

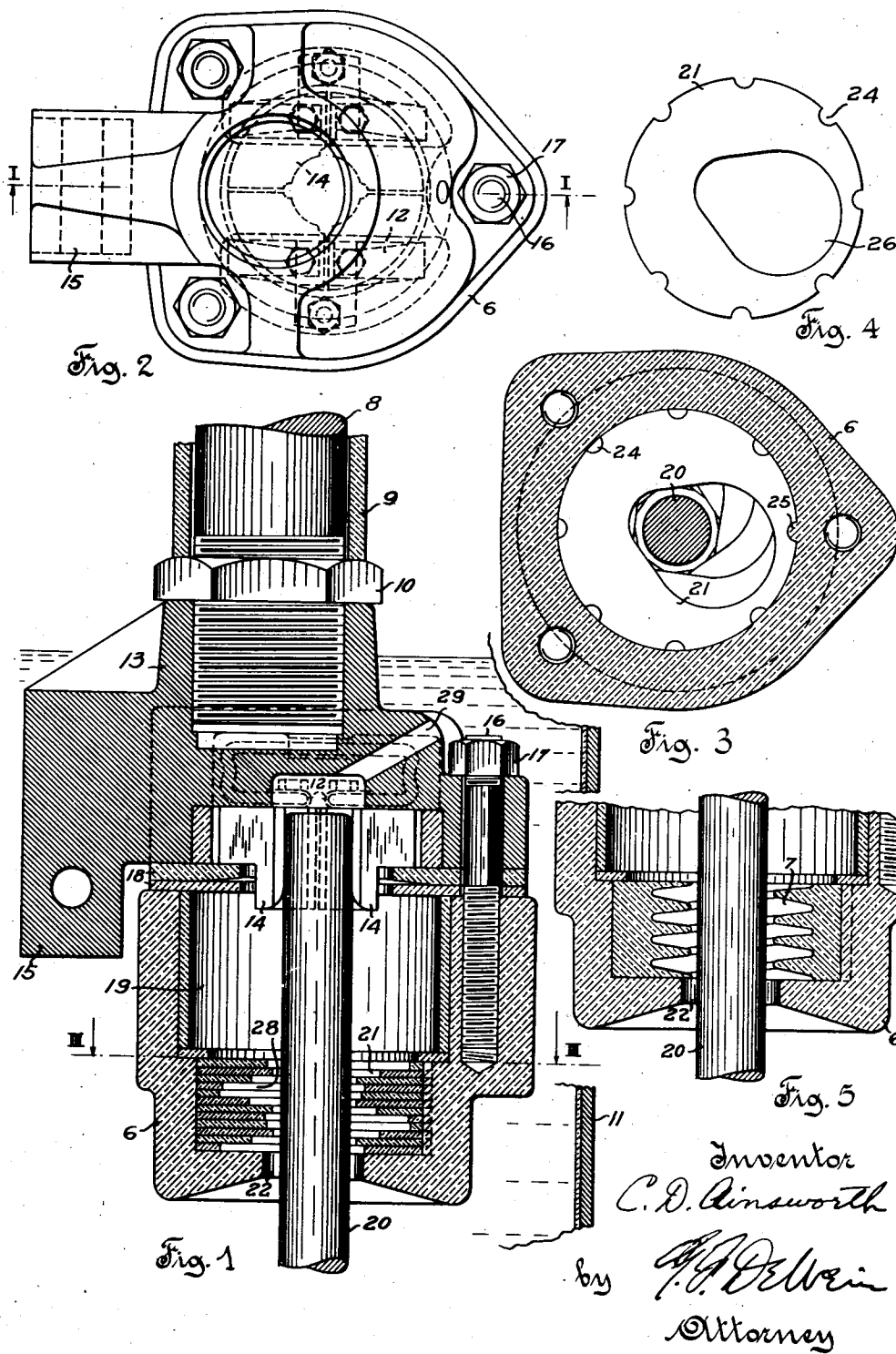
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CIRCUIT BREAKER

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CIRCUIT BREAKER

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This invention relates in general to circuit breakers and more particularly to circuit breakers of the fluid break type wherein the arc formed during interruption of the circuit is extinguished in oil or some similar insulating and arc extinguishing fluid.

It is an object of this invention to provide an improved circuit breaker of the above type wherein the arc is extinguished and the circuit is interrupted in an improved and more efficient manner.

