June 12, 1956

S. H. KAST

QUICK BREAK ATTACHMENT FOR HIGH VOLTAGE DISCONNECTING SWITCHES

2,750,460

Filed Dec. 12, 1952

2 Sheets-Sheet 1

FIG. 1.

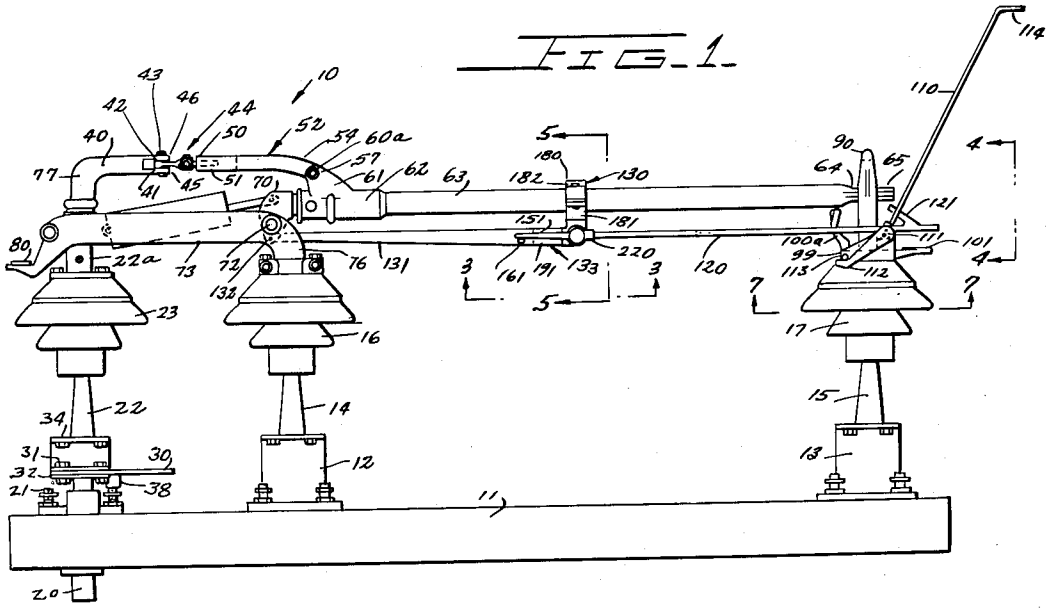
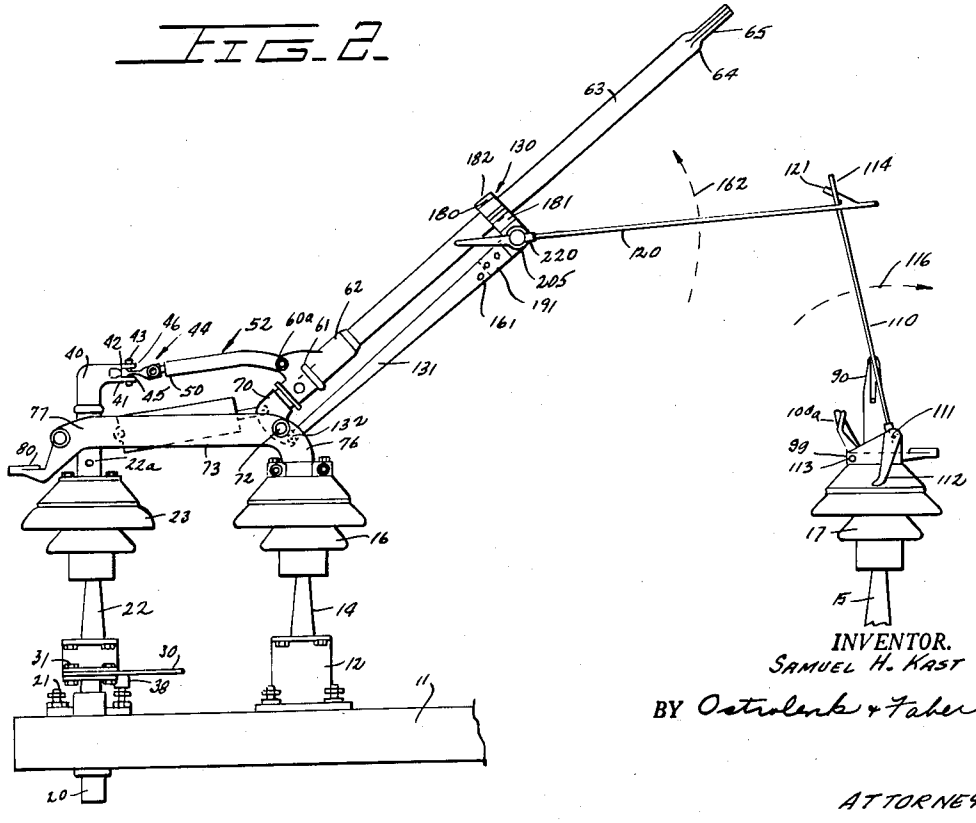


FIG. 2.



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FIG. 3.

