Nov. 30, 1965 D. M. McALLISTER 3,221,116

IGNITION SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed July 24, 1962

FIG. 1

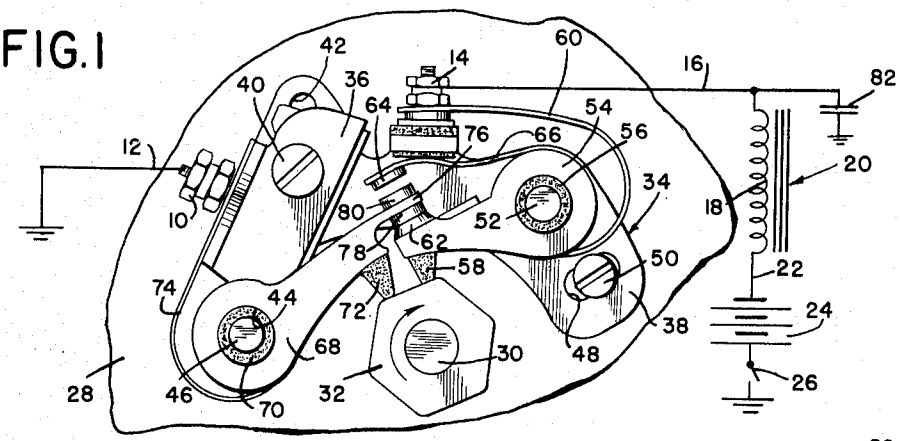


FIG. 2

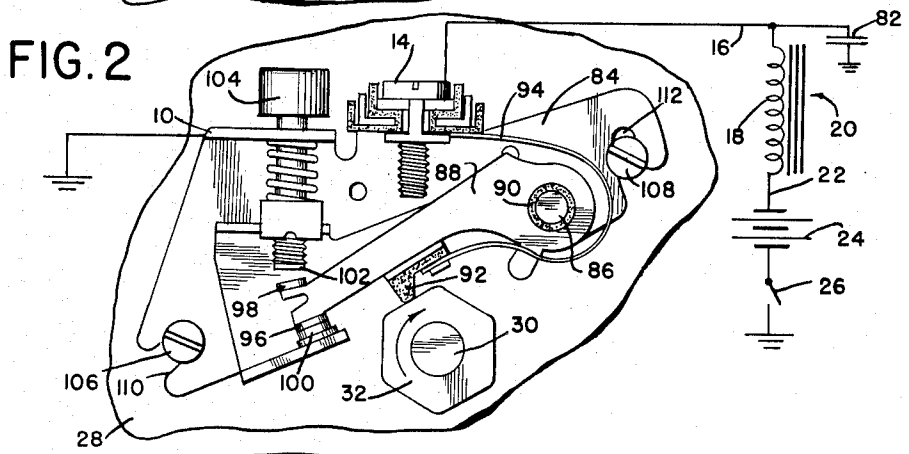
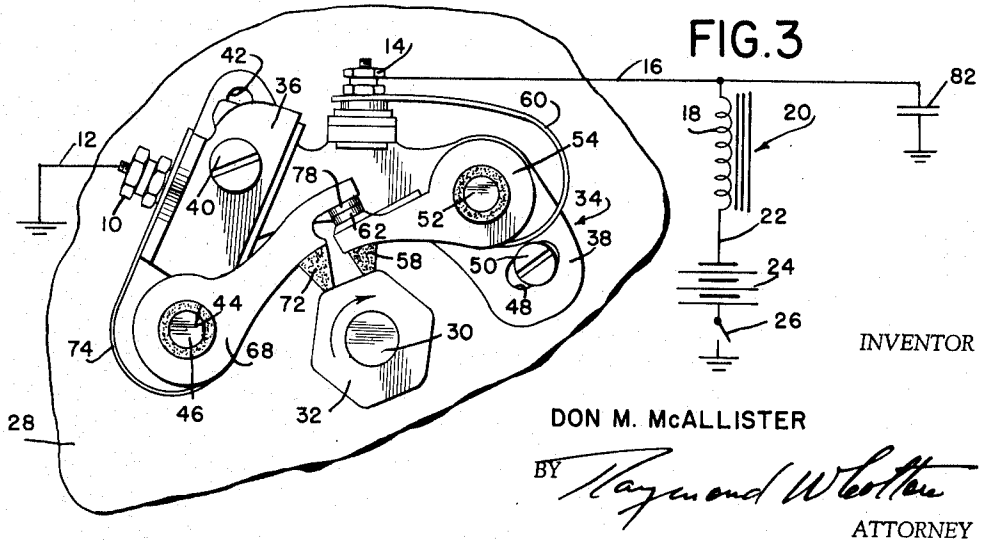


FIG. 3



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IGNITION SYSTEM FOR INTERNAL COMBUSTION ENGINES

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This invention relates to switching devices for internal combustion engines and is concerned primarily with improvements in the construction and operation of the breaker points.