A further object of this invention is to provide in a circuit breaker of the above type a throat member having a screw threaded or substantially spirally grooved form.

It is also an object of this invention to provide a new method of making a circuit breaker of the above type.

It is a further object of the present invention to provide a throat structure for a circuit breaker of the above type wherein a threaded throat member is built up out of a plurality of similarly cut out laminations.

A further object of this invention is to provide a method of assembling a substantially screw threaded throat member for a circuit breaker of the above type from a plurality of similarly cut out laminations.

Objects and advantages other than those above set forth will be apparent from the following description when read in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view of a circuit breaker embodying the present invention taken on the line I—I of Fig. 2;

Fig. 2 is a top view of the circuit breaker shown in Fig. 1;

Fig. 3 is a horizontal sectional view of the circuit breaker of Fig. 1 taken on the line III—III;

Fig. 4 is a plan view of one of the laminations used to make up the throat member of the circuit breaker of Fig. 1;

Fig. 5 is a fragmentary vertical sectional view of a circuit breaker embodying a modification of the present invention.

The circuit breaker as shown in Fig. 1 is of the type having a so-called explosion pot 6 formed of a suitable insulating material and supported in a tank 11 containing oil or some similar insulating and arc extinguishing fluid. The explosion pot structure is supported on the rod 8 which is threaded into a conducting member 13 and held in position by the lock nut 10. The rod 8 is insulated in the conventional manner by an insulating bushing 9. The conducting member 13 has an extension 15 on which may be mounted the current carrying contacts (not shown). Member 13 also carries the fixed contact assembly which consists of four contact members 14 suitably biased radially toward the center of the pot. The conducting member 13 also carries the

pot 6 which is held in place by studs 16 and nuts 17. The pot 6 has an opening 22 therein through which the movable contact 20 is operable to cooperate with the fixed contact 14 to draw an arc in the pressure chamber 19.

The throat member of the circuit breaker of the present invention is formed in the shape of a screw thread or substantially spiral groove 28 surrounding the movable contact member 20. This throat member in the embodiment of the invention shown in Figs. 1-4 is built up of disks of insulating material which are cheaply and easily manufactured in that the cut out portions thereof may be identical. The disks of the throat member shown in Figs. 1 and 3 all have the shape of the disk 21 shown in Fig. 4. This disk has a series of notched out portions 24 at equal angular distances around the circumferential edge of the disk, which notches hold the disks in place in the stack. A portion 26 of the disk is cut out and this portion may be pear shaped as shown or it may be substantially circular in shape, the controlling feature being that it is eccentric with respect to the disk, that is, the center of the cut out portion 26 does not coincide with the center of the disk 21. Thus, when a plurality of the disks 21 are formed in a stack so that each succeeding disk is rotated one notch, a spirally grooved or threaded throat is formed, as shown in Figs. 1 and 3. The lug 25 cooperates with the notches 24 to hold the disks in their proper positions in the stack.

There are various modifications embodying the broad method of assembling a stack of plates which have similar cut out portions to form a spiral opening through the stack. For example, the disk may be square in shape, having a curved cut out portion eccentric to the disk, the line joining the centers of the cut out portions and the center of the disk being at an angle of 45° to the vertical and horizontal. Thus, by rotating each succeeding disk of the stack 90° a very rough approximation of a spiral opening will be obtained. If a greater degree of conformation to a true screw thread is desired, an additional set of disks may be utilized in which the cut out members have their center line in the horizontal or vertical line through the center of the disks. Thus, by forming a stack, by alternating each succeeding disk first from one series and then from the other, a closer approximation to the throat structure shown in Fig. 5 will be obtained.

The disks and pot may also have a number of sides, for example, be octagonal in shape, with the center line of each disk and opening related in a predetermined similar manner to one side of the disk. Obviously, in the notch and lug form shown in Fig. 3, the greater the number of notches 24, the closer the conformation of the groove to a true helix. The cut out portions may

be of most any regular or irregular shape depending upon the degree of conformity desired and the feasibility of cutting out these sections.

