advantage with any type of distributor in which at least part of the displacement of the breaker plate or its equivalent is due to the application of a variable vacuum taken from any convenient source, e. g. from the manifold of the motor.

The classical method of checking the performance of a distributor of any kind involves the use of stroboscopic apparatus, the tests being carried out while the engine driving the distributor shaft is in motion. This calls for a rather complicated set-up and precludes the testing of distributors by simple means; moreover, the making of necessary adjustments during tests is rendered difficult by the fact that the resetting of the springs must be done in the immediate vicinity of a rapidly rotating shaft, unless one decides to stop the engine before each adjustment.

The general object of the present invention is to provide a method of checking the performance of a vacuum-controlled distributor which will avoid the above disadvantages, and which will allow testing a distributor during standstill or when it is disconnected from the engine, all without the use of a spark-generating circuit.

The above and further objects of the invention will become more fully apparent from the following description of a now preferred embodiment, reference being had to the accompanying drawing in which:

Fig. 1 shows in plan view a distributor of the character set forth above, in combination with a checking or testing device adapted to carry out the method of the invention;

Fig. 2 is a fragmentary section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a graph used in explaining the method according to the invention, this graph representing the performance characteristic of the distributor shown in Fig. 1.

2

Referring to Figs. 1 and 2, there is shown a conventional vacuum-controlled distributor 10 of which the cover has been removed. The distributor comprises a housing 11 and a breaker plate 12 journaled in this housing, this plate being concentric with a distributor shaft 13 passing through the center of the housing. The shaft is flattened at 14 for the entrainment of the distributor rotor or switch arm (not shown).

The breaker plate 12 carries a U-shaped contact spring 15 one leg of which is clamped in a terminal member 16, the other leg co-operating with a stationary contact 17 likewise mounted on the plate 12. A wire 18 extends from the terminal member 16 to a condenser 19 from which a flexible wire 20 leads to a terminal 21 for connection to other circuit elements (not shown) including a spark coil and a source of voltage. These elements need not be connected to the terminal 21 during the tests subsequently described. A breaker arm 22, pivoted to the plate 12 at 23, bears upon the contact spring 15 in such manner as periodically to disengage the same from the contact 17 when the shaft 13 rotates, the arm 22 being then intermittently deflected by a hexagonal cam 24 mounted on the shaft. The contact 17 is grounded to the distributor housing by way of a flexible wire 35.

The plate 12 is provided with two circular cutouts 25, 26 through which pass respective posts 27, 28 rising from the bottom of the housing 11, these posts and cutouts limiting the angular displacement of the plate 12 relative to the distributor housing. Post 27 serves as one anchorage for a light coil spring 29, the other end of this spring being anchored to an eccentric stud 30 projecting from a pin 31 which is rotatably held in the plate 12. Post 28 serves as one anchorage for a heavy coil spring 32, the other end of this spring being anchored to an eccentric stud 33 projecting from a pin 34 which is also rotatably held in the plate 12. It will be understood that rotation of the pins 31, 34 will permit adjustment of the tension of springs 29, 32 in the home position of the plate 12, which is the position illustrated in Fig. 1.

The mechanism for angularly displacing the breaker plate 12 with respect to the housing 11 includes a suitable connection, not shown, between this plate and a diaphragm 36 inserted between a tube 37, extending from the housing 11, and a nipple 38. The apparatus so far described is entirely conventional, nipple 38 being nor-

mally connected to the carburetor for applying a partial vacuum to the diaphragm 36 when the engine is in motion, thereby rotating the plate 12 counter-clockwise as viewed in Fig. 1.

The invention utilizes any suitable source of vacuum, such as a pump (not shown), for supplying a controllable amount of suction to the diaphragm 36 by way of conduit 39. A vacuum indicator, such as the manometer 40, is connected to the conduit 39. The manometer may be of any convenient type responsive to the range of vacua for which the spark advancing mechanism of the distributor 10 is designed.

