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Beier

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[54] **HIGH VOLTAGE CIRCUIT BREAKER**

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[30] **Foreign Application Priority Data**

Feb. 17, 1971 Germany.....P 21 08 265.5

[52] **U.S. Cl.**.....**200/144 AP**, 200/148 D

[51] **Int. Cl.**.....**H01h 33/16**

[58] **Field of Search**.....200/148 R, 144 AP, 200/148 D

[56] **References Cited**

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Primary Examiner—Robert S. Macon

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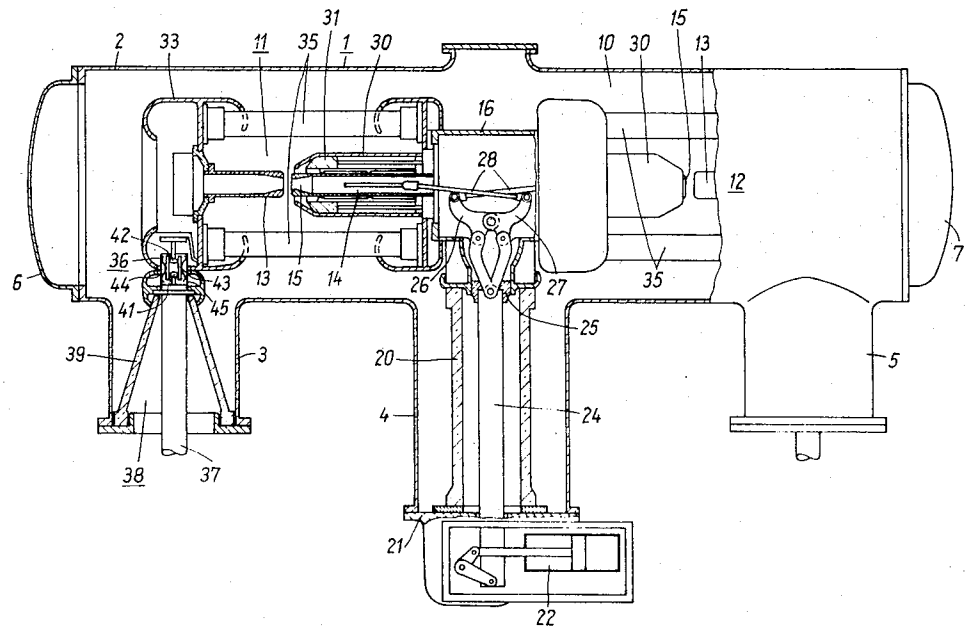
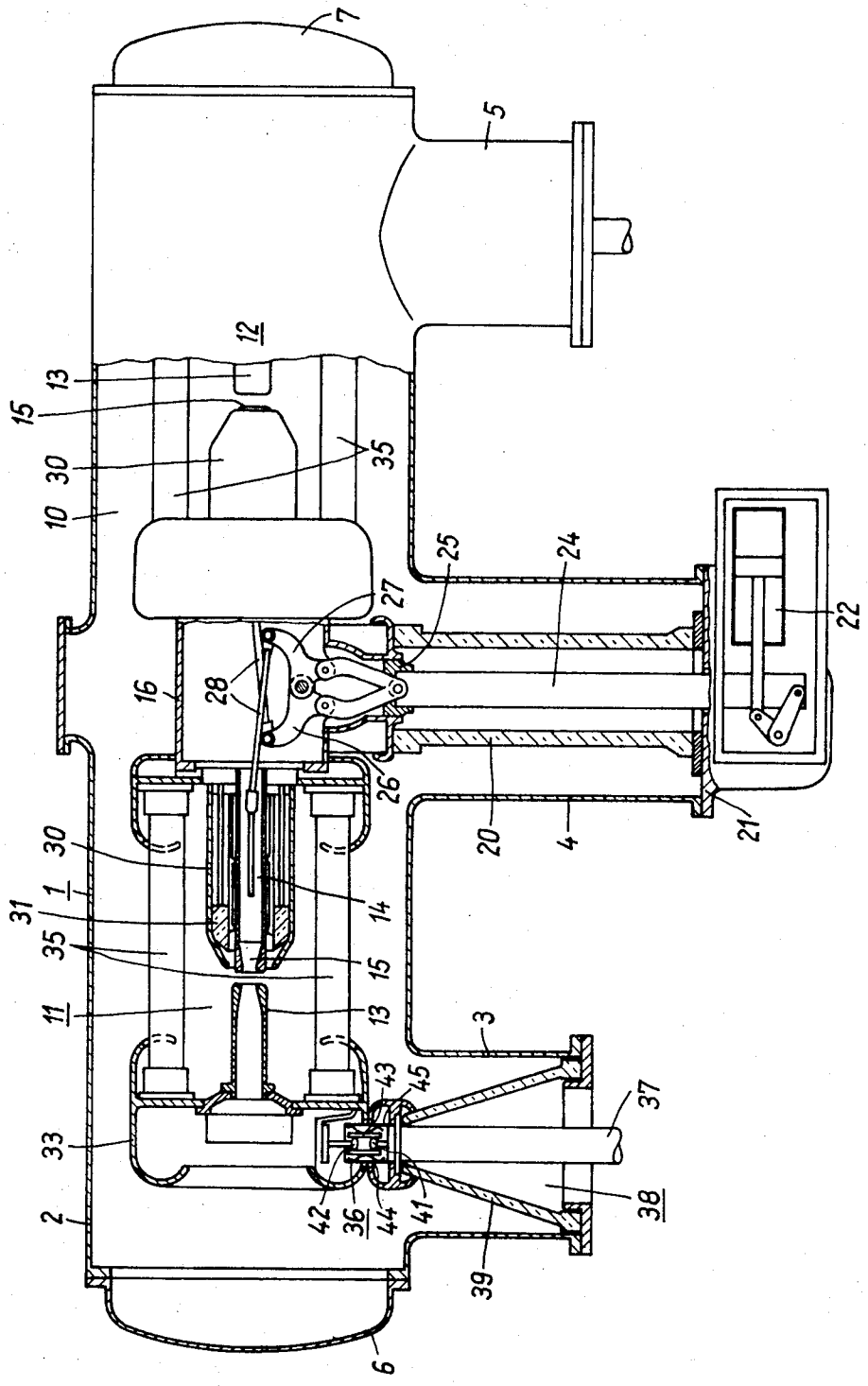
[57] **ABSTRACT**

