

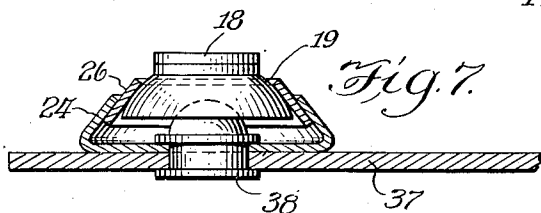
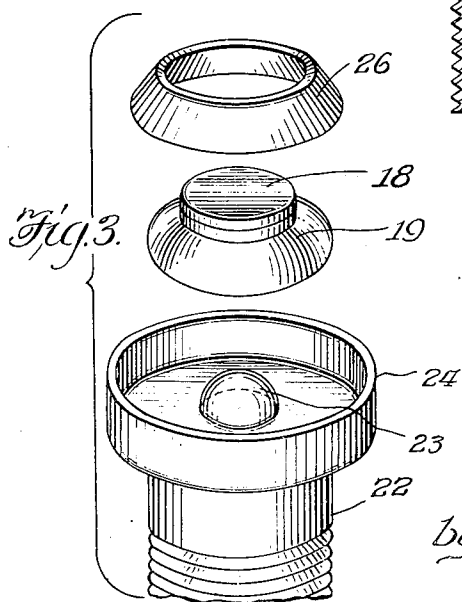
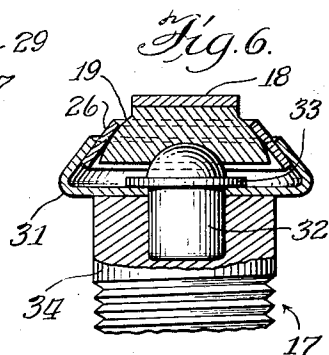
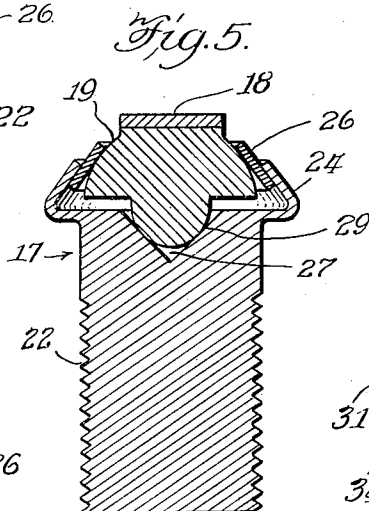
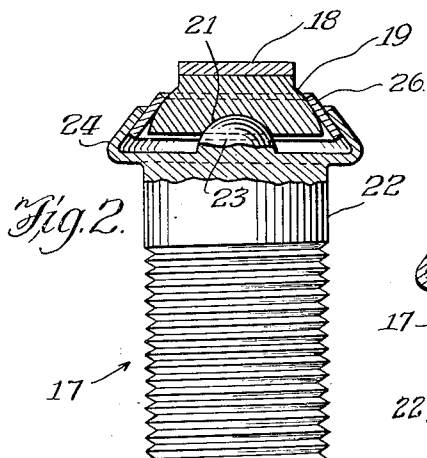
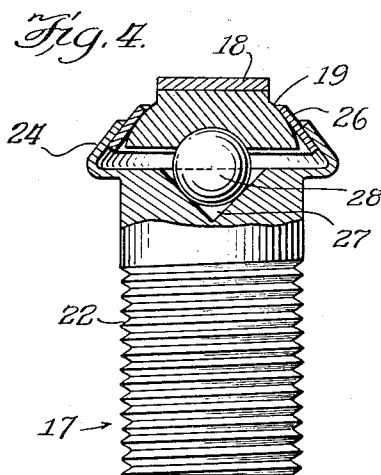
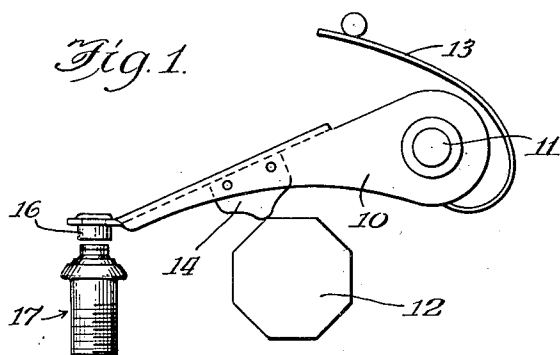
March 11, 1941.

C. E. IVES

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CIRCUIT BREAKER

Filed March 23, 1938



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2,234,346

CIRCUIT BREAKER

Clifford E. Ives, Chicago, Ill.

