

Jan. 25, 1944.

W. D. KIGHT

2,339,996

BREAKER POINT

Filed Aug. 11, 1941

2 Sheets-Sheet 1

Fig. 1.

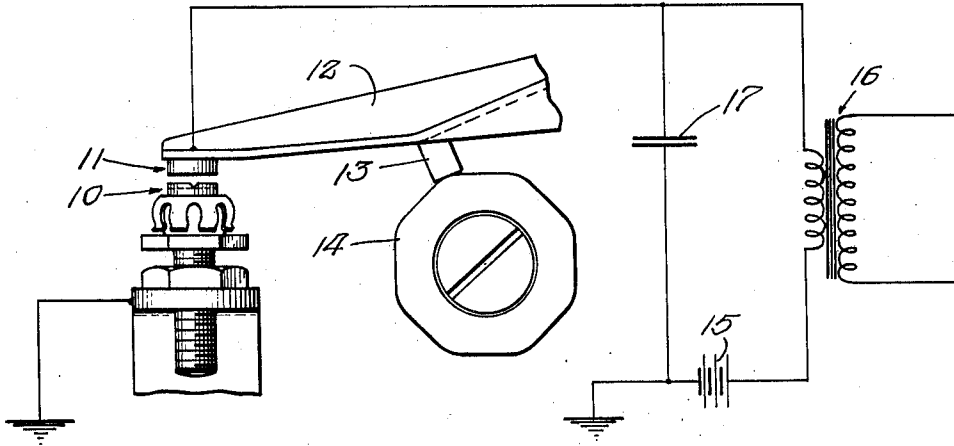


Fig. 2.

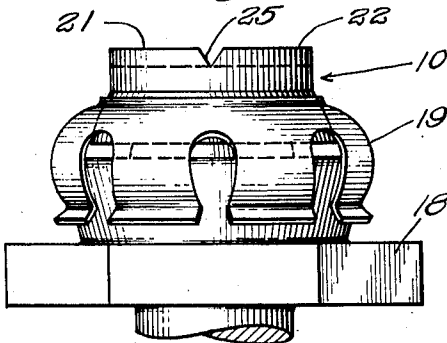


Fig. 3.

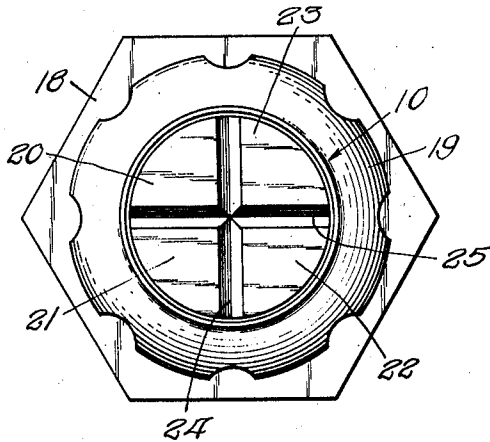


Fig. 8.

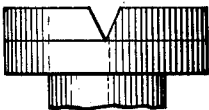


Fig. 11.

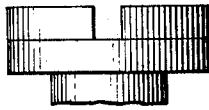


Fig. 9.

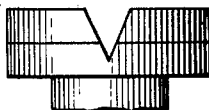


Fig. 12.



Fig. 10.



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2 Sheets-Sheet 2

Fig. 4.

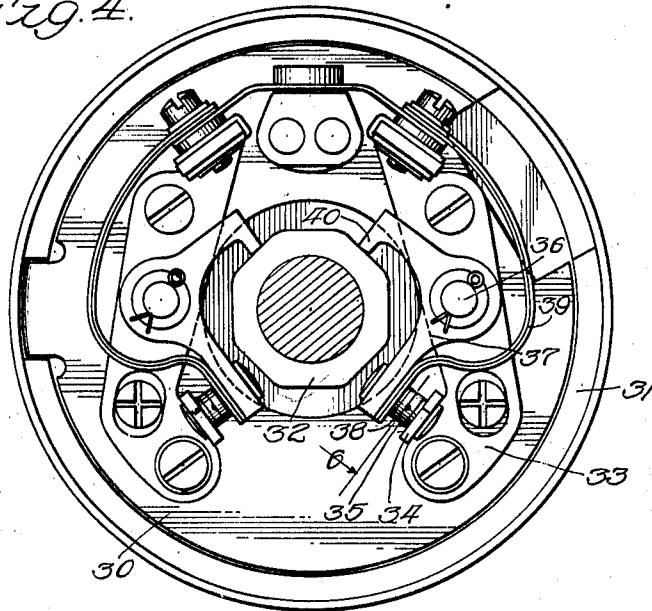


Fig. 5.