The invention proposes a high voltage circuit breaker, which contains a switching arrangement in a metal housing, which in the past included structural support for the switching arrangement in the housing. The present proposal does away with the structural support by including impedance elements into the housing which have sufficient rigidity so as to act as a mechanical support and thus obviate the use of other structural elements.

7 Claims, 1 Drawing Figure

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MEAT SLICING KNIFE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to a rotary meat slicing knife for severing a slice of meat from a larger piece upon one revolution thereof.

2. Description of the Prior Art

Slices of meat, such as steaks, chops or slices of ham, have been commonly cut from a larger piece of meat, such as a loin or whole ham, by a meat cutting band saw, appreciable operator time being required for cutting a quantity of such slices. A production meat slicing machine has been introduced which automatically feeds a large piece of meat to a rotating, eccentric knife blade which severs one piece of meat from the larger piece upon each revolution of the blade. The knife blade employed in that machine is generally crescent-shaped with a convexly curved cutting edge, the blade being mounted for eccentric rotation adjacent one of its ends and the cutting edge having serrations formed therein.

SUMMARY OF THE INVENTION

A rotary meat slicing knife comprising a blade having opposite sides and a convexly curved, uninterrupted, sharpened cutting edge extending continuously between opposite extremities. Means are provided for mounting the blade for eccentric rotation in a given direction about an axis normal to the blade sides with the leading one of the cutting edge extremities being more closely spaced from the axis of rotation than the trailing one of the extremities. One side of the blade has a plurality of circumferentially contiguous segments formed thereon adjacent said cutting edge and extending between the cutting edge extremities. Each of the segments comprises a surface which smoothly tapers away from the cutting edge and which also smoothly tapers in the direction of rotation toward the other side of the blade to the adjacent segment thus forming a compound wedge configuration pointing toward the cutting edge and in the direction of rotation for separating a slice of meat from a larger piece upon one revolution of the blade.

