United States Patent

Schratz et al.

[15] **3,681,543**

[45] **Aug. 1, 1972**

[54] **IGNITION DISTRIBUTOR WITH CAM AND CAM FOLLOWER LUBRICATION MEANS**

[72] Inventors: **Hubert Schratz**, Hinterstein; **Karl-Heinz Schneider**, Sonthofen, both of Germany

[73] Assignee: **Robert Bosch GmbH**, Stuttgart, Germany

[22] Filed: **April 27, 1970**

[21] Appl. No.: **32,211**

[30] **Foreign Application Priority Data**

May 6, 1969 Germany ..... P 19 22 923.3

[52] **U.S. Cl.** ..... **200/19 R**, 200/30, 74/569

[51] **Int. Cl.** **H01h 19/62**, F16h 53/06

[58] **Field of Search** ..... 200/11 A, 8, 19–32; 74/569; 184/1 A, 3, 102

[56] **References Cited**

UNITED STATES PATENTS

2,435,128	1/1948	Carlson	200/30
2,700,432	1/1955	Hieger	200/19 R UX
2,784,809	3/1957	Tollefsen et al.	184/102
2,979,577	4/1961	Adler	200/30
3,180,948	4/1965	McCarty	200/30
1,871,270	8/1932	Hubbard	184/3
2,191,087	2/1940	Spengler	200/30
2,290,469	7/1942	Griesbach	200/30
3,135,840	6/1964	Ausfeld	200/17 A UX
3,339,670	9/1967	McGrew, Jr. et al.	74/569 X

Primary Examiner—J. R. Scott

Attorney—Michael S. Striker

[57] **ABSTRACT**

A breaker lever for use in ignition systems of combustion engines has a main portion mountable at one end for pivotal movement about a predetermined first axis and provided at its opposite end with an electrical contact adapted to cooperate with an adjacent contact of the ignition system. An engagement portion of synthetic plastic material projects from the main body portion transversely of the aforementioned first axis and has an exposed engagement face which is adapted for sliding contact with a breaker cam rotating about a second axis. The engagement portion is formed with one or preferably several pockets which extend inwardly from the exposed face and which accommodate a viscous lubricant for transfer to and lubrication of the breaker cam in automatic response to sliding contact of the engagement face with the same.

