Dec. 20, 1960 J. C. NORRIS ET AL 2,965,726

DISTRIBUTOR

Filed Nov. 25, 1957

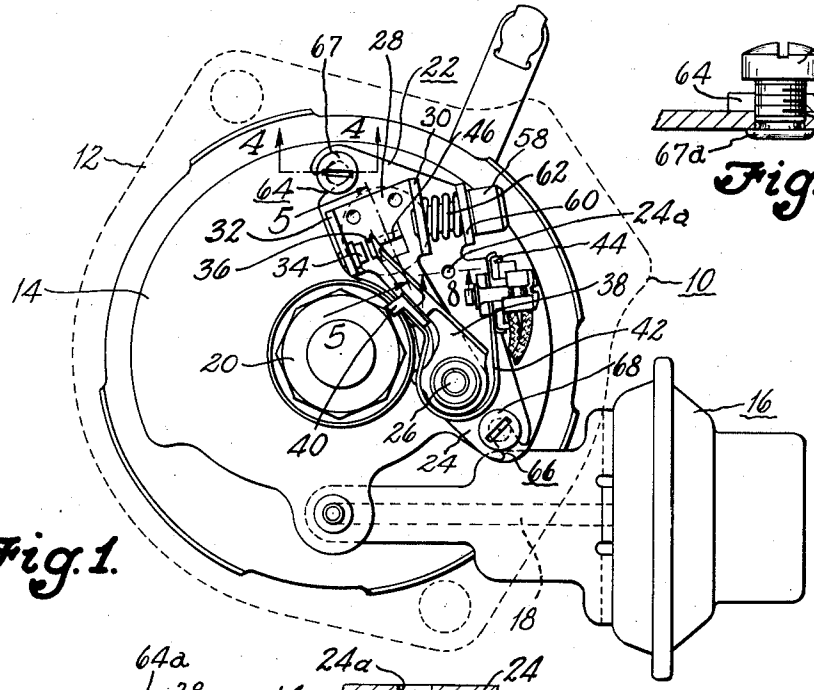


Fig. 1.

Fig. 4.

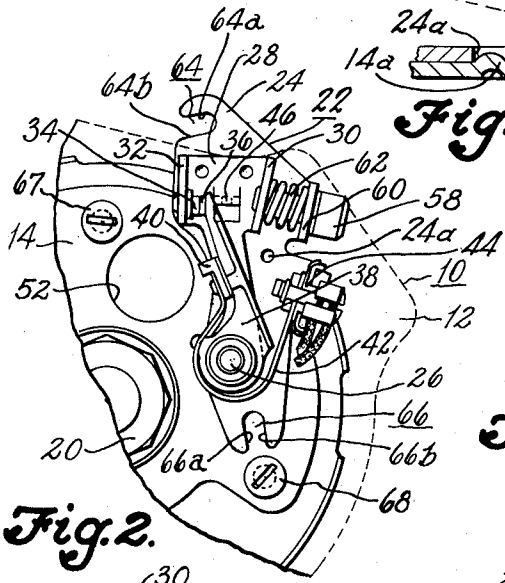


Fig. 2.

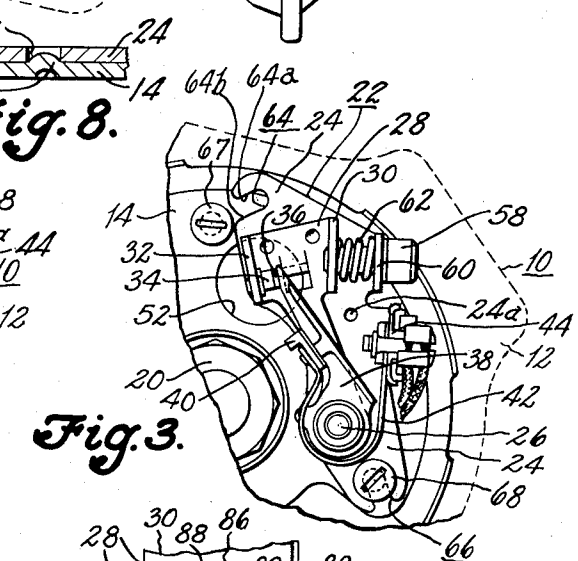


Fig. 3.

Fig. 8.