It is accordingly an object of the invention to provide an improved rotary meat slicing knife.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary view in perspective, partly broken away, illustrating a meat slicing machine incorporating the improved rotary meat slicing knife of the invention;

FIG. 2 is a side view of the rotary meat slicing knife of the invention;

FIG. 3 is a top view of the knife of FIG. 2;

FIG. 4 is a cross-sectional view taken generally along the line 4—4 of FIG. 2;

FIG. 5 is a cross-sectional view taken generally along the line 5—5 of FIG. 2;

FIG. 6 is an end view as viewed generally along the line 6—6 of FIG. 2;

FIG. 7 is a fragmentary cross-sectional view taken generally along the line 7—7 of FIG. 2;

FIG. 8 is a fragmentary view in perspective further illustrating the wedge segments of the knife of the previous figures; and

FIG. 9 is another side view of the knife of the invention illustrating its slicing action.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown a portion of a meat slicing machine, generally indicated at **10**, having a meat loading and feeding bin **12**, a slice-receiving bin **14**, and the improved rotary meat slicing knife **16** of the invention mounted for rotation between bins **12** and **14** within guard **18**. Knife **16** is driven by a suitable motor (not shown) through gear box **20**. Suitable meat feeding mechanism **22**, which does not form a part of the present invention, is actuated by lead screw **24** driven by gear box **20**, and incrementally feeds the piece of meat in bin **12** forwardly under knife **16** in response to each revolution thereof thereby to slice off one slice of the desired thickness.

Referring now to FIGS. 2 through 7 of the drawings, knife **16** comprises generally crescent-shaped blade **26** having opposite ends **28, 30** and convexly curved, uninterrupted, sharpened cutting edge **32** having its opposite extremities **34, 36** terminating at blade ends **28, 30**. In the illustrated and preferred embodiment, cutting edge **32** is accurately curved having the center of its radius of curvature located as shown at **38** in FIG. **2**.

Back-up plate **38** engages side **40** of blade **26**, mounting hub **42** engages back-up plate **38**, and mounting hub **44** engages side **46** of blade **26**, blade **26**, back-up plate **38** and mounting hubs **42, 44** being held in assembled relation by suitable screws **48**. Back-up plate **38** has beveled edges **39** facing cutting edge **32**. Sleeve **50** extends through openings in blade **26**, back-up plate **38** and mounting hubs **42, 44** and is secured thereto by suitable screws, one of which is shown at **52**. Knife **16** is adapted to be mounted on the output shaft (not shown) of gear box **20** by means of sleeve **50** which has a keyway **54** therein for keying knife **16** to the output shaft. Cap **56** covers one end of sleeve **50** and is secured to mounting hub **42**, as be welding.

It will now be seen that knife **16** is adapted to be mounted for eccentric rotation about axis **58** adjacent end **28** of blade **26**. Knife **16** is rotated by the motor and gear box **20** in the direction shown by arrow **60**, extremity **34** of cutting edge **32** thus being the leading extremity and being more closely spaced from axis of rotation **58** than the trailing extremity **36**.

In accordance with the invention, side **40** of blade **26** has a plurality of circumferentially contiguous segments **60, 62** formed thereon adjacent cutting edge **32** and extending between extremities **34, 36**. Each segment **62** is formed by surface **64** which, as viewed in transverse cross-section as seen in FIGS. **4, 5** and **6**, tapers smoothly away from cutting edge **32** and, as viewed in longitudinal cross-section as shown in FIG. **7**, also tapers smoothly in the direction of rotation **60** toward side **46** of the blade to the adjacent segment **62**.

Side 46 of plate 26 is substantially flat and, by virtue of the taper of surface 64 in direction of rotation 60, each segment 62 is joined to the adjacent segment by a discrete trailing edge 66 which extends inwardly from cutting edge 32 and is preferably slightly inclined in direction of rotation 60, as best seen in FIG. 2. Tapered surface 64 of each segment 62 thus forms a compound wedge configuration which points toward cutting edge 32 and in the direction of rotation 60. Blade 26 may be formed of any suitable metal and in a specific embodiment is formed of D–2 air hardened tool steel.