Application March 23, 1938, Serial No. 197,572

14 Claims. (Cl. 200—166)

My invention relates to circuit interrupting and closing mechanisms. It relates more in particular to circuit breakers of the type employed in ignition systems of automobiles wherein a pair of contact points is provided, one stationary and the other adapted to be moved with respect to the stationary contact for the purpose of opening and closing the circuit. In its more specific aspects, the invention is concerned with an improved breaker point assembly having a contacting surface adapted to comprise one of the contact members of such a system.

In my prior application Serial No. 111,762, filed November 20, 1936, I disclose a circuit breaker having many advantages in the association in which it is employed. The breaker point of my prior invention has a contact member swivelable on its seat sufficiently to permit its face to be maintained in alignment with the face of a cooperating contact member, but so supported that adequate electric conductance is maintained and in general excellent performance assured. This contact point, however, must be very carefully manufactured in order to assure uniform results and, while it may be utilized as a stationary contact, it is, in general, more adapted for association with the movable breaker arm.

My present invention is concerned with a similar breaker point with the same general functions and advantages, but with added improvements, particularly from the standpoint of manufacture, assembly and uniformity.

The objects and features of my invention will be made clear from the detailed description that follows. In the accompanying drawing

Fig. 1 is an elevational view showing a circuit breaker employing the features of my invention;

Fig. 2 is a sectional view, partly in elevation, of the stationary contact member employed in Fig. 1;

Fig. 3 is an exploded perspective view showing the parts utilized in Fig. 2 before they are assembled; and

Figs. 4 to 7, inclusive, illustrate modifications employing the same general principles.

In general, I secure the objects of my invention by utilizing a contact member having a contacting face, an annular shoulder, and a seating surface, the shoulder and seating surface being generally spherical and generated about a common center. I utilize a support member carrying a central seating surface engaging the seating surface on the contact member and an annular flange of normal cup-shape formed by spinning,

crimping, or other suitable operation, to engage around the annular shoulder. Preferably, I utilize a dished ring of spring material between the cup-shaped member and the annular shoulder whereby to impart greater resiliency to the engagement between the support member and the contact member. The cup-shaped portion of the support member may be integral with the support member or it may comprise a separate member suitably secured thereto. A suitable and desirable construction is to form the seat carried by the support member on a separate seat member which is secured to the main support member in such a way as to hold the cup-shaped member in position. The cup-shaped member may be formed of suitable material, such as spring material for example, in which case it may take the place of the dished ring entirely. For practical reasons, however, the use of the separate dished ring is preferred.

By this general arrangement, I provide a structure, all of the parts of which are simply and readily made on standard equipment found in any ordinary machine shop, and these parts are readily assembled by simple operations. Inspection problems are decreased because, in engaging the support member around the contact member, operations may be performed with unusual accuracy so that the tightness with which the contact member is held in position is substantially identical from part to part.

Referring now to Figs. 1 to 3, inclusive, I show a contact arm 10, reciprocable about a post 11, by the conjoint action of a cam 12 and a spring 13. The cam 12 engages a rubbing block 14 of usual type. A contact point 16 is secured to the arm 10 in a conventional manner. A stationary contact, generally indicated by the reference character 17, is positioned with respect to the contact member 16 so that on reciprocation of the arm 10, a circuit is made and broken between the contact members.

The stationary contact 17 has a contact member provided with a contacting face 18, a shoulder 19, and a seat 21. The contacting face 18 preferably is formed on a pellet of tungsten or other suitable contact material secured to the remaining portion of the contact member which is preferably formed of a suitable ferrous metal. The contact member and its manner of formation may be substantially as described in my prior application.

The shoulder 19 and seating surface 21 comprise surfaces of spheres generated about a common center. This arrangement, as will be de-

scribed, is provided for cooperation with a support member to permit free swiveling so far as is required to maintain alignment of the contacting surface 18.

5 A threaded shank 22 has an integral, convex, spherical seating surface 23, coincident with its axis, and an annular flange 24 deformed inwardly so as to engage the outside of a dished ring 26 which lies against the shoulder 19. Thus, the
10 contact member is held resiliently in position but still with sufficient rigidity and firmness that adequate electrical contact is maintained at all times.

The manner of forming this assembly is clear
15 from Fig. 3 taken with Fig. 2. The annular flange 24 is cup-shaped and, as formed, this flange is substantially parallel to the axis of the support member. The dished ring 26, preferably formed of spring material such as phosphor-bronze and the like, is separately formed by stamping. If
20 the parts shown in the exploded view are nested together in the order there shown, and the flange 24 is then formed over so as to engage the dished ring 26, the assembly is complete as shown in Fig. 2. This deforming operation may be made by
25 any suitable operation. Preferably I mount the assembly in a jig which has a pair of cooperating die members capable of being brought together, one die member engaging under the rim of the
30 cup-shaped portion of the support member and the other having a generally conical inner surface engaging over the upper rim of the flange with a definite pressure so as to form the entire circumference of the flange over and inwardly in
35 a single operation. Since the pressure on the die can be controlled and the characteristics of the materials may be maintained substantially uniform, uniform results in assembly are substantially assured.