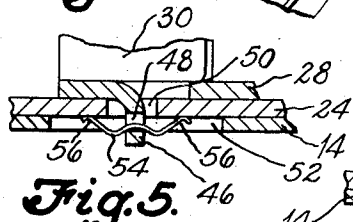


Fig. 5.

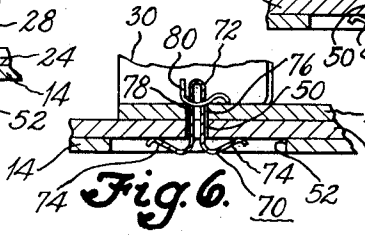


Fig. 6.

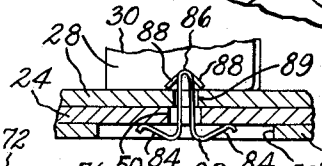


Fig. 7.

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12 Claims. (Cl. 200—30)

This invention relates to motor vehicle distributors, and more particularly to an arrangement for mounting a distributor circuit-breaker assembly on a breaker plate and to an arrangement for securing together certain parts of the circuit-breaker assembly.

It is an object of this invention to provide a motor vehicle distributor wherein a circuit-breaker assembly may be attached to or removed from a breaker plate without removing the attaching screws from their threaded openings in the breaker plate. This object is accomplished by providing the contact supporting plate of the circuit-breaker assembly with open-ended slots at opposite ends thereof that accommodate the screws.

It is another object of this invention to provide a distributor wherein a breaker plate carries a plurality of threaded fasteners that are adapted to secure a circuit-breaker assembly to a breaker plate, and wherein the threaded fasteners are headed or staked over at one side of the breaker plate to prevent removal of the threaded fasteners from the breaker plate, the circuit-breaker assembly including a contact supporting plate having open-ended slots formed at opposite ends thereof that accommodate the threaded fasteners.

A further object of this invention is to provide a circuit-breaker assembly for a distributor wherein the contact supporting plate carries a second plate that is pivotally connected to the contact supporting plate at one end thereof, and wherein a slidable connection is provided between the opposite end of the second plate and the contact supporting plate, the slidable connection including a resilient member that is secured to the second plate and which has a portion projecting through a slot formed in the contact supporting plate, the portion extending through the slot having integral ears that slide along one face of the contact supporting plate.

Still another object of this invention is to provide a circuit-breaker assembly including a contact supporting plate that has open-ended slots formed at opposite ends thereof and wherein the open end of one of the slots faces in a direction substantially normal to the direction of facing of the open end of the other slot.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a top plan view of a distributor made in accordance with this invention showing the breaker-plate assembly and circuit-breaker assembly of the distributor.

Fig. 2 is a partial top plan view of the distributor shown in Fig. 1 and showing one step of a series of steps for assembling a circuit-breaker assembly to the breaker plate of the distributor.

Fig. 3 is a view similar to Fig. 2 and showing another step in the attachment of the circuit-breaker assembly to a breaker plate.

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken along line 5—5 of Fig. 1.

Fig. 6 is a sectional view similar to Fig. 5 showing a modified arrangement for slidably securing together two plate members of a circuit-breaker assembly.

Fig. 7 is a sectional view similar to Fig. 5 showing still another arrangement for securing together two plate members of a circuit-breaker assembly.

Fig. 8 is a sectional view taken along line 8—8 of Fig. 1.

Referring now more particularly to Fig. 1, a distributor generally designated by reference numeral **10** is shown. The distributor has a housing **12** and a breaker plate **14** that is rotatably supported by the housing in any suitable manner. The breaker plate **14** is connected with a vacuum power unit **16** by a link **18**. The vacuum unit, as is well known to those skilled in the art, rotates the breaker plate **14** to adjust the timing of the distributor. A breaker cam **20** is located centrally of the breaker plate and is connected with a shaft (not shown) that is, in turn, driven by the engine of a motor vehicle in a conventional manner.