Referring now to FIG. 9 of the drawings, the relationship of knife 16 to loading and feeding bin 12 is shown as viewed generally in the direction shown by the arrow 9 in FIG. 1, guard 18 being eliminated. A piece of meat 68 having bone 70 therein, such as a beef loin from which steaks are to be sliced, is shown positioned in bin 12. With knife 16 continuously rotating in direction 60, and with knife 16 generally in the position shown in FIG. 1, feeding mechanism 22 pushes piece 68 of meat forwardly the requisite distance so that upon the next revolution of knife 16, a slice of the desired thickness will be cut-off. In a specific embodiment, a 1,750 r.p.m. motor is employed with gear box 20 providing a 10 to 1 speed reduction thus driving knife 16 at 175 r.p.m. so as to provide 175 slices per minute.

The position of cutting edge 32 immediately prior to beginning a slicing operation is shown in dashed lines at 32–1, and intermediate positions during the slicing operation are shown in dashed lines at 32–2 and in solid lines in FIG. 9. Considering now point 72 on cutting edge 32, the path of movement of point 72 about axis 58 is shown by arrow 74. The path of movement 74 of point 72 can be vectorially resolved into component 76 normal to cutting edge 32 and component 78 tangent to cutting edge 32, it being observed that the compound wedge configuration formed by the tapered surface 64 of the respective segment 62 is likewise tapered or pointed in directions 76, 78. It will further be seen that the wedges formed by surfaces 64 of the segments 62 progressing toward trailing extremity 36 are moving at progressively higher linear rates of speed. Thus, the cumulative effect of the slicing action of the "flying" wedges formed by tapered surfaces 64 is smoothly to separate the slice of meat from piece 68, wedges 64 and tapered edges 39 of back-up plate 38 ejecting the resulting slice into receiving bin 14.

The improved slicing knife 16 of the invention provides smoother, easier and faster cutting with less power than prior art machines.

While the flying wedge cutting edge configuration of the invention is particularly applicable to rotary meat slicing knives, as described above, it is also applicable to other types of slicing knives.

While there have been described above the principles of this invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of the invention.

What is claimed is:

1. A rotary meat slicing knife comprising a blade having opposite sides and a convexly curved, uninterrupted, sharpened cutting edge extending continuously between opposite extremities, and means for mounting said blade for eccentric rotation in a given direction about an axis normal to said sides with the leading one of said cutting edge extremities being more closely spaced from said axis than the trailing one of said extremities, one side of said blade having a plurality of circumferentially contiguous segments formed thereon adjacent said cutting edge and extending between said extremities, each of said segments comprising a surface which smoothly tapers away from said cutting edge and which also smoothly tapers in said direction toward the other side of said blade to the adjacent segment thereby forming a compound wedge configuration pointing toward said cutting and in said direction for separating a slice of meat from a larger piece upon one rotation of said blade.

2. The knife of claim 1 wherein said segments respectively have substantially the same size and configuration.

3. The knife of claim 1 wherein said other side of said blade is substantially flat.

4. The knife of claim 1 wherein said cutting edge is arcuate with the center of its radius of curvature spaced from said axis.

5. The knife of claim 1 wherein each of said segments is joined to the adjacent segment by a discrete trailing edge.

6. The knife of claim 1 wherein said blade is generally crescent-shaped and has opposite ends, said cutting edge extremities being respectively at said ends, said axis being adjacent one of said ends.

7. The knife of claim 6 wherein said segments have substantially the same size and configuration, said other side of said blade being substantially flat, said cutting edge being arcuate with the center of its radius of curvature spaced from said axis, each of said segments being joined to the adjacent segment by a discrete trailing edge.