In Fig. 5 the throat member is molded or otherwise suitably formed from insulating material and may be utilized in a circuit breaker such as is shown in Fig. 1. In operation, the contact 20 is moved downwardly drawing a pressure generating arc in the chamber 19. The contact 20 then moves the arc into the throat where the spiral groove is completely filled with oil, and the arc is efficiently and rapidly extinguished and the circuit interrupted. The spiral threaded throat members as shown have proven to be very efficient when functioning in combination with a properly proportioned pressure generating oil chamber to serve as a throat or channel passage therefrom, for the movable contact rod. The purpose of these throat devices is, fourfold, first, to prevent premature expulsion of oil from within the pressure chamber and secondly, to limit the size and volume of that portion of the arc which the throat encloses. The throat also functions to intimately envelop that portion of the arc with a sufficient quantity of oil to effect locally the highest possible degree of deionization and dielectric recovery prior to current zero. Fourth, due to the throat conformation, to effectively direct into the arc zone at a current zero the oil which is propelled into the channel passage from the pressure chamber above so as to rapidly complete dielectric recovery and thereby prevent reignition.

Although but a few embodiments of the present invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. In combination, a substantially closed arc extinguishing pressure chamber provided with an opening therein, means forming a helical passage concentric with said opening, said means comprising a stack of disks provided with substantially identically cut out portions.

2. A circuit breaker comprising a pressure generating chamber containing arc extinguishing liquid, a throat chamber adjoining said pressure chamber and provided with a wall the interior surface of which is substantially a screw thread, a first contact withdrawable through said throat, and a second contact fixed in said pressure chamber and spaced substantially from said throat and cooperable with said first contact to draw a pressure generating arc through a substantial portion of said pressure chamber.

3. A circuit breaker comprising a pressure generating chamber containing arc extinguishing liquid, a throat chamber of a diameter substantially less than the diameter of said pressure chamber and positioned adjacent and connected to said pressure chamber and provided with walls the interior surface of which is substantially a screw thread, a first contact withdrawable through said throat, and a second contact fixed in said pressure chamber and spaced from said throat and cooperable with said first contact to draw a pressure generating arc through more than twenty-five percent of the length of said pressure chamber.

4. In combination, a plurality of axially aligned disks of insulating material each having portions

of the circumferential edge thereof removed forming notches at predetermined distances therearound, a curved portion thereof cut out to form an opening therein, the center of said curved portion being at an appreciable distance from the center of said disk and means including said notches for positioning said disks.

5. In combination, a tank containing arc extinguishing liquid, a chamber formed of insulating material therein provided with an opening therein, a contact operable through said opening to draw an arc in said chamber, means of insulating material forming a helical opening surrounding said contact, said means comprising a stack of sheets of insulating material having substantially identical cut out portions.

6. In a circuit breaker of the character described the combination of a casing containing arc extinguishing fluid, a pressure chamber supported in said casing and provided with an opening through which a contact is operable to draw a pressure generating arc, with a means providing a throat for said chamber and contact, said means comprising stacked sheets of insulating material provided with similarly cut out portions eccentric with respect to said sheets.

7. In a circuit breaker of the character described the combination of a casing containing arc extinguishing fluid, a pressure chamber supported in said casing and provided with an opening through which a contact is operable to draw a pressure generating arc, with a means providing a throat for said chamber and contact, said means comprising a stack of disks of insulating material each of which is provided with formed portions at predetermined angular distances around said disk, and each disk further provided with a similar cut out portion eccentric to said disk, and means cooperating with said formed portions to position said disks in said stack.

8. In combination, a plurality of circumferentially aligned disks of insulating material each having a portion thereof removed to form an eccentric opening therein, and means for positioning said disks, said means including substantially similar formed portions on each disk.

9. In combination, a plurality of axially aligned disks of insulating material each having a portion thereof removed to form a curved opening therein, the center of said opening being at an appreciable distance from the center of said disk, and means for positioning said disks, said means comprising a fixed member and formed portions on each said disk.

10. In combination, a plurality of circumferentially aligned disks of insulating material each having a portion thereof removed to form an eccentric opening therein, one of said disks being angularly displaced from the disk adjacent thereto, and means for positioning said disks, said means including substantially similar formed portions on each disk.

11. In a circuit breaker of the character described the combination of a casing containing arc extinguishing fluid, a pressure chamber supported in said casing and provided with an opening through which a contact is operable to draw a pressure generating arc, with a means providing a throat for said chamber and contact, said means comprising stacked sheets of insulating material provided with similarly cut out portions eccentric with respect to said sheets, each successive sheet being angularly displaced from the preceding sheet.

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