The circuit-breaker assembly of the distributor is generally designated by reference numeral **22** and comprises a contact supporting plate **24** that carries a pin **26**. The pin **26** pivotally supports a second contact plate **28** that has an opening (not shown) through which the pin **26** passes. The contact plate **28** is provided with upturned flanges **30** and **32**, the flange **32** carrying a fixed electrical contact **34**. The contact **34** co-operates with an electrical contact **36** that is carried by a breaker arm **38**, which is pivotally supported by pin **26**. The breaker arm **38** carries a rubbing block **40** which engages the breaker cam **20**. The contacts **34** and **36** are normally held closed by a spring **42** which has one end attached to rubbing block **40** and which has its opposite end fixed to an upstanding lug **44** which is integral with the contact supporting plate **24**. With this arrangement and during rotation of cam **20**, the breaker arm **38** is periodically moved to an open position against the bias of spring **42** to provide for intermittent engagement of the breaker point contacts **34** and **36**.

The plate **28**, as is more particularly shown in Fig. 5, is provided with a downturned tongue **46** having an opening **48**. This tongue projects through a slot **50** formed in contact supporting plate **24** and also projects into an opening **52** formed in breaker plate **14**. A rectangular spring metal member, generally designated by reference numeral **54** and having upwardly-extending ears **56**, is threaded through the opening **48** of downturned tongue **46** with the upstanding ears **56** engaging the lower face of contact supporting plate **24**. The opening **48** is made just wide enough to accommodate the spring metal member **54**. The slot **50** is wide enough to provide for sliding movement of tongue **46** within the slot **50**, this movement being along an arc of a circle whose center is the center of pin **26**.

The flange **30** of plate **28** has a threaded opening that is adapted to receive a threaded fastener **58**. The threaded fastener passes through an opening in a flange **60** that is integral with the contact supporting plate **24**. A spring **62** is interposed between flanges **30** and **60** and normally biases the plate **28** in a counterclockwise direction around pivot pin **26** as viewed in Fig. 1. With this arrangement, the plate **28** may be adjusted relative to contact supporting plate **24** by a rotation of the threaded fastener **58**. When the plate **28** is being adjusted relative to contact supporting plate **24**, the spring **54** provides a slidable connection therebetween, the ears

56 sliding along the bottom edge of contact supporting plate 24.

It is to be particularly observed that the contact supporting plate 24 is provided with open-ended slots 64 and 66 which are adapted to accommodate threaded fasteners 67 and 68. The side edges 64*a* and 64*b* of slot 64 are directed along an arc of a circle, the center of which is located within the arcuate portion of slot 66, and thus the open end of slot 64 faces in a direction that is substantially normal to the open end of slot 66. The threaded fastener 67, which may be a screw, is shown in greater detail in Fig. 4. This fastener threadingly engages a threaded hole 69 formed in breaker plate 14 and has a staked or headed-over portion 67*a* located below breaker plate 14 which prevents the removal of screw 67 from the breaker plate. The threaded fastener 68 is identical to threaded fastener 67 and is likewise threaded into breaker plate 14 and has a staked or headed-over portion which prevents removal of the fastener from the breaker plate. It is also to be observed that the breaker plate 14 has a dimple or struck-away portion 14*a* that interfits with an opening 24*a* formed in contact supporting plate 24.

When it is desired to assemble the circuit-breaker assembly 22 to the breaker plate 14, the slot 66 is slid onto the shank of threaded fastener 68 and the circuit-breaker assembly is then rotated counterclockwise to a position wherein the slot 64 surrounds the shank of threaded fastener 67. These steps of assembly are illustrated in Figs. 2 and 3 of drawings. When the circuit-breaker assembly is in place, as shown in Fig. 1, the dimple 14*a* fits within opening 24*a* and the threaded fasteners may then be tightened to tightly secure the circuit-breaker assembly 22 to the breaker plate 14. It will be observed that it is not necessary to remove the screws 67 and 68 from the breaker plate in order to remove or assemble a circuit-breaker assembly to the breaker plate. In fact, with the arrangement described, it is impossible with ordinary means to remove the screws 67 and 68 from the breaker plate 14 once the screws have been assembled to the breaker plate and headed over as shown in Fig. 4.