8. A slicing blade having opposite sides and an uninterrupted, sharpened cutting edge extending continuously between opposite extremities, one side of said blade having a plurality of contiguous segments formed thereon adjacent said cutting edge and extending between said extremities, each of said segments comprising a surface which smoothly tapers away from said cutting edge and which also smoothly tapers toward one of said extremities and the other side of said blade to the adjacent segment thereby forming a compound wedge configuration pointing toward said cutting edge and said one extremity.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,728,504 Dated April 17, 1973

Inventor(s) Helmut Beier

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Cancel columns 1 thru 4 of the printed patent and substitute the attached columns 1 thru 4.

Signed and sealed this 30th day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

HIGH VOLTAGE CIRCUIT BREAKER

The invention relates to a high voltage circuit breaker with a switching arrangement disposed in a metal housing and insulated therefrom. The arrangement comprises a stationary switching portion and a movable switching pin guided in a stationary slide contact, further including an impedance which is disposed in parallel to the switching arrangement and is similarly disposed in the metal housing. As a rule, in such circuit breakers, the so-called switching chamber tube has been provided in the form of an insulating material tube, which encloses both of the switching pieces, as well as the sliding contact and provides for the mechanical support of the switching arrangement. In place of the switching chamber tube, insulating material rods are used, as known from the U.S. Pat. No. 3,160,727, wherein a circuit breaker has been described, in which, in addition to nozzle bodies for the guidance of a quenching gas stream. insulating material rods are used which are at least provided on opposite sides of the circuit breaker arrangement, whereby a mechanically stabilized ladder-formed structure is obtained.

It is an object of the invention to provide a further simplification of high voltage circuit breakers of the type described. The invention consists in that the impedance at high voltage potential provides the only rigid mechanical connection between the stationary switching piece and the sliding contact.

In accordance with the invention, the impedance whose function it is to facilitate the disconnect or connect of the high potential circuit breaker or to act as a control impedance for the control of the voltage distribution, particularly in circuit breakers with multiple interruption, simultaneously functions also as a mechanical construction element. As a result, the usual switching chamber tube or corresponding insulating rods may be dispensed with.

The impedance may be particularly comprised of a condenser made of casting resin. Such condensers, in which the casting resin may comprise the dielectric and a protective sheath, may be made mechanically at little cost and of very high quality and which may take up the stresses occurring in the embodiment in accordance with the invention. The impedance may also consist of two or more partial impedances, which are disposed about the switching unit and slide contact, preferably in a symmetrical manner. The mechanical stresses on the individual elements are thereby reduced, while the costs may not have to be significantly higher when, by using equal impedances for different circuit breakers, an advantageously greater number of pieces may be provided.

In a particularly advantageous embodiment of the invention for circuit breakers with two switching arrangements connnected in series, the switching arrangements are carried by a single support. This support engages in the middle of the structure at the ends of the switches facing each other. The other ends, which face away from each other, to which electrical connections have been made without imposing mechanical stresses thereon, are connected mechanically to the support only through the impedances in parallel with the switches. In this arrangement, the control impedances are free of all mechanical stresses which exceed the weight of the stationary switch pieces and the stresses occurring during the coaction of the stationary with the movable pieces. The stresses due to the inertia of the movable switch pieces are completely balanced out due to the symmetrical arrangement, so that the impedances, used as supporting insulating elements, may be of a size which is particularly advantageous.

For the purpose of a better explantion of the invention, an exemplified embodiment will be described in connection with the accompanying FIGURE. A heavy-duty switch breaker will be described here comprising a metal encapsulated high voltage circuit breaker arrangement with sulfahexafluoride as a quenching and insulating gas using a potential of 220 or more kV.

The circuit breaker includes a grounded metal housing **1**, which consists of a cylindrical portion **2** having three tubular pipe sockets **3, 4** and **5.** The front ends of the cylindrical portion **2** are closed by means of covers **6** and **7.**

Two equal, electrically in series connected switching arrangements **11** and **12** are disposed as at 10 of the cylindrical portion **2.** Each switching arrangement includes two stationary electrodes **13** and **15,** which are hollow and function as jet nozzles. During the connect position, the electrodes are connected through a hollow movable switching pin **14.** The circuit then comprises the electrode **13,** which is to be considered as a stationary portion, over the switching pin **14** to the electrode **15,** which, acting as a sliding contact, conducts the current from the switching pin **14** to a stationary metal housing **16,** disposed in the center between the two switching arrangements **11** and **12.** A hollow supporting insulator **20** consisting of cast resin engages the metal housing **16.** The insulator **20** is rigidly connected with the metal housing **16** at its high potential end. The grounded end of the insulator, extending into the socket **4,** is rigidly secured to the cover **21,** which pertains to the housing of a switching drive **22.**