40 In Fig. 4, I show a modification wherein a generally conical axial aperture 27 is provided in the support member in which a ball 28 is seated, this ball having an outside surface, the radius of curvature of which is substantially the same as
45 the convex spherical surface on the swiveling contact member. The straight line surfaces of the aperture 27 are substantially tangent to the surface of the ball 28. Thus, when the parts are assembled as shown in Fig. 4 a swivelable connection is established which, for all practical
50 purposes, is equivalent to the structure of Fig. 2. I have accordingly applied the same reference characters as employed in Fig. 2 to like parts in Fig. 4.

55 In the form shown in Fig. 5, a convex seating surface 29 is provided on the swivelable contact member, the radius of curvature of which is shorter than the radius of curvature of the shoulder 19, but both surfaces are sections of
60 spheres generated about a common center. I employ an aperture 27 in the support member identical with the aperture described in connection with Fig. 4. The straight line surfaces of this aperture are substantially tangent to the
65 convex seating surface 29. The remaining parts are substantially as described in connection with the previous figures and obviously substantially the same functional result is obtained.

70 In Fig. 6, the portion of the assembly comprising the support member in the previously described embodiments consists of a plurality of parts instead of being formed from a single solid blank. In this form, I utilize a separate cup-shaped member 31 having a central aperture. A
75 seat member 32 is provided having a generally

semi-spherical convex seating surface, and a right angular flange 33 so disposed that when the shank of the seat member is driven into an aperture provided in the top of a supporting
5 shank 34, it holds the cup-shaped member in position. In this embodiment, when the members 31, 32 and 34 are assembled, the result is the provision of a body capable of assembly with a contact member, as shown, to produce substantially the same general result as that obtained in the previous embodiments. The
10 embodiment of Fig. 6, however, has the advantage that a different material may be employed for the three parts where desired, and different methods of forming the different parts may be
15 utilized where such should be of advantage. For example, the cup-shaped member 31 may, if desired, comprise a stamping, while obviously, in the form shown in Fig. 2, the entire support member would have to be made as a unit on a
20 suitable piece of equipment such as an automatic screw machine. The parts of the embodiment of Fig. 6 which are identical with those parts previously described are given the same reference characters for convenience and in order
25 to conserve space.

The embodiment of Fig. 7 is generally similar to the embodiment of Fig. 6 with the exception that the support member comprises an arm 37
30 which may be associated with either the movable or stationary contact of a circuit breaker system. The seat member extends entirely through an aperture in the arm 37 and is riveted over as shown at 38 to produce a rigid assembly. The arrangement of the cup-shaped member, convex
35 seat on the seat member, and the like, are otherwise substantially the same as shown in the previous embodiment. As in the other embodiments, the same reference characters are employed to identify like parts.

40 Thus it will be seen that the improvements of my invention are capable of many modifications while still employing the same general principles. Each of the embodiments may possess certain advantages or disadvantages as compared
45 to the others depending upon specific considerations. In each case, however, the contact member is provided with a contacting surface, an annular shoulder and a seat portion, and the support member is provided with an annular
50 flange, engaging a dished ring formed preferably of spring material which engages the annular shoulder on the contact member, and a seat or seating surface which cooperates with the seating
55 surface on the contact member to permit a swiveling function with which my invention is concerned.

In those embodiments in which the support member comprises a single unitary member, the same functional parts are provided as in the
60 figures where the support comprises a plurality of members secured together to form a substantially integral structure. In this latter form of embodiment, I employ the term "support" in the claims to identify both the complete support assembly and the main supporting part thereof, but
65 in each case the context of the claim is believed to render the significance of the language clear.

A characteristic of the seating surfaces is that those surfaces which are sections of spheres are
70 all generated about a common center. Those surfaces which are not spheres are in the direction in which movement takes place tangent to a sphere generated about the same common center. This is true of the conical aperture of Figs. 75

4 and 5 and also of that surface of the dished ring which engages the annular shoulder. It may be pointed out here that the dished ring may have its surfaces flat as shown, or such surfaces may be concave-convex if desired. The function in either case is the same. Because of this arrangement of surfaces, swiveling is permitted even though the contact member be held firmly, because swiveling entails a movement about a center and all surfaces are so related to that center as to facilitate swiveling without binding.