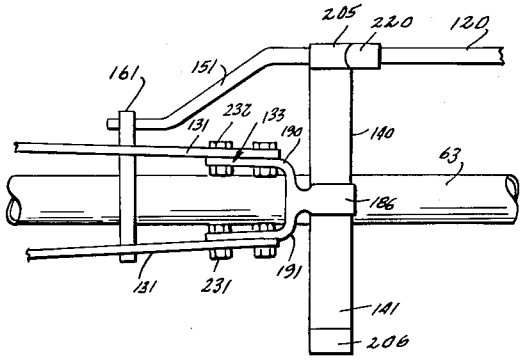


FIG. 4.

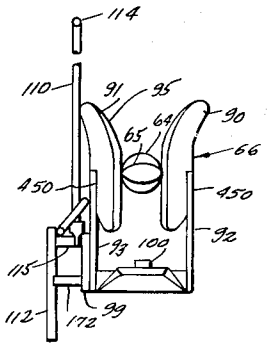


FIG. 5.

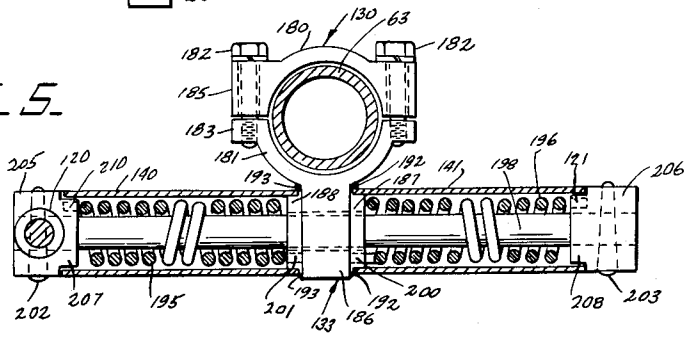


FIG. 6.

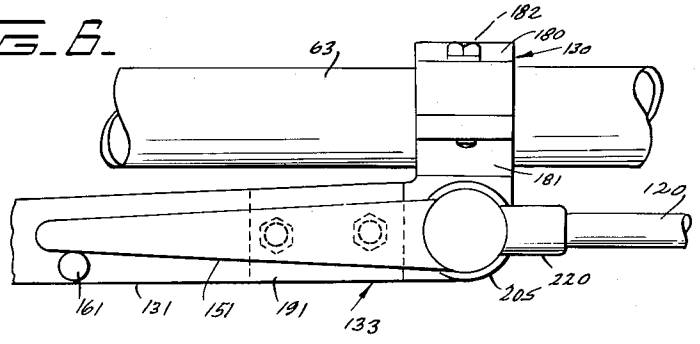
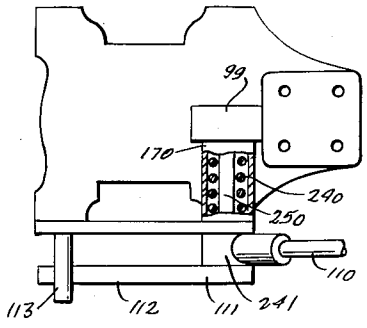


FIG. 7.



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QUICK BREAK ATTACHMENT FOR HIGH VOLTAGE DISCONNECTING SWITCHES

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Application December 12, 1952, Serial No. 325,640

10 Claims. (Cl. 200—48)

My invention relates to a quick-break arc horn attachment for high-voltage disconnecting switches of the type described in co-pending applications, Serial No. 145,389, filed February 21, 1950, now Patent No. 2,673,902, March 30, 1954; Serial No. 265,409, filed January 8, 1952, now Patent No. 2,673,913, March 30, 1954; Serial No. 232,497, filed June 20, 1951, now Patent No. 2,673,903, March 30, 1954; and Serial No. 238,613, filed July 26, 1951, now Patent No. 2,658,964, November 10, 1953.

The disconnect switches described in the above-mentioned co-pending applications are adapted to establish high pressure contact between a source of electric current and a load current, so arranged that all of the circuit connections through the disconnect switches will be through high-pressure contact elements which will make it possible to omit all flexible connections such as pigtails and the like.

This disconnect switch has an angularly rotatable contact arm which is also rotatable about its longitudinal axis and is provided with current carrying contact connections between the contact arm and the support on which it rotates angularly and an additional current-carrying contact connection between the portions of the contact arm which rotate on its longitudinal axis and the remainder of the contact arm. Thus the contact arm of the disconnect switch is rotated angularly to enter the stationary contact jaws and is then rotated on its longitudinal axis into high-pressure engagement with the contact jaws.

My invention is particularly directed to a novel quick-break attachment for disconnecting switches of the type described above which are used in the range of 15 kv. to 230 kv. In the opening operation of these switches the speed of separation of the arc horn or horns is critical. Sufficient air gap to withstand the normal voltage without breakdown must be established within a period of approximately 0.050 second in order to obtain effective arc interruption. At this speed of operation, or at higher speeds, currents up to approximately 50 amperes at 115 kv. are interrupted with an arc length in the order of six or eight inches. However, if the time of operation is less than one critical value of approximately 0.050 second, the arc may be drawn out to a length of as much as ten or fifteen feet and the arcing horn or horns become relatively ineffective.