The switching drive **22** is formed as a double-acting hydraulic drive. The drive provides a reciprocating motion of an insulating material driving rod **24** in the direction of the axis of the insulator **20** which is guided through the metal housing **16** as at **25.** Two angle levers **26** and **27,** movable in counteraction, are thereby set into motion and are coupled with the movable switching pins **14** of the switching arrangements **11** and **12** through rods **28.** The rods **28** are further connected with a blast cylinder **30** which, during disconnect, is pulled over a stationary blast piston **31,** whereby by means of sulfahexafluoride, which is subject to compression thereby and which streams through the hollow switch pieces **13** and **14,** a quenching of the electric arc is effected.

Arounded metal cap **33** is secured to the end of the respective switching arrangements **11** and **12,** which are remote from the support **20,** whereon the stationary switch piece **13** is supported. This metal cap is connected with the metal housing **16** over the control condensers **35,** which are connected in parallel to the switching arrangements **11** and **12,** and which serve to provide an even distribution of the potential on both of the switching arrangments. The control condensers, with the aid of cast resin, are made such

that they are not only self-supporting, but are also capable of taking up mechanical stresses. Individually, they are considered as partial impedances, which are arranged in spatial symmetry with respect to the switching arrangments **11** and **12.** Although the metal caps **33** are connected through the plug contact connection **36** with the conductor 37 of an inlet **38,** the conical insulating bodies of which are referred to at **39,** the plug contact connection **36,** however, is not capable of transmitting mechanical stresses, since it is comprised of two sphere-like thickened conductor ends **41** and **42** which are electrically connected through contact laminations **43.** The contact laminations are subject to the action of leaf springs **44** which are supported at a cylindrical housing **45.** Thus, a freely movable and electrically well conducting connection is available so that mechanical stresses are not capable of being transmitted from the switching units to their inlets. Thus, the only rigid mechanical connection between the metal cap **33,** which supports the stationary switch piece **13** and the sliding contact **15,** associated with the metal housing **16,** is provided by the impedances **35.** It is thus possible to get along in this circuit breaker, in accordance with the invention, with a few simple insulating material parts, which are protected against weathering by means of the metal housing **1.**

Although the invention is illustrated and described herein as embodied in high voltage circuit breaker, it is, nevertheless, not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

It is claimed:

1. A high voltage circuit breaker comprising a metal housing, at least one switch arrangement disposed in said housing and electrically insulated therefrom; said switch arrangement including a stationary switch portion and a movable switch pin disposed for coaction therewith, and a stationary sliding contact for guiding said pin; an impedance disposed in said housing for controlling the high voltage switching forming the only rigid mechanical connection between said stationary switch portion and said sliding contact.

2. The circuit breaker according to claim **1,** wherein said impedance comprises a condenser made of cast resin.

3. The circuit breaker according to claim **1,** wherein said impedance consists of two or more partial impedances arranged for distribution about said stationary switch portion and said slide contact.

4. The circuit breaker according to claim **3,** wherein said distribution is symmetrical.

5. The circuit breaker according to claim **1,** wherein there are included two series connected switching arrangements each having two ends, one end being adjacent to and facing and the other end being remote and facing away from that of the other switch arrangement, means for supporting said switching arrangements disposed adjacent said facing ends, electrical connecting means connected to each of said remote ends, and means in said housing forming an inlet each for each of said electrical connecting means.

6. The circuit breaker according to claim **5,** further including means for mechanically linking said remote ends to said supporting means comprising solely said impedances disposed in parallel to said switching arrangements.

7. The circuit breaker according to claim **6,** wherein said electrical connecting means, together with said inlet means, comprise plug contacts, consisting of two coaxial conductors with sphere-like ends, and include a coupling contact piece encompassing said sphere-like ends.

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