I have described the features of my invention in detail and illustrated several embodiments for the guidance of those skilled in the art. My invention is limited, however, only by the scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. In a circuit breaker, a contact member having a contacting face, an annular shoulder portion and a seat portion, said shoulder portion and seat portion being spherical and generated about a common center, a dished ring lying against said shoulder portion, a support member having a seat with which the seat portion of the contact member is associated, and an annular flange carried by the support member engaging said dished ring to hold said dished ring against said annular shoulder portion whereby to hold said contact member firmly on its seat.

2. In a circuit breaker, a contact member having a contacting face and two discontinuous seating surfaces, a dished ring of spring material engaging one of said seating surfaces, and a support member having a seating surface against which the second of said seating surfaces of the contact member engages, said support member engaging said dished ring so as to pinch it against said seating surface, all of said seating surface being spherical and generated about a common center, or substantially tangent to such a spherical surface.

3. In a circuit breaker, a contact member having a contacting face, and two discontinuous seating surfaces, a support member for said contact member having two surfaces engaging the seating surfaces of the contact member, and pinching the contact member between them, at least two of said surfaces, which are not mutually engaging, comprising sections of spheres of different diameters generated about a common center, and a dished ring of spring material disposed between said support member and one of the seating surfaces of said contact member.

4. In a circuit breaker, a swiveled contact member having a contacting surface on one side thereof, a convex spherical shoulder surrounding said contacting surface and facing in the same direction as said contacting surface but spaced therefrom, and a spherical seating surface on the opposite side thereof, a dished ring engaging said shoulder, and a support member carrying a seat engaged by said spherical seating surface and an annular flange engaging said dished ring and causing it to engage firmly against said shoulder.

5. A circuit breaker as defined in claim 4 wherein said support member includes a threaded shank whereby to adjust the position of said contacting face with respect to a contacting face carried by a cooperating contact member.

6. In a circuit breaker, a support member comprising a normally cup-shaped portion having a central seat portion, a contact member having

a contacting face, an annular shoulder and seat portion being sections of spheres generated about a common center and facing in opposite directions, said seat portion engaging the seat portion on the support member, and a dished ring of spring material, the rim of said cup-shaped portion being formed over to engage said ring and hold it against said shoulder.

7. A circuit breaker as defined in claim 6, wherein said support member includes an arm adapted to comprise a movable contact arm of a motor circuit breaker.

8. In a circuit breaker, a cup-shaped member having a central aperture, a seat member having a seat, a shank extending through said aperture and an annular flange, a support member, said seat member engaging said support member whereby to hold said cup-shaped member firmly in position, a contact member having a seat engaging the seat of the seat member, an annular shoulder, and a contacting face, and a dished ring of spring material engaging said annular shoulder, said cup-shaped member engaging said dished ring whereby to hold said contact member resiliently against its seat.

9. A circuit breaker as defined in claim 8 wherein the shank of said seat member extends entirely through said support member and has such end riveted over to secure it in position.

10. A circuit breaker as defined in claim 8, wherein said shank has a drive fit in an aperture provided in the support member.

11. In an automobile ignition circuit breaker, a movable contact arm having a contact member integrally associated therewith, said contact member having a contact face, and a stationary contact assembly comprising a support having a seat, and a swivellable stationary contact member associated therewith, said stationary contact member comprising a contact face, a shoulder and a seat, said shoulder and seat being discontinuous, said contact seat and support seat being mutually engaging and so shaped as to permit relative swivelling movement therebetween, and means associated with said support for engaging said shoulder to maintain engagement between said seats, while allowing limited swivelling movement between said contact member and its support, whereby face to face engagement of said contact members is maintained and said movable contact arm may be of light weight whereby high operating speeds thereof may be employed.

12. A contact of the kind described, including: a supporting member having upwardly extending side walls; a contact element having a contact face and a base portion having a recess therein, the supporting member being provided with means adapted to cooperate with said recess to form a pivotal connection between the element and the member; and resilient means engageable with said side walls and said base portion to maintain the parts in positive operative relation.

13. Apparatus of the character claimed in claim 12, wherein the side walls extend above the remainder of the supporting member to make it cup-like in shape, and the resilient means is in the form of a ring engaging the interior of the side walls.

14. A contact of the kind described, including: a cup-like supporting member having upwardly extending side walls extending above the remainder thereof; a contact element having a contact face and a base portion having a re-

cess therein, the supporting member having, in the center of the cup-like space defined therein, an upwardly extending part providing a segmental spherical portion adapted to be received by the recess and engage its walls to provide a supporting pivotal bearing surface for the con-

tact element, the side walls being spaced throughout from the element; and a ring of spring metal engaging said base portion and the interior of the side walls to maintain the parts in positive operative relation.

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