According to the invention I provide a pair of relatively displaceable indicator members 41, 42 for measuring the angle by which the plate 12 is rotated with respect to the housing 11. One of these members, e. g. the scale 41, is secured to the movable plate 12, for example by means of spring clips 43 engaging the condenser 19. The other member, e. g. the pointer 42, is held in fixed but adjustable position relative to the housing 11. For simplicity's sake I prefer to mount the pointer on the free end of shaft 13 which remains stationary during tests carried out in accordance with the invention. The pointer is, for this purpose, provided with a spring clip 44 slidingly fitting over the end of the shaft and resiliently engaging same. As illustrated, the scale member 41 may be of generally sector-shaped configuration.

As will appear from the chart of Fig. 3, in which degrees of deflection as read on the scale 41 are plotted against inches (or millimeters) of vacuum as read on the manometer 40, the deflection follows a non-linear law, represented by the curve 45, which will be different for different types of distributors but will be predeterminable (usually in accordance with data supplied by the manufacturer) for each particular type. After the pointer has been set to zero position (by manually rotating it on the shaft 13) at zero vacuum, a gradually increasing vacuum is applied to the manometer 40 and to the diaphragm 36, the deflections of pointer 42 on the scale 41 being noted and compared with the values corresponding to curve 45. If the readings reasonably correspond to the predetermined values, no further action need be taken. If, however, there is a discrepancy, the distributor is adjusted as follows:

A low vacuum v_1 is applied to the diaphragm, whereupon tension of the light spring 29 is adjusted (by suitable manipulation of the pin 31) until the pointer 42 shows the desired deflection d_1. Next a higher vacuum v_2 is applied, whereupon the heavy spring 32 is adjusted (by suitable manipulation of the pin 34) until the pointer 42 shows the desired deflection d_2. The vacua v_1, v_2 are selected in those portions of the range of operation in which the heavy spring 32 and the light spring 29 have, respectively, a negligible influence only upon the deflection of the plate 12. Upon completion of these adjustments the readings will generally correspond to the values of the chart, unless either or both springs are defective and must be replaced.

Reference to any external chart (such as the one shown in Fig. 3) may, however, be rendered unnecessary, at least for certain types of distributors, by providing the scale member 41 with one or more sets of markings each permitting direct determination of the amount of vacuum at which a particular deflection should occur. Fig. 1 shows, by way of example, two such sets of markings, designated A and B, respectively; each of these relates to a particular type of distributor. The first and the second marking of each set serves for the adjustment of the light and of the heavy spring, respectively, the third marking being provided for the purpose of counterchecking the performance of the springs after adjustment has been made. This last marking may cover an angle of one degree or more, thus indicating a permissible tolerance.

It is to be understood that the invention is not limited to the specific form shown and described but that the arrangement illustrated may be modified in various ways. Thus, for example, the scale member 41 may be secured to some portion of the breaker plate 12 other than the condenser 19. Also, the positions of the pointer and of the scale may be reversed, e. g. by making the scale portion of member 41 transparent so that the pointer may be viewed therethrough. These and other modifications and adaptations will be readily apparent to those skilled in the art and are intended to be embraced within the scope of the invention as defined by the appended claim.

I claim:

A method of testing an automotive distributor of the vacuum-controlled type by means of two relatively movable indicator members, the distributor including a shaft and a breaker plate rotatable independently of said shaft, which comprises the steps of affixing one of said members to the shaft, affixing the other of said members to the breaker plate, placing said members in a predetermined reference position relative to each other by rotating said one of said members on the shaft with respect to the breaker plate, successively applying different amounts of vacuum to the distributor while holding the shaft stationary, and observing from the departure of said members from said relative reference position whether the deflections of the breaker plate agree with standard deflections corresponding, respectively, to the different amounts of vacuum.

PATTERSON O. STEWART.

No references cited.