12 Claims, 5 Drawing Figures

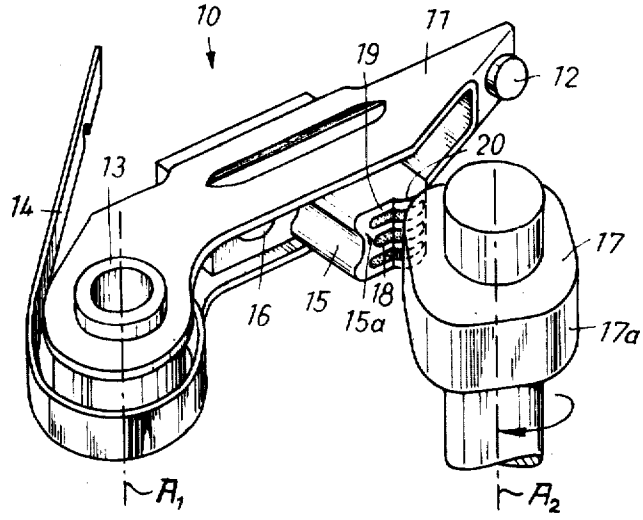


Fig.1

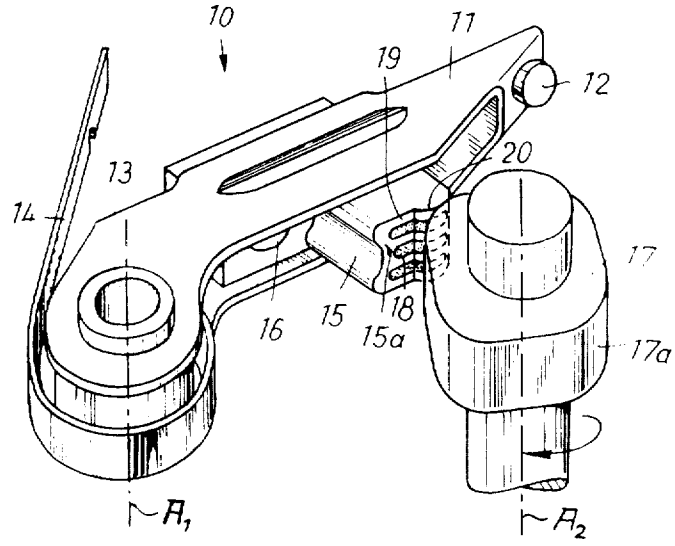


Fig.2

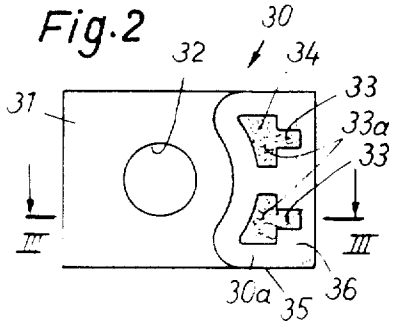


Fig.4

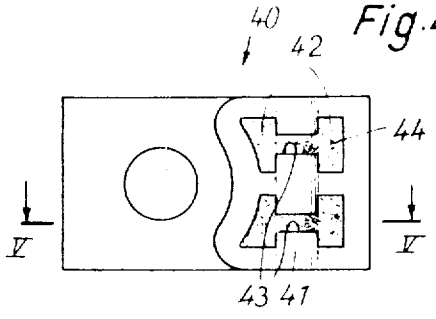


Fig.3

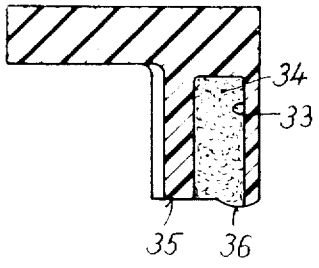
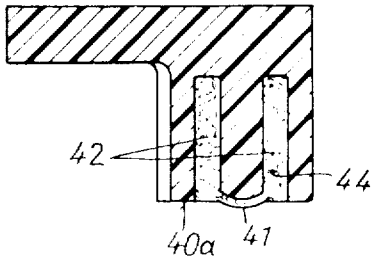


Fig.5



INVENTORS:
Hubert SCHRATZ
Karl-Heinz SCHNEIDER

By Michael J. Striker
their ATTORNEY

IGNITION DISTRIBUTOR WITH CAM AND CAM FOLLOWER LUBRICATION MEANS

BACKGROUND OF THE INVENTION

The present invention relates generally to a novel article of manufacture, and more particularly to an article of manufacture for use in ignition systems of combustion engines. Still more specifically the present invention relates to a novel breaker lever for use in such ignition systems.

It is hardly necessary to explain that in the ignition systems of combustion engines the supply of electrical energy to the spark plugs must be interrupted and restored in a predetermined time sequence. For this purpose breaker levers are known which are mounted for pivotable movement about an axis and which engage with an engagement portion—in effect constituting a cam follower—a breaker cam which rotates about another axis. Biassing means is provided for urging the engagement portion into contact with the breaker cam and an electrical contact provided on a free end of the breaker lever cooperates with a stationary contact with which it becomes engaged and from which it becomes disengaged sequentially as determined by the configuration of the breaker cam.

It is known to construct the engagement portion of such breaker levers of synthetic plastic material. This engagement portion has an exposed engagement face which is in contact with the cam face of the cam track of the breaker cam. Evidently, over a period of time the sliding contact between the exposed engagement face and the breaker cam causes wear, usually on the exposed engagement face, and this results in an impermissible deviation from the predetermined time sequence controlling the ignition of the fuel mixture by the spark plugs which are energized via the breaker lever. To avoid this it is known to coat the breaker cam with a lubricant, such as viscous grease, but although this protective step is effective it must be repeated at relatively short intervals if the protection afforded by it is to be maintained in force.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to provide an improved breaker lever for use in such ignition systems.

More particularly it is an object of the present invention to provide a breaker lever for use in the aforementioned application which does not require periodic renewal of lubrication and which is not subject to wear even over a long period of use.