As noted above, the open ends of slots 66 and 64 are positioned in a predetermined angular relationship so that the slot 64 extends along an arc of a circle whose center is located within slot 66. Further, as noted above, the breaker plate 14 has a protuberance 14*a* that fits within opening 24*a* in contact supporting plate 24. This arrangement provides for easy assembly of the circuit-breaker assembly to the breaker plate, and also insures that the circuit-breaker assembly 22 will be held positively to the breaker plate 14 during rotation of breaker cam 20. This is due in part to the fact that the side edges 66*a* and 66*b* of slot 66 face in a direction that is substantially normal to the line of force being applied to the breaker arm through breaker cam 20 and rubbing block 40. This line of force thus tends to move the side edge 66*a* of the slot 66 against the threaded fastener 68, which precludes movement of the circuit-breaker assembly 22 away from breaker cam 20. The assembly 22 is also held fixed from movement away from breaker cam 20 by reason of the dimple 14*a* contacting the walls of opening 24*a* of contact supporting plate 24. The dimple 14*a* cannot leave the opening 24*a* because the circuit breaker assembly 22 is held tightly against breaker plate 14 by screws 67 and 68. It should be observed that the position of slots 64 and 66 could be reversed, in which case the side edges 66*a* and 66*b* of slot 66 again would be normal to the line of force being applied to rubbing block 40 but would pass around screw 67 rather than around screw 66.

Referring now to Fig. 6, a modified arrangement for slidably supporting one end of plate 28 on contact supporting plate 24 is shown. In this figure the same reference numerals as used in Fig. 5 are employed to designate identical parts in each figure. In the arrangement of Fig. 6, a resilient spring clip 70 is provided which has a U-shaped shank 72 and a pair of upwardly-extending ears 74. The U-shaped shank 72 projects through an opening 76 formed in contact supporting plate 28, and also projects through opening 50 formed in contact supporting plate 24. The ears 74, like the arrangement shown in Fig. 5, are positioned in the opening 52 formed in breaker plate 14. The U-shaped shank member 72 has slots 78 through which are passed a retaining member 80 that contacts the upper face of plate 28. With the arrangement shown in Fig. 6, a slidable connection is provided between contact support 24 and plate 28, the ears 74 sliding along the lower face of contact plate 24 and the upper end of U-shaped member 72 being held in fixed relationship to plate 28 by member 80. The opening 76 in this arrangement is just wide enough to accommodate the width of spring clip 70.

Another modified arrangement for providing a slidable connection between one end of plate 28 and contact supporting plate 24 is illustrated in Fig. 7. In this figure, the same reference numerals as those used in Fig. 5 have been employed to identify identical parts in each figure. In the arrangement of Fig. 7, a spring metal member 82 having upstanding ears 84 is employed. The spring metal member has a U-shaped shank portion 86 which carries outwardly-struck ears 88. The shank portion 86 passes through a slot 89 formed in contact support 28 and passes through a slot 50 formed in contact supporting plate 24. The slot 89 is just wide enough to accommodate the width of shank portion 86. The lower ends of ears 88 engage the top edge of plate 28, whereas the upstanding ears 84 engage the lower edge of contact supporting plate 24. With the arrangement described, a slidable connection is provided between plate 28 and contact supporting plate 24, the ears 84 sliding along the lower edge of contact support 24 and the ears 88 providing a fixed connection between the spring metal member 82 and the plate 28. In the arrangement of Fig. 7, it is only necessary to force the spring metal member 82 upwardly through slots 50 and 89 to assemble the plate 28 to the contact supporting plate 24. When the spring metal member 82 has been forced upwardly a sufficient distance, the ears 88 snap outwardly to engage the upper face of plate 28.

It will be observed that in the embodiments of Figs. 5, 6 and 7 the plates 28 and 24 are spring-held together from vertical movement relative to one another, but are permitted to slide relative to one another. In each case, this connection is made by a rectangular resilient spring member which has upstanding ears that slidingly engage a lower face of contact supporting plate 24 and which is secured to plate 28.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a motor vehicle distributor, the combination comprising, a driven cam member, a breaker plate, a circuit-breaker assembly including a contact supporting plate and a second plate secured to contact supporting plate, a fixed electrical contact supported by said second plate, a breaker arm carrying an electrical contact that intermittently engages said fixed contact pivotally supported by said contact supporting plate and having means in engagement with said cam member for intermittently separating said fixed and movable contacts, a first open-ended slot in said contact supporting plate located at one end thereof, a second open-ended slot in said contact supporting plate located at the opposite end of said contact supporting plate from the location of said first slot, a first threaded fastener passing through said first slot in threaded engagement with said breaker plate for holding one end of said circuit-breaker assembly in fixed relationship with said breaker plate, and a second threaded fastener passing through said second slot in threaded en-

gagement with said breaker plate for holding the opposite end of said circuit-breaker assembly in fixed relationship with said breaker plate, said threaded fasteners each having bent-over portions located at the side of said breaker plate opposite from the side that supports said circuit-breaker assembly whereby said threaded fasteners are prevented from being removed from said breaker plate.