A primary object of my invention is to provide arc horn attachments for high voltage disconnect switches which separate with rapid motion and create a substantial air break distance in approximately 0.050 second.

My novel attachment consists of one quick-break arc horn attached to the blade of the switch and a second quick-break arc horn attached to the jaw of the switch. Both arcing horns are resilient members provided with torsional springs at their hinges.

The arc horns are in engagement with each other during the closed position of the switch. As the switch opens, resilient means mounted on the arc horns are interengaged and maintain the engagement of the arc horns during at

least a portion of the opening movement of the switch. The arc horns are therefore flexed and stressed during the opening of the switch due to the releasable interengaging resilient means. During this opening operation the torsional springs at the hinges of the arc horns are stressed to thereby store energy therein during the initial position of the opening operation.

After a predetermined movement of the switch, the releasable interengaging means is released and separation acceleration for the arc horn is derived from the energy stored in the torsional springs. Also a slight separation acceleration is derived from the energy stored in the stressed arc horns. Thus the arc horns rapidly spring apart to their original position on the jaw and contact blade with a snap acting quick break.

That is after a predetermined position of the switch blade is passed during an opening operation, the arcing horns rapidly separate due to the bias of torsion springs, thereby causing a rapid speed of separation; since both arc horns are spring biased by their torsion springs in such a way that when the main blade of the switch is opened to a predetermined angle, the horns separate with rapid motion and create a substantial arc-break distance in approximately 0.050 second.

Heretofore, it has been customary to use a single quick-break arc horn rather than two arcing horns as set forth in my invention. Although a single horn may be satisfactory for disconnect switches of voltage rating in the range of 15 kv. to 69 kv. it is unsatisfactory for disconnect switches of higher voltage rating. That is, as above-mentioned, if a substantial air-break distance is not established within the critical period of approximately 0.050 second, the arc resulting from the interruption of a 115 kv. may be drawn out to a length of as much as ten or fifteen feet.

The reason a single arc horn is usually ineffective to give the desired result is that the large mass thereof prevents rapid movement for a sufficient air-break distance within the critical period noted. However, by using two arc horns as set forth in my invention, each horn may be substantially one-half the length of a single arc horn. Hence by cutting the length of the arc horn in half, the relative speed of motion of the two horns can theoretically be increased sixteenfold.

Accordingly, another object of my invention is to provide a disconnect switch with an arc horn attachment which will separate with sufficient speed so as to create a substantial air-break distance within a critical period.

Another object of my invention is to provide, in high-voltage disconnect switches, a quick-break attachment which will create a sufficient air gap therebetween within a period of approximately 0.050 second.

A still further object of my invention is to provide a disconnect switch which is to be used for high voltage with two arc horns so that rapid separation thereof can be increased approximately sixteenfold as compared to the separation of a single arc horn.

Another object of my invention is to provide a novel quick-break attachment consisting of one arc horn attached to the blade of a switch and a second arc horn attached to the jaw of the switch in such a manner that they are biased by torsion springs toward separation after the main blade of the switch has moved through a predetermined angle.

As heretofore noted, the disconnect switch, to which my quick-break attachment is applicable, has a contact arm which comprises a switch blade and a hinged casting which are assembled so that (as noted in the above-mentioned co-pending applications), (1) the switch blade is angularly rotatable with the hinged member and also, (2) has rotation about its longitudinal axis.

Thus, as heretofore noted, the main blade of the switch will have rotation about its longitudinal axis during the

initial opening thereof, in order to relieve the high contact pressure prior to the angular rotation of the blade.

In my novel attachment, one arcing horn is attached to the switch blade. The blade, however, during opening rotation, rotates about its own axis and then moves angularly. The arc horn mounted on the blade must be restricted so that it will have only the angular movement and not a rotational movement about its own axis. That is, it becomes necessary to provide means so that the rotation of the switch blade about its longitudinal axis will not be imparted to the arc horn, mounted on the blade and thereby ensure that only the angular rotation of the switch blade will be imparted thereto.

Accordingly, a further object of my invention is to provide a novel means for attaching the quick-break arc horn which will permit the main switch blade to rotate about its longitudinal axis without interfering with the proper operation of the quick-break arc horn.

This is accomplished by providing a bearing near the center of the main switch blade and supporting this bearing by auxiliary members which are attached to a tie casting. One end of the tie casting is permanently secured to a leg of the hinge casting which supports the blade for angular movement so that it has angular rotation therewith but is prevented from having the longitudinal rotation of the switch blade.

The opposite end of the tie casting is permanently secured to the auxiliary members which form a support for the bearing member. Since the bearing member is provided with a loose fit, the switch blade rotation about its longitudinal axis is permitted even though the bearing is maintained in a fixed position by means of the tie and hinged casting. Thus the blade bearing and the auxiliary member form a support for the quick-break horn on the main blade of the switch and permit the switch blade to rotate about its longitudinal axis without similarly rotating the quick-break arc horn.