An additional object of the invention is to provide such novel breaker lever which is rather simple in its construction and therefore inexpensive to manufacture.

A concomitant object of the invention is to provide such a breaker lever which can be employed in all ignition systems utilizing such breaker levers.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of the invention resides in a novel breaker lever for use in ignition systems of combustion engines, which lever briefly stated comprises a main body portion having a first end mountable for pivotal movement about a predetermined first axis, and a second end. An electrical contact is provided on the second end and adapted for

cooperation with an adjacent contact of the ignition system. An engagement portion projects from the main body portion intermediate the ends and transversely of the first axis, having an exposed engagement face which is adapted for sliding contact with a breaker cam rotating about a second axis adjacent the main body portion. At least one pocket is formed in the engagement portion and extends inwardly from the exposed face thereof, and a viscous lubricant is accommodated in this pocket for transfer to and lubrication of the breaker cam in automatic response to sliding contact of the engagement face with the same.

The engagement portion advantageously is made of synthetic plastic material and it is preferred that two or more pockets are provided in it which are filled with viscous lubricant, such as a suitable grease. The size and configuration of the pockets or pocket is such that the viscous lubricant accommodated therein will pass under the influence of adhesion forces in form a thin lubricant film onto the cam face of the breaker cam which contacts the exposed engagement face.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an enlarged perspective view illustrating one embodiment of a breaker lever according to the present invention, shown in cooperation with the breaker cam of an ignition system in which it is to be used;

FIG. 2 is an enlarged end-elevational view illustrating a further embodiment of the invention;

FIG. 3 is a section taken on the line III-III of FIG. 2;

FIG. 4 is a view similar to FIG. 2 but illustrating an additional embodiment of the invention; and

FIG. 5 is a view taken on the line V—V of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing firstly the embodiment of FIG. 1 it will be seen that the breaker lever per se is identified with reference numeral **10**. It has a main body portion **11** preferably made from sheet metal, to one end of which an electrical contact **12** is secured, as by soldering or the like. The opposite end of the main body portion **11** is provided with a journalling sleeve **13** of electrically insulating material. A leaf spring **14**, together with an engagement portion **15** of synthetic plastic material, are secured to and in the main body portion **11** intermediate the opposite ends of the latter by means of a rivet **16**, or the like.

It will be appreciated that when the breaker lever **10** is mounted in operative position in an ignition system of a combustion engine, the main body portion **11** will be pivotally journalled by means of the sleeve **13** for pivoting movement about a first axis A_1 which is shown in broken lines. Adjacent the main body portion **11** will be a breaker cam **17** which rotates on its mounting shaft about a second axis A_2, for instance in the

direction identified by the arrow. The cam face of the breaker cam 17 is identified with reference numeral 17*a*. The arrangement is, in accordance with well known practice, such that the leaf spring 14 urges the exposed engagement face 15*a* of the engagement portion 15 into sliding contact with the cam face 17*a* of the breaker cam 17. A stationary contact of the ignition system is not illustrated, but will be understood to cooperate with the contact 12. Thus, as the breaker cam 17 rotates about the axis A_2, it will alternately displace the main body portion 11 about the axis A_1 in counterclockwise direction, thereby disengaging the contact 12 from the stationary associated contact interrupting the electrical circuit, and permit the main body portion 11 to pivot about the axis A_1 in clockwise direction under the urging of the spring 14, with the exposed engagement face 15a following the contour of the cam track 17a, so that the contact 12 can again move into engagement with the non-illustrated stationary contact and close the circuit. This, of course, is known from the art.

The engagement portion 15, and more particularly the exposed engagement face 15*a* thereof, constitutes a cam follower and must be protected against wear resulting from sliding engagement with the cam track 17a.

In accordance with the present invention such protection is afforded by providing the engagement portion 15 with one or preferably a plurality of pockets 18 extending inwardly from the engagement face 15*a* and filled with viscous lubricant such as grease which is extracted in form of a thin lubricant film onto the cam face 17*a* when the same rotates in engagement with the exposed engagement face 15*a*. Thus, the engagement portion 15 is self-lubricating for a very long period of time, requiring no renewal of the lubrication and being reliably and for an extended period of time protected against wear resulting from the absence of lubrication or from inadequate lubrication.