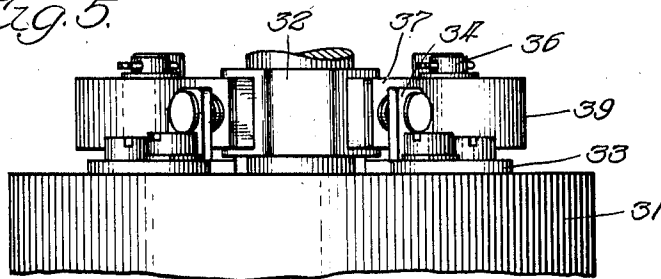


Fig. 6.

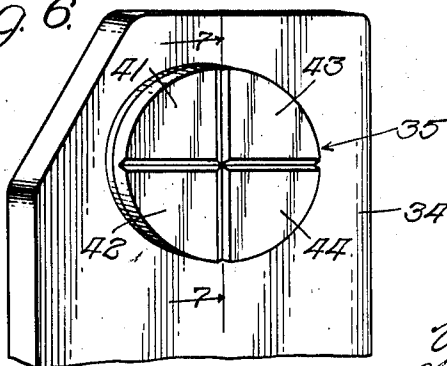
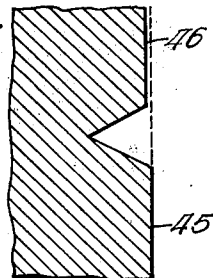


Fig. 7.



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UNITED STATES PATENT OFFICE

2,339,996

BREAKER POINT

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4 Claims. (Cl. 200—19)

This invention relates to breaker points, more particularly of the kind used in high tension ignition systems for internal combustion engines.

One feature of this invention is that it provides an improved high speed circuit making and breaking apparatus; another feature of this invention is that it results in lessened deterioration of the breaker points under adverse operating conditions; yet another feature of this invention is that it results in lessened inter-point resistance and a distribution and reduction in pitting; other features and advantages of this invention will be apparent from the following specification and the drawings, in which:

Figure 1 is a view, partly schematic, of one embodiment of my invention as applied to an automobile ignition system; Figure 2 is a side elevational view of a breaker point embodying my invention, together with its supporting means; Figure 3 is a top plan view of the point shown in Figure 2; Figure 4 is a top plan view of another embodiment of my invention; Figure 5 is a side elevational view of the device shown in Figure 4; Figure 6 is a perspective view of one of the points of this last embodiment; Figure 7 is an exaggerated fragmentary sectional view along the line 7—7 of Figure 6; and Figures 8 to 12, inclusive, are similar detail side elevational views of breaker points having different forms of grooves or cuts therein.

Breaker points in the ignition system of an automobile engine, for example, make and break a circuit carrying 5 to 10 amperes at a rate which may be several thousands of times per minute. Even though a condenser is used to lessen arcing upon opening of the circuit, ignition breaker points soon lose efficiency because of the formation of dark bluish oxide and the creation of a pit in one point while a corresponding tit is built up on the other point.

My invention obviates or at least greatly lessens these defects and objections by using two breaker points having flat cooperating contact surfaces and dividing preferably one of the contacting surfaces into a plurality of spaced contact surface portions or into similar segmental portions, as by grooving it. Moreover, I have found that the fullest effectiveness of this divided contact surface is obtained when proper alignment between the cooperating contacting faces is ensured. This alignment can be assured by so mounting one of the contact elements as to enable it to have, at least to a limited extent, universal movement, permitting proper alignment between the surfaces and even distribution of contact pressure along

the segments; or by manufacturing all of the parts into an integral unit, with the cooperating contacts factory aligned and locked in desired relation.

Referring now to the particular embodiment of my invention illustrated herewith in Figures 1 to 3, a pair of cooperating contact elements 10 and 11 are adapted to have their contacting surfaces moved into and out of engagement with each other periodically to make and break a circuit. The element 11, for example, is shown as mounted on a movable arm 12 having a rubbing block 13 in contact with a cam 14. This arrangement is conventional in distributors used in ignition systems, and results in opening and closing the circuit completed through the contact elements 10 and 11 at a rate synchronized with piston movement in the cylinders of the engine. In accordance with conventional practice, this circuit is shown as comprising a battery 15 and the primary of a step-up transformer 16 of high ratio. When the circuit is completed through the contact elements 10 and 11 a magnetic field is built up in the transformer 16; and the collapse of this field when the circuit is opened delivers a high voltage impulse to whatever spark plug may be connected to the secondary at that time. The condenser 17 serves to reduce undesired arcing between the contacts.