Accordingly, it is an object of my invention to provide a novel attachment for high voltage disconnect switches having switch blades with angular and longitudinal rotation which permit the rotation of the switch blade about its longitudinal axis without changing the angular relationship of the quick-break arc horn.

It is a further object of my invention to provide a quick-break attachment comprising an arc horn attached to the jaw of a switch and a second horn attached to the blade of the switch by means of a bearing member which will permit the main switch blade to rotate about its longitudinal axis without interfering with the proper operation of the quick-break arc horn.

A still further object of my invention is to provide a high voltage disconnect switch with arc horn attachments which are connected in such a manner that only the angular rotation of the blade will be imparted to the arc horn and in which the rotation of the blade about its longitudinal axis will not be imparted to the blade arc horn.

These and other objects of my invention will be apparent from the following description when taken in connection with the drawings in which:

Figure 1 is a side view of a high voltage disconnect switch in closed position. This figure shows my novel quick-break attachment wherein one arc horn is attached to the blade of the switch and a second arc horn is attached to the jaw of the switch.

Figure 2 is a side view of the high voltage disconnect switch of Figure 1 when it is open to the point where the quick-break arcing horns are about to separate.

Figure 3 is a detailed view taken along the line 3—3 of Figure 1. This figure shows the bearing and auxiliary member which permit attachment of one arcing horn to the switch blade in such a manner that the blade will not impart the rotational movement about its longitudinal axis to the arc horn.

Figure 4 is an end view taken in the direction of the arrows 4—4 of Figure 1 showing the stationary contact arrangement of the high voltage disconnect switch and the arcing horn.

Figure 5 is a detailed view taken in the direction of the arrows 5—5 of Figure 1. This figure shows another view of the bearing and auxiliary member by which the blade arc horn is secured to the blade of the switch.

Figure 6 is a detailed exploded view of blade arc horn bearing and auxiliary member of Figure 1.

Figure 7 is a view taken in the direction of arrows 7—7 of Figure 1. This view shows the attachment of the jaw blade horn to the jaw of the switch.

Referring first to Figure 1, the disconnect switch 10 is mounted on the base 11 which is a suitable longitudinal structural support, in this case shown horizontally arranged for a horizontally or upright mounted disconnect switch.

The base 11 has secured thereto in any suitable manner, as by the insulator spacers 12 and 13, the stationary upright supporting posts 14, 15 on the upper portions of which are mounted insulators 16, 17.

Base 11 is also provided with the bearing 20 appropriately secured thereto in any suitable manner as by the bolts 21 and carrying the rotatable vertical shaft 22 to the upper end of which is keyed the insulator 23 for rotation with the vertical shaft or post 22.

Below insulator 23 there is keyed to the shaft 22 the crank 30 secured thereto in any suitable manner as by the bolts 31 connected to the flange or crank plate 32. Bolts 21 which secure the bearing 20 in position also secure the stop plate 34 in position, the stop plate being provided at opposite ends with the adjustable stops which engage at either end with the stop 38 on the operating crank 30.

Shaft 22*a* extends above the insulator 23 and is effectively a continuation of vertical shaft 22, being, however, spaced therefrom by insulator 23. Crank 40 at the upper end of shaft 22*a* is preferably integral therewith and, therefore, rotates therewith.

Crank 40 extends horizontally or at least parallel with the base supporting structure 11 and rotates in the horizontal plane. Crank 40 is shown herein as tubular although it may have any desired cross-section consistent with the mechanical loads imposed thereon. The outer end of crank 40 is flattened at 41 and is provided with a circular opening 42 through which pin 43 may pass.

A clevis member 44, receives extension 41, the said clevis 44 being provided at its opposite legs 45, 46 with openings which register with opening 42 in extension 41 of the crank 40 and receiving the pin 43.

Clevis 44 is integral with the threaded extension 50 which enters into the tapped opening 51 in the forked link 52. The threaded extension 50 is so arranged that as the threaded extension 50 rotates with respect to the forked link 52 and its tapped opening 51, it has linear movement with respect thereto.

The outer end of the tubular switch blade 63 is flattened at 64 and is provided with appropriate contacts 65 engageable with the stationary contact jaws 66.

The blade 63 supports sleeve casting 62 and is mounted for rotation about its longitudinal axis on an extension of the hinged casting 70 which is in turn rotatably mounted by the hinged bearing indicated generally as 72.

The stationary contact 66 comprises the plurality of contact blades 90, 91 on each side biased toward each other by the spring support members 92, 93 and so arranged that when the blade 63, 65 enters at an angle to the horizontal position during the closing operation, it will clear the blades 90 on each side. These contact members are so arranged that when the contact is rotated by rotation of the switch blade 63 about its longitudinal axis to increase contact pressure to bring the blade 65 on each side thereof will spread against the tension of springs 92, 93 thereby creating the desired contact pressure.

The spring blades **92**, **93** are current conducting and are connected in any suitable manner as by the bolts to the base plate **99**, which in turn is mounted in any suitable manner as by bolts **100** at the top of insulator **17**. Thus when the disconnect switch is in the closed position of Figure 1, current enters through terminal **80**, passes through the frame casting **73** to the hinged bearing **72**, then into the current carrying contacts in the hinged bearing **72**, to the hinged bearing **70**, then through current carrying contacts to the contact blade **63** to the stationary contact elements **90**, **91** and then through base **99** to the terminal extension **101**.