2. In a motor vehicle distributor, the combination comprising, a rotatable cam member, a breaker plate, a circuit-breaker assembly including a contact supporting plate and a second fixed contact supporting plate, a fixed electrical contact point supported by said second plate, a breaker arm carrying an electrical contact that intermittently engages said fixed contact pivotally supported by said contact supporting plate and having means in engagement with said cam member for intermittently separating said fixed and movable contacts, a first open-ended slot in said contact supporting plate located at one end thereof, a second open-ended slot having its open end facing in a direction substantially normal to the direction of facing of the open end of said first slot in said contact supporting plate located at an opposite end thereof, a first threaded fastener passing through said first slot in threaded engagement with said breaker plate for holding one end of said circuit-breaker assembly in fixed relationship with said breaker plate, and a second threaded fastener passing through said second slot in threaded engagement with said breaker plate for holding the opposite end of said circuit-breaker assembly in fixed relationship with said breaker plate, said threaded fasteners each having bent-over end portions located at the side of said breaker plate opposite from the side that supports said circuit-breaker assembly whereby said threaded fasteners are prevented from being removed from said breaker plate.

3. A circuit-breaker assembly for a distributor comprising, a contact supporting plate, an upstanding pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of the second plate, and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, a spring metal member having a portion secured to said second plate and having a pair of resilient ears engaging the underside of said contact supporting plate adjacent said opening whereby said contact supporting plate and said second plate are slidably secured together, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, a first open-ended slot located at one end of said contact supporting plate, and a second open-ended slot located at an opposite end of said contact supporting plate, said second slot extending along an arc of a circle the center of which is located in said first slot.

4. A circuit-breaker assembly for a distributor comprising, a contact supporting plate, an upstanding pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of said second plate, and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, a downwardly-extending lug having an opening, said lug extending through the opening in said contact supporting plate, a spring metal member extending through the opening in said lug having a pair of ears engaging the underside of said contact supporting plate adjacent said opening whereby said contact supporting plate and said second plate are slidably secured together, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, means for

adjusting said second plate relative to said contact supporting plate, a first open-ended slot at one end of said contact supporting plate, and a second open-ended slot located at an opposite end of said contact supporting plate, said second slot extending along an arc of a circle, the center of which is located in said first slot.

5. A circuit-breaker assembly for a distributor comprising, a contact supporting plate, an upstanding pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of said second plate, and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, an opening in said second plate, a spring metal member having a substantially U-shaped shank portion, extending through said openings and having a pair of resilient ears engaging the underside of said contact supporting plate adjacent the opening in said contact supporting plate, said shank portion having aligned openings located above said contact supporting plate, a member passing through said aligned openings and engaging the top side of said second plate, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, means for adjusting said second plate relative to said contact supporting plate, a first open-ended slot at one end of said contact supporting plate, and a second open-ended slot located at an opposite end of said contact supporting plate, said second slot extending along an arc of a circle the center of which is located in said first slot.

6. A circuit-breaker assembly for a distributor comprising, a contact supporting plate, an upstanding pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of said second plate, and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, an opening in said second plate, a spring metal member having a substantially U-shaped shank portion extending through said openings and having a pair of integral resilient ears engaging the underside of said contact supporting plate adjacent the opening in said contact supporting plate, said shank portion having a second pair of integral ears engaging the top side of said second plate whereby said contact supporting plate and said second plate are slidably secured together, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, means for adjusting said second plate relative to said contact supporting plate, a first open-ended slot at one end of said contact supporting plate, and a second open-ended slot located at an opposite end of said contact supporting plate, said second slot extending along an arc of a circle the center of which is located in said first slot.