There have been many efforts in the past to maintain a constant gap between the breaker points of internal combustion engines over a long period of time and to provide proper sparking conditions at both starting speeds and operating speeds of such engines, but thus far such proposals have involved such inadequate or incomplete solutions to the problems as to preclude their adoption in practice.

It is among the objects of the present invention to provide a switching device for internal combustion engines comprising a mounting plate providing spaced pivots, a relatively rotatable shaft extending beyond the plate and carrying cam means, a pair of arms mounted on the pivots respectively, and providing followers engaging the cam means, the arms carrying cooperating contacts which are successively closed and opened during rotation of the shaft to provide a gap dimension substantially independent of wear between the cam means and followers. Means for adjusting the contacts to set the dimensions of the gap are contemplated and it is preferred that means be provided for biasing the followers toward the cam means. The followers preferably engage the cam means at circumferentially spaced positions relative to the shaft. According to a preferred embodiment of the invention, each arm carries a pair of contacts to produce a pair of gaps, rotation of the shaft successively opening and closing such gaps. The contacts carried by each arm in such an embodiment are preferably relatively rigidly fixed against relative movement once they have been adjusted.

The invention contemplates a pair of independently movable arms mounted on pivot means and providing followers engaging the cam means, each of the arms carrying a pair of contacts to produce a pair of gaps, rotation of the shaft successively opening and closing the gaps.

It is also contemplated that a first pair of electrically interconnected contacts be carried by the plate in predetermined spaced relationship in association with a breaker arm pivotally carried by the plate, a follower carried by the arm, a second pair of electrically interconnected contacts carried by the arm in predetermined rigidly spaced relationship cooperating with the first contacts respectively, to define first and second gaps, and cam means carried by the shaft engaging the follower and successively opening and closing the gaps. In such a case the first pair of contacts are preferably mounted on a second arm pivotally carried by the plate.

By virtue of the present invention, a more efficient operation is assured and a longer life is imparted to the breaker points themselves as well as to the entire ignition system. Maintenance time and cost are also greatly reduced in conjunction with installations incorporating the present invention.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

FIG. 1 is a fragmentary plan view depicting one form of the present invention;

FIG. 2 is a fragmentary plan view of a modified form of the invention; and

FIG. 3 is a fragmentary plan view of a further modified form of the invention.

In each of the modifications depicted in the drawings, the low voltage side of a conventional ignition circuit has been depicted diagrammatically in conjunction with the switching device. In each case, one terminal **10** of the switching device is connected to ground through a conductor **12** while the other terminal **14** is connected by a conductor **16** to one side of the primary winding **18** of an ignition coil **20**, the other end of the winding being connected by a conductor **22** to the vehicle battery **24** which is connected in series with an ignition switch **26** to ground.

Extending beyond a conventional mounting plate **28** is a conventional rotatable shaft **30** carrying a conventional cam **32** depicted, for purposes of this description, as having six lobes.

Referring to FIG. 1, a bracket assembly **34** is composed of a first bracket member **36** and a second bracket member **38** adjustably secured together by a screw **40** extending through an opening in the bracket member **36** and through a slot **42** in the bracket member **38**, with a nut, not shown, applied to the opposite threaded end of the screw **40** to maintain the bracket members in a desired predetermined relationship.

The bracket member **36** contains an opening **44** penetrated by a post or pivot member **46** extending upwardly from the plate **28**. The bracket member **38** contains a slot **48** in cooperation with a screw **50** received in a threaded opening provided in the plate **28** so as to clamp the bracket assembly in a desired position. A pivot or post **52** extends upwardly from the bracket member **38** to rotatably support an arm **54**, between which and the pivot **52** there is interposed an insulating sleeve **56**. Adjacent the free end of the arm **54** there is secured a follower or rubbing block **58** maintained in engagement with the cam **32** by means of a leaf spring **60** in a conventional fashion. On a surface of the arm **54** opposite the follower **58** there is secured a breaker point **62**, and in spaced relationship with the breaker point **62**, another breaker point **64** is carried by a rigid extension **66** of the arm **54**. It is important that there be a minimum of resiliency in the extension **66** so that for all practical purposes, the breaker points **62** and **64** will be maintained in mutually fixed relationship.

Another breaker arm **68** is pivotally mounted on the pivot **46** with an intervening insulating sleeve **70** and at its free end carries a follower or rubbing block **72** biased towards the cam **32** by means of a leaf spring **74**. An extension **76** of the arm **68** projects into the gap provided by the spaced breaker points **62** and **64**, and on its opposite surfaces carries breaker points **78** and **80** cooperating respectively with breaker points **62** and **64** to provide multiple gaps for the ignition system which are successively opened and closed as the shaft **30** rotates and the cam **32** displaces the followers **72** and **58**. Starting from the position depicted in FIG. 1, as the shaft **30** rotates clockwise as indicated by the arrow, the arm **68** will move counterclockwise causing the points **62** and **78** to separate, at the same time moving the points **80** and **64** towards contacting positions. Then the arm **54** will begin to move clockwise about its pivot **52**, moving the point **64** away from the point **80** and the point **62** towards the point **78**. This combined movement of the two arms is preferably timed so that the initial break between the points **62** and **78** will occur prior to head dead center of the power stroke being controlled and so that the break between the points **64** and **80** occurs beyond head dead center of that power stroke so as to provide an extended ignition period so as to promote more uniform combustion. It is important that the points **62** and **64** be rigidly mounted with respect to one another and that the points **78** and **80** be rigidly mounted with respect to one another so that there will be no resilient bounce