Turning now more particularly to the contact element 10 and the way in which it is mounted, it will be seen that the contact element 10 is held in place on a supporting member or stud 18 by an annular spring 19. The arrangement is such that there is what may be termed a ball and socket relation between the contact element 10 and its supporting member, permitting universal or swivelable movement of the contact member within a range limited by the construction of the parts. The spring 19, of course, serves to hold the contact element in place on the supporting member while permitting the limited swivelable movement. The exact construction and arrangement of such a universal mounting is fully disclosed in Janser Patent No. 2,214,530, issued September 10, 1940; and it will not, therefore, be further described here.

As will be best seen in Figures 2 and 3, the flat contacting surface of the contact element 10 is, in the preferred form as illustrated, divided into preferably four similar segments 20, 21, 22 and 23 by the grooves 24 and 25. As will be seen in Figure 3, these grooves are disposed transversely of the circular contact surface at right angles to each other. The result is that the con-

tact surface of the element 10 is divided into four similar segments all on the same plane.

Since the cooperating contact surface of the element 11 is flat, and since the universal mounting enables proper relation of the two contacting surfaces, each of the segments of the contact element 10 will be brought into engagement with a cooperating portion of the contact surface of the element 11, with substantially uniform pressure. This results in each of the segments carrying a portion of the current, so that there is one small arc, upon breaking of the circuit, at some point on each of the segments rather than one large arc at some one point. Moreover, if an undesirable amount of foreign matter, as oil or grit, gets onto the surfaces the small segments seem to be able to cut through this film easier and provide a contact of lower resistance than would otherwise be possible.

Heretofore most ignition systems in commercial usage have used one flat contact surface and one slightly arced or convex surface. This resulted in an actual contact area smaller than the contact area provided by any one of the four segments of my improved point, and I have demonstrated that if any one segment is clean and operating properly, it provides as low contact resistance as such a conventional point arrangement, even though the other three segments are covered with oil film, heavy oxide, or the like. In this regard, it is desirable to divide the contact surface into four or more segments in order to have a plurality of relatively small areas.

In the embodiment of my invention illustrated in Figures 4, 5 and 6, I achieve the advantages of a plurality of contacting segments in conjunction with means for insuring perfect alignment between the contacting surfaces, the means in this case comprising the factory manufacture, setting, and alignment of a breaker point unit which is inserted as a unit in the distributor of the engine. Perfect alignment of the cooperating contacting surfaces of flat breaker points cannot be achieved by the ordinary mechanic who installs the breaker point himself in a distributor; but where all of the cooperating parts are factory installed and aligned on a mounting plate, and the local mechanic merely puts the entire unit into the distributor, proper alignment can be maintained and insured.

Referring now to the drawings, a plate 30 is adapted to be inserted in or removed from a distributor, the shell 31 and cam 32 being shown. The plate is merely slipped over the cam shaft and down into position, and then locks there by any appropriate means, as a spring ring. The plate 30 has mounted on it the brackets and movable arms carrying the cooperating breaker points. In the particular commercial arrangement here shown, two pairs of identical arrangements are used, and only one of these will be described in detail. It will be seen that a bracket 33 mounted on the plate 30 has an upstanding portion 34 which carries what is termed the fixed breaker point or contact 35. The plate 30 also carries a stud 36 about which is rotatably mounted a breaker arm 37. This breaker arm carries the moving contact point 38 at its outer end, the arm being urged in the direction tending to bring the points together by the spring 39. In accordance with conventional practice the arm 37 carries a rubbing block 40 adapted to engage the cam 32 to open and close the points at desired intervals. By precision assembly and adjustment of all of these parts at the factory,

it will be readily apparent that perfect and complete contact (i. e., proper alignment) between the contact points can be insured.