The jaw arc horn **110** and the blade arc horn **120** are longitudinal members made of suitably conducting resilient materials so that they may be spring biased toward separation from each other as the switch blade **63** opens toward the predetermined position shown in Figure 2. One end of jaw arc horn **110** is pivotally mounted by a torsion spring at **111—120** on the base plate **99**. A stop crank extension **112**, which is permanently secured to the arc horn **110**, extends in the opposite direction of the arc horn **110**.

Stop member **113** extends from the base plate **99**. Engagement of the stop pin **113** by the stop crank **112** limits the clockwise rotation of the arc horn **110**, as seen in Figure 1. The upper portion of the arc horn **110** is a resilient bent portion **114** which interlocks with hook **121** of the blade arc horn **120**.

It will be noted that the hook portion **121** of the blade horn **120** surrounds the arc horn **110** at all times as seen in Figures 1 and 2 to form a releasable interengaging means for the blade arc horn **120** and jaw arc horn **110** as will hereinafter be more fully explained.

As the switch blade **63** is angularly rotated from the closed portion of Figure 1 to the partially open position of Figure 2, the hooked portion **121** of the blade horn **120** will urge the hinged horn **110** in a clockwise direction.

The counter-clockwise rotation of the switch blade **63** from the position of Figure 1 to the position of Figure 2 will cause the engagement between the hooked portion **121** of blade arc horn **120** and the jaw arc horn **110** and its extension **114**. This will cause the jaw arc horn **120** to be urged in a counter-clockwise direction as seen in Figure 2, to thereby urge its torsion spring (hereinafter more fully described) to be flexed.

Also the blade arc horn **120** will be urged in a clockwise direction to thereby flex its torsion spring and thereby store energy therein. Hence energy will continuously be imparted to and stored in the resilient arc horns **110—120** and their associated torsion springs. After further clockwise rotation, of the blade **63** past the position of Figure 2, the releasable interengagement between members **114—121** will be and the arc horns **110—120** will be rapidly accelerated in a clockwise and counter-clockwise direction, respectively by energy stored in the resilient horns and torsional springs. That is, the resilient arc horns **110—120** will move in the direction of the arrows **116**, **162** respectively after the release of the releasable engagement means **114—121**.

The attachment of the blade arc horn **120** to the switch blade **63** will now be described. As heretofore noted, the blade **63** has both rotation about its longitudinal axis and also rotation about its hinge. Hence it is necessary to provide a bearing **130** which will ensure that only the rotation of the blade **63** about its pivot is imparted to the blade arc horn **120** and ensuring that the arc horn **120** remains stationary while the blade **63** rotates about its own axis.

The bearing **130** has two semi-circular sections **180—181** which are rotatably secured to the blade **63** by means of bolts **182** which pass through appropriate openings in flange **185** and are threadably secured in opening of flange **183**.

The lower semi-circular section **181** has a U-shaped extension **133** rigidly secured to the lower end thereof.

The U-shaped extension comprises base **186** having protruding lugs **118** and two legs **190—191**. Hollow cylindrical tubular members **140** and **141** having an inside diameter slightly greater than the diameter of the lugs **187—188**, are fitted over these lugs and welded at **192** and **193** to the base **186** of the bracket **131**.

Appropriate openings in the lugs **187—188** are provided to rigidly secure the left and right hand end **200—201** of torsional springs **196**, **195** respectively. A shaft **198** extends through an opening in the base **193**, lugs **187** and **188**, and extends past the right and left hand edge of the hollow cylindrical tubes **141** and **140**. The torsional springs **195** and **196**, respectively, housed in the hollow cylindrical tubular members **140** and **141**, are positioned concentric with the shaft **198**. The shaft **198** serves to position the torsional springs **195** and **196** within the housing **140** and **141**.

It will be noted that although the shaft **198** is rotatably mounted with the housings **140—141** it has no transverse movement relative thereto due to the support in the openings of base **186** and lugs **188** and **187**. The position of the shaft **196** which extends beyond the ends of the hollow cylindrical housings **140—141** is provided with a tappered opening which is perpendicular to its longitudinal axis, to receive tappered pins **202—203**, and also provide with a second opening which is also perpendicular to the longitudinal axis of the shaft but perpendicular to the axis of the tappered opening for the pin **202—203**, one of which is adapted to receive the resilient blade arc horn **120**.

End plugs **205**, **206** having stepped portions **207**, **208**, respectively, are rotatably fitted into the left and right hand end of the hollow cylindrical housings **140**, **141** respectively. These end plugs are provided with longitudinal opening to receive shaft **196** and are placed over the portion of the shaft **196** which protrudes past the ends of housings **140**, **141**. The end plugs **205**, **206** are further provided with two perpendicular openings which extend perpendicular to the axis of the plugs **205**, **206** and register with the aforementioned openings in the end of shaft **198**.