7. A circuit-breaker assembly for a distributor comprising, a contact supporting plate, a second plate pivotally supported by said contact supporting plate, an electrical contact supported by said second plate, a breaker arm pivotally mounted on said contact supporting plate carrying an electrical contact that is periodically engageable with said first-named electrical contact, a rubbing block carried by said breaker arm and adapted to be engaged by a distributor breaker cam, a first open-ended slot in said contact supporting plate located adjacent one end thereof, and a second open-ended slot in said contact supporting plate located adjacent an opposite end thereof, said second slot extending substantially along an arc of a circle the center of which is located in said first slot.

8. In a distributor, a breaker plate, a circuit-breaker assembly including a contact plate resting on said breaker plate, a second plate pivoted to said contact plate, a first

contact on said second plate and a breaker arm having a contact that is engageable with said first contact pivotally supported by said contact plate, an open-ended slot in said contact plate, an opening in said contact plate, an integral projection on said breaker plate fitting within said opening, and a screw threaded into said breaker plate having a portion engaging the top side of said contact plate and passing through the said slot formed in said contact plate for holding said projection positively seated in said opening.

9. In a distributor, a breaker plate, a rotatable breaker cam, a circuit-breaker assembly including a contact plate resting on said breaker plate, a second plate pivoted to said contact plate, a first contact on said second plate and a breaker arm having a contact that is engageable with said first contact pivotally supported by said contact plate, a rubbing block on said breaker arm engageable with said breaker cam, an opening in said contact plate, a projection on said breaker plate fitting within said opening, an open-ended slot in said contact plate the side edges of which are located substantially normal to the direction of force applied to said rubbing block by said breaker cam, and a screw passing through said slot having a portion engaging the top side of said contact plate and threaded into said breaker plate for holding said projection positively seated in said opening.

10. In a distributor, a breaker plate, a rotatable breaker cam, a circuit-breaker assembly including a contact plate resting on said breaker plate, a second plate pivoted to said contact plate, a first contact on said second plate and a breaker arm having a contact that is engageable with said first contact pivotally supported by said contact plate, a rubbing block on said breaker arm engageable with said breaker cam, an opening in said contact plate, a projection on said breaker plate fitting within said opening, a first open-ended slot in said contact plate the side edges of which are located substantially normal to the direction of force applied to said rubbing block by said breaker cam, a second open-ended slot in said contact plate having side edges that extend substantially along an arc of a circle the center of which is located in said first slot, a first screw extending through said first slot and threaded into said breaker plate, and a second screw extending through said second slot and threaded into said breaker plate, said screws operating to hold said projection positively seated in said opening.

11. A circuit breaker assembly for a distributor comprising, a contact supporting plate, an up-standing pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of said second plate and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, an opening in said second plate, a spring metal member having a substantially U-shaped shank portion extending through said opening and having a pair of integral resilient ears engaging the under side of said contact supporting plate adjacent the opening in said contact supporting plate, said shank portion having a second pair of integral ears engaging the top side of said second plate whereby said contact supporting plate and said second plate are slidably secured together, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, and means for adjusting said second plate relative to said contact supporting plate.

12. A circuit breaker assembly for a distributor, comprising, a contact supporting plate, an upstanding pin fixed to said supporting plate, a second plate carrying a fixed contact pivotally mounted on said pin at a point located adjacent one end of said second plate and resting on said contact supporting plate, an opening in said contact supporting plate spaced from said pin and located below a portion of said second plate, an opening in said second plate, a spring metal member having a substantially U-shaped shank portion extending through said opening and having a pair of integral resilient ears engaging the underside of said contact supporting plate adjacent the opening in said contact supporting plate, said shank portion having extending portions engaging the top side of said second plate whereby said contact supporting plate and said second plate are slidably secured together, a breaker arm pivotally supported by said pin having a contact that is engageable with said fixed contact and carrying a rubbing block that is adapted to engage a distributor breaker cam, and means for adjusting said second plate relative to said contact supporting plate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,187,430	Kenly	June 13, 1916
2,066,069	Ehrlich	Dec. 29, 1936
2,124,694	Gachet et al.	July 26, 1938
2,328,757	Tinnerman	Sept. 7, 1943
2,546,710	Eldridge	Mar. 27, 1951
2,758,181	Crouch	Aug. 7, 1956
2,816,968	Julian et al.	Dec. 17, 1957
2,835,755	Filko	May 20, 1958

FOREIGN PATENTS

576,225	Great Britain	Nov. 9, 1943
482,035	Canada	Mar. 25, 1952