While in theory it might be possible to provide a single one of the pockets 18 filled with viscous lubricant, it is preferred to provide two or, as illustrated in FIG. 1, three of them which are spaced axially of the axis A_2, that is of the axis of rotation which is surrounded by the cam track 17*a*, so that lubrication is applied equally and evenly over the entire surface of the cam track 17*a*. As FIG. 1 clearly shows, the exposed engagement face 15*a* comprises at the leading side thereof, that is the side first contacted by the cam track 17*a* rotating in the direction of the arrow, with a planar or stepped portion 19 which is followed at the trailing side of the exposed face 15*a* by a convex portion 20. The pockets 18 are provided in both portions and movement of the cam track 17*a* over the convex portion 20 causes the viscous lubricant to move out of the pockets 18 due to the adhesion force and to become distributed in form of a thin film on the cam track 17*a*.

The embodiment in FIGS. 2 and 3 differs from that of FIG. 1 in the arrangement and configuration of the pockets. In FIGS. 2 and 3 most of the components shown in FIG. 1 have been omitted because they may be identical with those shown in FIG. 1. FIGS. 2 and 3 accordingly only show on an enlarged scale an engagement portion 30 corresponding to the engagement portion 15 and securable in the place of the latter with the main body portion 11 and the other components illustrated in FIG. 1. It will of course also cooperate with a cam track such as the one identified with reference numeral 17 in FIG. 1.

The engagement portion 30 in FIGS. 2 and 3 is also made from synthetic plastic material as the section in FIG. 3 shows. It is substantially L-shaped in configuration and provided in the arm 31 with a bore or hole 32 for passage of a rivet, screw or the like by means of which it is to be secured to the main body portion of the breaker lever. The exposed contact face of the other or second arm is identified with reference numeral 30*a* and this other arm is provided with two pockets 33 which extend inwardly from the contact face or engagement face 30*a* and are filled with viscous lubricant 34. The upstream side of the face 30*a*, that is the one which is contacted first by a cam track rotating in the direction indicated by the arrow in FIG. 1, is provided with a recessed or planar portion 35 which is followed at the downstream side, that is the side which is last contacted by the cam track, with a convex portion 36. The drawing clearly shows that the pockets 33 are so configurated that in the region of the planar portion 35 they are enlarged to form a storage space 33a. The operation of the embodiment in FIGS. 2 and 3 is of course the same as that shown in FIG. 1.

There is, finally, the exemplary embodiment shown in FIGS. 4 and 5. Whereas the embodiment in FIG. 1 and that shown in FIGS. 2 and 3 are intended for use in applications where the cam track 17 rotates in the direction identified by the arrow in FIG. 1, the embodiment in FIGS. 4 and 5 can be used in applications in which the cam track will rotate either in the aforementioned direction, or in the opposite direction. The illustration of the embodiment in FIGS. 4 and 5 is analogous to that of FIGS. 2 and 3, that is only the engagement portion 40 has been illustrated, corresponding to the engagement portion 30 in FIGS. 2 and 3. As FIG. 5 shows, the engagement portion 40 is also of substantially L-shaped configuration and FIG. 4 shows that it is provided with an opening analogous to the one identified with reference numeral 32 in FIG. 2, for the same purpose as there disclosed.

In the embodiment of FIGS. 4 and 5, however, the exposed engagement face is identified with reference numeral 40a but while it is also provided with a convex surface portion 41 analogous to that identified with reference numeral 36 in FIGS. 2 and 3, the convex surface portion 41 is located substantially centrally of the exposed face 40*a*. It is flanked at opposite sides by stepped or recessed planar portions one of which will be first engaged by the rotating cam track (not illustrated), no matter in which direction the cam track rotates.