It will be noted that, as best seen in Figures 3 and 5, that there is a housing **140**, **141** and associated torsion spring **195**, **196** which extends to the left and right, respectively, of the base **186** of the bracket **133**. With this arrangement, the blade arc horn **120** can be attached to either the left or right hand end thereof, depending on the mounting of the switch **10** and/or the placement of the jaw arc horn **110** on the right or left hand side of the jaw **66**.

In the illustrated embodiment, the blade arc horn **120** is mounted on the left, as seen in Figure 5 and hence the right hand end is not used for the mounting of the blade arc horn. Thus tapered pin **203** is placed through the tappered opening in plug **206** to ensure that the torsion spring **196** will remain within the housing **141**.

An appropriate opening is provided in the plug **206** to receive the end **211** of the torsion spring **196**. It will be noted that since the plug **206** is rotatably mounted in housing **141** and is keyed to shaft **198** rotation of the shaft **198** will cause rotation of the plug **206**. Since the torsion spring is rigidly secured at end **200** to base **186** and rigidly secured at end **208** to plug **206**, rotation of the shaft **198** to flex or wind due to motion imparted thereto through the plug **206**.

The plug **205**, which is positioned on the left of housing **140** where the blade arc horn **120** is to be attached, is similar to plug **206** as above noted but has an integral extension **151** in one direction and a housing support **220** in the opposite direction.

The housing support **220** is provided with an axial opening which registers with an aforementioned opening in the plug **205**.

As best seen in Figures 3, 5, 6, one end of the blade arc horn **120** is positioned through the opening in the

housing support 220 and the opening in the plug 205. A transverse tappered opening is provided in the end of the arc horn 120, which registers with the tappered opening in the plug 205. The tappered pin 202 is passed through the tappered opening in the end of blade arc horn 120 and plug 205. Hence the arc horn is integrally keyed and secured to the plug 205 by means of the tappered pin 202.

The end 210 of the torsional spring is secured in any appropriate opening in plug 205. Rotation of the blade arc horn 120 will cause rotation of plug 205 and through shaft 198 cause rotation of plug 206. Since the torsion spring 195, 196 is secured at each end to either the stationary member 186 or the plugs 205, 206. Hence since the inside ends 200, 201 of the torsional springs 195, 198 are fixed, rotation of the plugs 205, 206 will cause the torsional springs to flex or wind to thereby impart and store energy in them as will hereinafter be more fully explained.

The torsional springs 195, 196 are positioned within the housing 140, 141 and secured at their ends so as to impart a counterclockwise rotation to the blade arc horn 120. Hence if the blade arc horn 120 is rotated in clockwise direction from the position of Figure 1 to the position of Figure 2, the torsional springs 195, 196 will be flexed and wound to thereby have energy stored therein.

As heretofore mentioned the U-shaped bracket 133 is provided with two extending legs 190, 191, to which one end of tie rods 131, are rigidly secured thereto by means of bolts 231, 232 and extend substantially parallel to the switch blade 63.

The opposite ends of the tie rods 131, are pivotally secured at 132 to the hinged bearing 70. Since the hinged bearing 70 is limited to angular rotation and has no movement about the longitudinal axis of the switch blade 63, the pivotal connection 132 between the tie bars 131 and the hinged bearing 70 will restrict movement of the tie bar 131 to angular movement. Since the tie bar 131 is permanently secured through the U-shaped member 133 to the bearing 130, the bearing 130 will likewise be restricted to angular movement. Hence even though the switch blade 63 will rotate about its longitudinal axis furring the initial opening operation, the rotatably mounted bearing 130 will be maintained stationary by means of the tie bars 131. Hence the angular relation between the blade arc horn 120 and the jaw arc horn 110 will not be altered during period of operating of the switch when the blade 63 is being rotated about its longitudinal axis.

A stop pin 161 is passed through the legs tie bars 131 and are positioned beneath the arc horn extension 151 of blade arc horn 120. Hence the counterclockwise bias of the torsion spring 195, 196 will urge the blade arc horn 120 to the position seen in Figure 1 where it is prevented from having further motion due to the engagement of the arc horn extension 151 with the arc horn extension 151 with the stop pin 161.

It will be noted that if the blade arc horn is mounted on the right of the housing of Figure 5, the stop pin 161 will extend in the opposite direction to that shown in Figure 3.

It will be noted that the jaw arc horn 110 is secured to plate 99 of the jaw 66 by means of a torsional spring 240 in substantially the same manner as set forth above in connection with the blade arc horn 120. Thus hollow cylindrical housing 170, shaft 24, plug 241, arc horn extension 111 and stop pin 113 at the jaw connection for the jaw arc horn 110 are similar in construction, function and connection to the hollow cylindrical housing 140, shaft 196, plug 205, arc horn extension 151 and stop pin 161, respectively, at the blade 63 for the connection of the blade arc horn 120.