which would otherwise occur at elevated speeds. In this way the gap between the points 62 and 78 will close sooner than otherwise so as to increase the dwell period during which the coil 20 is being saturated in advance of the next discharge. The closing of the second gap between the points 64 and 80 partially removes the charge from the capacitor 82 that occurred during the opening of the points 62 and 78, thereby extending the life of the points constituting the first gap defined by the points 62 and 78. The dwell of the points 64 and 80 of the second gap will be shorter than that of the points of the first gap so that the charge placed upon the capacitor 82 by the second gap is less and the adverse effect on the points of the first gap will be less, assuring them a longer life. It is contemplated that the followers 58 and 72 will wear equally so as to maintain the gaps uniform throughout the life of the points. This will greatly extend the life of the points and will also result in uniformly efficient operation of the engine. The initial size of the gap in each case will be adjusted by manipulation of the screws 40 and 50 and by either bending the extension 66 or by adjusting the initial distance between the point 64 and the point 80 in some other suitable fashion that will assure relative rigidity between the points 64 and 62 once the setting has been effected.

The modification depicted in FIG. 3 differs from that of FIG. 1 in the elimination of the second gap defined by the points 64 and 80 of the modification shown in FIG. 1. Otherwise the structure, operation and advantages parallel those described with reference to FIG. 1.

Referring to FIG. 2 of the drawings, a bracket 84 provides an upstanding post or pivot 86 over which an arm 88 is disposed with an intermediate insulating sleeve 90 for pivotal mounting of the arm. The arm carries a follower or rubbing block 92 of insulating material biased towards the cam 32 by means of a leaf spring 94. The free end of the arm 88 carries opposed breaker points 96 and 98 which cooperate respectively with breaker points 100 and 102 rigidly secured in spaced relationship on a fixed portion of the bracket 84. Whereas the breaker point 102 is adjustably mounted with respect to the bracket 84 by means of a screw 104, once it has received its desired adjusted position, it is then rigid relative to the breaker point 100. The bracket 84 is secured to the mounting plate 28 by means of screws 106 and 108 received in slots 110 and 112 respectively so as to produce a prescribed gap dimension. In this case, when the follower 92 begins to wear, the gap between the points 96 and 100 will become smaller and the dwell will increase, producing a higher saturation of the coil and a greater charge on the condenser. As this is occurring, the gap defined by the breaker points 98 and 102 will increase and even though it no longer closes completely, the higher charge on the condenser will bridge this gap to produce a progressively greater spark to compensate for the decrease in the dimension of the gap occurring between the points 96 and 100.

Whereas the present invention has been described with reference to a very limited number of forms, the appended claims contemplate such variations as will be suggested by the present disclosure to those skilled in the art.

I claim:

1. A switching device for internal combustion engines comprising a mounting plate providing spaced pivots, a relatively rotatable shaft extending beyond said plate and carrying cam means including a plurality of cam surfaces, a pair of arms mounted on said pivots respectively and providing followers engaging said cam means, said followers lying in the path traversed by said cam surfaces and spaced apart along said path by a distance less than the length of one of said cam surfaces, each of said arms carrying a pair of contacts, each contact of the pair on one arm periodically engaging a contact on the other arm, said contacts defining two gaps which are successively closed and opened during rotation of said shaft.

2. A switching device according to claim 1 including means for adjusting said contacts to set the dimension of one of said gaps.

3. A switching device according to claim 1 including means biasing said followers towards said cam means.

4. A switching device according to claim 1 wherein said followers engage said cam means at circumferentially spaced positions relative to said shaft.

5. A switching device according to claim 1 wherein the contacts are relatively rigidly carried by their respective arms.

6. A switching device for internal combustion engines comprising a mounting plate providing pivot means, a relatively rotatable shaft extending beyond said plate and carrying cam means including a plurality of cam surfaces, a pair of independently movable arms mounted on said pivot means and providing followers engaging said cam means, said followers lying in the path traversed by said cam surfaces and spaced apart along said path by a distance less than the length of one of said cam surfaces, each of said arms carrying a pair of contacts to produce a pair of gaps, rotation of said shaft successively opening and closing said gaps.

7. A switching device for internal combustion engines comprising a mounting plate, a rotary shaft extending beyond said plate, a first pair of electrically interconnected contacts carried by said plate in predetermined spaced relationship, a breaker arm pivotally carried by said plate, a follower carried by said arm, a second pair of electrically interconnected contacts carried by said arm in predetermined rigidly spaced relationship, each contact of one of said pairs periodically engaging a contact of the other of said pairs to define first and second gaps, and cam means carried by said shaft engaging said follower and successively opening and closing said gaps.

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