In the embodiment of FIGS. 4 and 5 there are provided to pockets 42 at one side of the convex surface portion 41, and two pockets 42 at the opposite side, both extending inwardly from the recessed planar surface portions. Advantageously one pocket on each of the two opposite sides is located in the same plane as the associated pocket on the other opposite side, and according to the invention two such associated pockets 42 are connected by a narrow channel or groove 43 provided in the convex surface portion 40a and communicating with both of them. The pockets and the

channel are filled with viscous lubricant **44**. Rotation of the noneillustrated breaker cam will cause the latter to come initially into contact with either one or the other of the recessed planar surface portions before it comes into contact with the convex surface portion **41**. The viscous lubricant **44** will be drawn from the pockets located in that planar recessed surface portion which is first contacted by the cam track, and deposited under the influence of adhesive force on the cam track.

It will be appreciated that the size and configuration of the pockets makes it possible to fill them with a precisely defined quantity of viscous lubricant, preferably under vacuum. This, in turn, makes it feasible to produce a breaker lever which is completely free of any necessity for repeated lubrication during its lifetime, and which is not subjected to wear and therefore avoids undesired changes in the ignition timing.

Of course, the illustrated embodiments are exemplary only and the invention concerns and includes all breaker levers provided in their exposed engagement faces with pockets for viscous lubricant. Thus, more or fewer than the illustrated pockts could be provided, and these pockets could also be arranged in different manner than shown. For instance, the pockets could be provided in a raster—that is in somewhat grid-like configuration—tightly adjacent one another covering all or part of the surface area of the exposed engagement face.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a novel breaker lever for use in ignition systems of combustion engines, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended

1. A contact breaker assembly including a breaker lever for use in ignition systems of combustion engines, comprising a main body portion having a first end and being mountable for pivotal movement about a predetermined first axis, and a second end; an electrical contact provided on said second end and adapted for cooperation with an adjacent contact of the ignition system; an engagement portion projecting from said main body portion intermediate said ends and transversely of said first axis, said engagement portion having an exposed engagement face adapted for sliding contact with a breaker cam rotating about a recessed axis adjacent said main body portion; at least one circumferentially closed pocket formed in said engagement portion extending inwardly from and being open only at said exposed face thereof; and a body of viscous lubricant accommodated in said pocket for transfer to and lubrication of said breaker cam in automatic response to sliding contact of said engagement face with the same.

2. A contact breaker assembly as defined in claim **1**; further comprising at least one additional circumferentially closed pocket provided in said engagement portion and extending inwardly from said exposed face adjacent to but spaced from the first-mentioned pocket, said additional pocket also being open only at said exposed face; and an additional body of viscous lubricant accommodated in said additional pocket.

3. A contact breaker assembly as defined in claim **1**, said pockets being spaced in axial direction of said second axis.

4. A contact breaker assembly as defined in claim **1**, said exposed face having a substantially planar portion extending in longitudinal direction of said second axis, and a convex portion also extending in longitudinal direction of said second axis and following said planar portion in the direction of rotation of said breaker cam.

5. A contact breaker assembly as defined in claim **4**, said exposed face further having an additional substantially planar portion, said planar portions together flanking said convex portion with respect to the direction of rotation of said breaker cam.

6. A contact breaker assembly as defined in claim **5**, said pockets each comprising a section extending inwardly from said planar portion and said additional planar portion, respectively; and further comprising a pair of narrow grooves provided in said convex portion and each connecting said sections of one of said pockets with one another.

7. A contact breaker assembly as defined in claim **2**, wherein said engagement portion is of synthetic plastic material.

8. A contact breaker assembly as defined in claim **2**; further comprising a plurality of additional pockets provided in said engagement portion extending inwardly from said exposed face and accommodating viscous lubricant, all of said pockets being arranged in form of a raster.

9. A contact breaker assembly as defined in claim **5**, said pockets extending in part inwardly from the respective planar portions, and in part from said convex portion.

10. A contact breaker assembly as defined in claim **9**, wherein that part of said pockets which extends inwardly from said planar portions has a volumetric content greater than that part of said pockets which extends inwardly from said convex portion.

11. A contact breaker assembly as defined in claim **4**, said pockets extending in part inwardly from said planar portion and in part from said convex portion.

12. A contact breaker assembly as defined in claim **11**, wherein that part of said pockets which extends inwardly from said planar portion has a volumetric content greater than that part of said pockets which extends inwardly from said convex portion.

* * * * *