In order to achieve the benefits of my improvements in connection with this latter modification, I divide the contacting surface of one of the breaker points, as the fixed point, into a plurality of segments. As may be best seen in Figure 6, the point 35 or its contact surface may be divided into segments 41, 42, 43 and 44 by grooves or cuts. In any form of my invention these intermediate grooves may be V-shaped, or they may be relatively straight sided cuts extending into the tungsten body, or through it, or through such tungsten body into the base beneath the tungsten content. The principal thing is to divide the contacting surface into a plurality of portions or segments, preferably with substantial openings therebetween, so that there will be a good division of arcing between all of the portions or segments and a considerable movement of air in the slots as the points open and close. Arcing creates ozone, and if this ozone is allowed to remain at the surface of the contact points, they oxidize more rapidly than would otherwise be the case.

The small tungsten disc providing the contact surface is usually welded or otherwise fastened to a ferrous metal base, and I have found that under some conditions of use it is preferable to cut clear through the tungsten into the base. Figure 8 shows a form of contact which is very simple to manufacture, and quite effective, wherein the groove is V-shaped and just extends to the base. Figure 9 shows a somewhat preferable form wherein the V-shaped groove dividing the tungsten into segments or portions extends not only through the tungsten but partially into the base. This provides more space for ventilation, and better distribution of the current between the various contacting portions. I have found that one very convenient method of cutting the tungsten is by use of a small rubber abrasive cutting wheel, the use of such a wheel giving a straight-sided groove as illustrated in Figures 10, 11 and 12. Figure 10 shows the groove extending only partially through the tungsten; Figure 11 shows it extending clear to the base; and Figure 12 shows a preferable form where it extends down to the base.

In connection with any modification of my invention, I have found that it is preferable to make at least one of the contacting surfaces or segments slightly lower than the others, this being illustrated in Figure 7. In this fragmentary view, it will be noted that the plane of the contacting surface 45 is slightly above or offset relatively to the plane of the contacting surface 46, preferably about $\frac{2}{1000}$ of an inch. I have found that if one of the contacting segments is thus made slightly lower than the others, the others will carry the current load for a considerable length of time, say four or five thousand miles of travel of an ordinary automobile. By that time, however, they will have pounded down until the previously inoperative segment becomes effective, thus bringing a fresh, clean, contacting surface or surfaces into operation. Not only does this automatically provide a new contacting surface or surfaces which are not oxidized or pitted, but it seems to give the other surfaces a chance to rest, as it were, and to pound out some of their oxide film. At any rate, the other contacting segments actually improve slightly after the lower segment or segments have come into operation.

The separate surfaces seem to operate as separate contacts, each carrying their respective portion of the total current load, in so far as arcing and pitting are concerned, a long run with my improved points resulting in several very small and relatively unobjectionable pits rather than one large pit. Moreover, it appears that the grooves improve the cooling and ventilation of the contact surfaces and result in a slower rate of oxidation of the tungsten or other metal used by rapidly removing ozone from the arcing surfaces; and, as stated above, the provision of a number of segments, with at least one preferably slightly below the others, seems to enable the points to better withstand dirty conditions, as so frequently found in the distributors of old trucks and cars. Whatever the explanation may be, however, the fact is that points of my improved type stand up better over long periods of service, maintain the desired spacing and separation better because of lessened pitting, and after long periods of use have lower contact resistance than conventional points run under similar conditions.

While I have described and shown certain embodiments 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 without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. Circuit making and breaking apparatus of the character described, including: a contact element having a flat contacting surface; a second contact element having at least three flat contacting surfaces, at least two of said surfaces being in one plane and at least one of said surfaces being in a slightly lower plane; and means

for moving the contacting surfaces of the elements into and out of engagement with each other.

2. Circuit making and breaking apparatus of the character described, including: a contact element having a flat contacting surface; a second contact element having at least three flat contacting surfaces, at least two of said surfaces being in one plane and at least one of said surfaces being in a slightly lower plane; means for insuring perfect alignment of said contacting surfaces; and means for moving one of said elements relatively to the other of said elements whereby the contacting surfaces of the elements are brought into and out of engagement with each other.

3. Circuit making and breaking apparatus of the character described, including: a contact element having a flat contacting surface; a second contact element having at least three flat contacting surfaces, at least two of said surfaces being in one plane and at least one of said surfaces being in a plane about $\frac{2}{1000}$ of an inch lower than the first-mentioned plane, one of the contact elements being so mounted as to have at least limited universal movement; and means for moving one of said elements whereby the contacting surfaces of the elements are brought into and out of engagement with each other.

4. A circuit making and breaking contact element including a support for said element, said contact element being divided into a plurality of spaced portions secured in relatively fixed positions on said support, said spaced portions being separated by recesses extending between said portions and partially into said support and said portions having plane-aligned contact surfaces.

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