The torsional spring 240 biases the jaw arc horn 110 in a clockwise direction (as viewed in Figures 1 and 2). The position shown in Figure 1 indicates the extreme clockwise position of the jaw arc horn 110 since its extension engages stop pin 113 and is therefore restricted from having further movement. Thus the torsional springs 195, 196 urge the blade arc horn 120 counterclockwise against the stop pin 161 and the torsion spring 240 urges the jaw arc horn 110 clockwise against the stop pin 113.

After the initial rotation of the switch blade 63 about its longitudinal axis, during the opening operation, the blade member 63 will have angular movement from the position of Figure 1 to the position of Figure 2.

As noted, the engagement of the hook 121 of the blade horn 120 with the jaw horn 110, will cause partial clockwise rotation of the blade horn 120, thereby removing the arc horn extension 151 from engagement with the stop pin 161 of the tie bar 131, and cause counterclockwise rotation of jaw blade horn 110 thereby removing arc horn extension 112 from engagement with the stop pin 113.

This forced movement of the blade horn 110, 120 will flex or wind the torsion springs 195, 196 and 240 in a direction against their original bias. Hence, when the components are in the position as indicated in Figure 2, the torsion spring 195, 196 will tend to urge the blade horn 120 in a counterclockwise direction and the torsion spring 240 will tend to urge the jaw arc horn 110 in a clockwise direction. Continued movement of the switch blade 63 in the counterclockwise direction, which is passed the position indicated in Figure 2, will cause disengagement of the releasable interengaging means 121 from extension 114, thereby permitting the torsion springs 195, 196 to urge the blade arc horn 120 to move rapidly in the counterclockwise direction as indicated by the arrow 162 and the torsion spring 240 to urge the jaw arc horn 110 to move rapidly in the clockwise direction as indicated by arrow 116. Hence, since both arc horns 110 and 120 are so biased so that after the main switch blade 63 has opened to a predetermined angle, the horns 110 and 120 will separate with a rapid motion and create a substantial air-break distance therebetween in approximately 0.050 second.

This is accomplished by:

1. Using two arc horns 110 and 120, each having substantially one-half the length of a single arc horn so that the relative speed of motion of the two horns can be theoretically increased sixteenfold and:

2. By providing a novel arrangement whereby the two horns 110 and 120 are spring biased in opposite directions. Disengagement of the releasably interengaging means will be followed by rapid separation of the arc horns so that a sufficient air gap to withstand normal voltages without breakdown, will be established within a critical period of time.

In summary, both arc horns 110 and 120 are attached to torsional springs. These springs are wound up and have energy stored therein as the switch 10 and arc horns 110, 120 move from the position of Figure 1 to Figure 2. Since the arc horns 110 and 120 are flexible, they deflect from straight lines and finally assume a shape as shown in Figure 2 with extension 114 almost vertical. Just past this position the releasable interengaging means 121—114 are disengaged. The large amount of energy stored in both the torsional springs and also the small amount of energy stored in the flexible arc horns is then released and causes rapid separation acceleration.

In the foregoing, I have described my invention only in connection with preferred embodiments thereof. Many variations and modifications of the principles of my invention within the scope of the description herein are obvious. Accordingly, I prefer to be bound not by the specific disclosure herein but only by the appending claims.

I claim:

1. In a high voltage disconnect switch comprising a switch blade having rotational movement about its longitudinal axis and angular movement about its pivot; a

jaw member and a hinged bearing; said hinged member carrying said switch blade; said hinged bearing having angular movement with said switch blade; said jaw member engaged by said movable switch blade when said disconnect switch is in closed position; a quick break attachment comprising a first and second arcing horn; said first and second arc horns being conducting resilient members; said first arc horn pivotally mounted on said jaw member; a bearing; said bearing loosely fitted on said switch blade; said second arcing horn pivotally mounted on said bearing; releasable interengaging means interconnecting said first and second arc horn.

2. In a high voltage disconnect switch comprising a switch blade having rotational movement about its longitudinal axis and angular movement; a jaw member and a hinged bearing; said hinged member carrying said switch blade; said hinged bearing having an angular movement with said switch blade; said jaw member engaged by said movable switch blade when said disconnect switch is in closed position; a quick break attachment comprising a first and second arcing horn; said first and second arc horns being conducting resilient members; said first arc horn pivotally mounted on said jaw member; a bearing; said bearing loosely fitted on said switch blade; said second arcing horn pivotally mounted on said bearing; means to limit the rotation of said first and second arc horns in a first and second direction respectively.

3. In a high voltage disconnect switch comprising a switch blade having rotational movement about its longitudinal axis and angular movement; a jaw member and a hinged bearing; said hinged member carrying said switch blade; said hinged bearing having an angular movement with said switch blade; said jaw member engaged by said movable switch blade when said disconnect switch is in closed position; a quick break attachment comprising a first and second arcing horn; said first and second arc horns being conducting resilient members; said first arc horn pivotally mounted on said jaw member; a bearing; said bearing loosely fitted on said switch blade; said second arcing horn pivotally mounted on said bearing; releasable interengaging means interconnecting said first and second arc horn; biasing means mounted at the pivot point of at least one of said arc horns to bias said last mentioned arc horn in a first direction.

4. In a high voltage disconnect switch comprising a switch blade having rotational movement about its longitudinal axis and angular movement; a jaw member and hinged bearing; said hinged member carrying said switch blade; said hinged bearing having an angular movement with said switch blade; said jaw member engaged by said movable switch blade when said disconnect switch is in closed position; a quick break attachment comprising a first and second arcing horn; said first and second arc horns being conducting resilient members; said first arc horn pivotally mounted on said jaw member; a bearing; said bearing loosely fitted on said switch blade; said second arcing horn pivotally mounted on said bearing; means biasing said first and second arc horns in a first and second direction respectively.

5. In a high voltage disconnect switch comprising a switch blade having rotational movement about its longitudinal axis and angular movement; a jaw member and a hinged bearing; said hinged member carrying said switch blade; said hinged bearing having an angular movement with said switch blade; said jaw member engaged by said movable switch blade when said disconnect switch is in closed position; a quick break attachment comprising a first and second arcing horn; said first and second arc horns being conducting resilient members; said first arc horn pivotally mounted on said jaw member; a bearing; said bearing loosely fitted on said switch blade; releasable interengaging means interconnecting said first and second arc horn; means biasing said first and second arc horns in a first and second direction respectively; initial opening of said switch effective to store energy in said means while said releasable interengaging means remain interengaged, said stored energy released from said biasing means to said arc horns when said releasable interengaging means are disengaged.

6. A circuit interrupter comprising a movable contact arm having angular movement, and a stationary contact; said stationary contact engaged by said movable contact arm when said circuit interrupter is in closed position; a first resilient arc horn pivotally mounted at said stationary contact; a second resilient arc horn pivotally mounted on said movable contact arm; means biasing said first and second arc horn in a first and second direction respectively; said first and second arc horns releasably interengaged; said second arc horn imparting energy to said first arc horn and its biasing means through said releasable interengagement when said circuit interrupter is being moved toward open position; said means imparting energy to said first and second arc horns when said releasably interengagement is released.

7. A circuit interrupter comprising a movable contact arm having angular movement, and a stationary contact; said stationary contact engaged by said movable contact arm when said circuit interrupter is in closed position; a first resilient arc horn pivotally mounted at said stationary contact; a second resilient arc horn pivotally mounted on said movable contact arm; a first means controlling the extreme rotation of said first arc horn in a first direction; a second means controlling the extreme rotation of said second arc horn in a second direction; a first biasing means biasing said first arc horn in said first direction; a second biasing means biasing said second arc horn in said second direction; a releasable mechanical engagement between said first and second arc horn; said first and second biasing means storing energy while said releasable mechanical engagement is operative during the opening operation of said circuit interrupter.

8. A circuit interrupter comprising a movable contact arm having angular movement, and a stationary contact; said stationary contact engaged by said movable contact arm when said circuit interrupter is in closed position; a first resilient arc horn pivotally mounted at said stationary contact; a second resilient arc horn pivotally mounted on said movable contact arm; said first and second arc horns being releasably interengaged; a first means controlling the extreme rotation of said first arc horn in a first direction; a second means controlling the extreme rotation of said second arc horn in a second direction; biasing means biasing said first and second arc horn respectively in said first and second direction; said biasing means urging said arc horns away from each other when said circuit interrupter is partially open; said second arc horn imparting energy to said first arc horn when said circuit interrupter is partially opened.

9. A circuit interrupter comprising a movable contact arm having angular movement, and a stationary contact; said stationary contact engaged by said movable contact arm when said circuit interrupter is in closed position; a first resilient arc horn pivotally mounted at said stationary contact; a second resilient arc horn pivotally mounted on said movable contact arm; a first means controlling the extreme rotation of said first arc horn in a first and second direction; a second means controlling the extreme rotation of said second arc horn in said first direction; a biasing means biasing said first arc horn in a first direction; said biasing means urging said first arc horn away from said second arc horn when said circuit interrupter is partially open; a second biasing means biasing said second arc horn in a second direction, said second biasing means urging said second arc horn away from said first arc horn when said circuit interrupter is partially open.

10. A high voltage means for electric circuits comprised of a blade, a jaw, a blade arc horn and a jaw arc horn; said blade having an engaged and disengaged position with respect to said jaw; said blade arc horn and said jaw arc horn each being made of resilient conducting

material; said blade arc horn being rotatably mounted on said blade; said jaw arc horn being rotatably mounted on said jaw; individual biasing means for said jaw arc horn and said blade arc horn to respectively maintain said horns in a predetermined first position; said individual biasing means maintaining said arc horns in said first position when said blade is in said engaged position with respect to said jaw; said blade operative to move said jaw arc horn from said first position to a second position by means of a releasable mechanical engagement between said blade arc horn and said jaw arc horn when said blade is being moved from said engaged position toward said disengaged position; said mechanical engagement between said blade arc horn and said jaw arc horn resulting in the movement of said blade arc horn to a second position when said blade is being moved from said engaged position to said disengaged position; said blade movement to said disengaged position with respect to said jaw operative to result in the mechanical disengagement of said resilient arc horns to thereby permit said individual biasing means to drive said arc horns to their respective first positions.

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