

May 22, 1945.

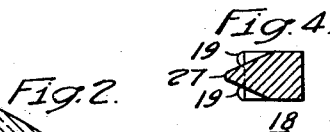
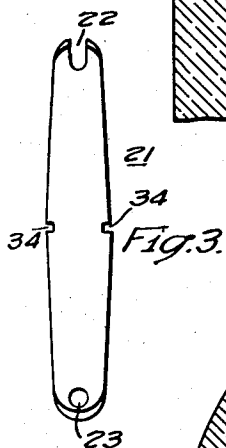
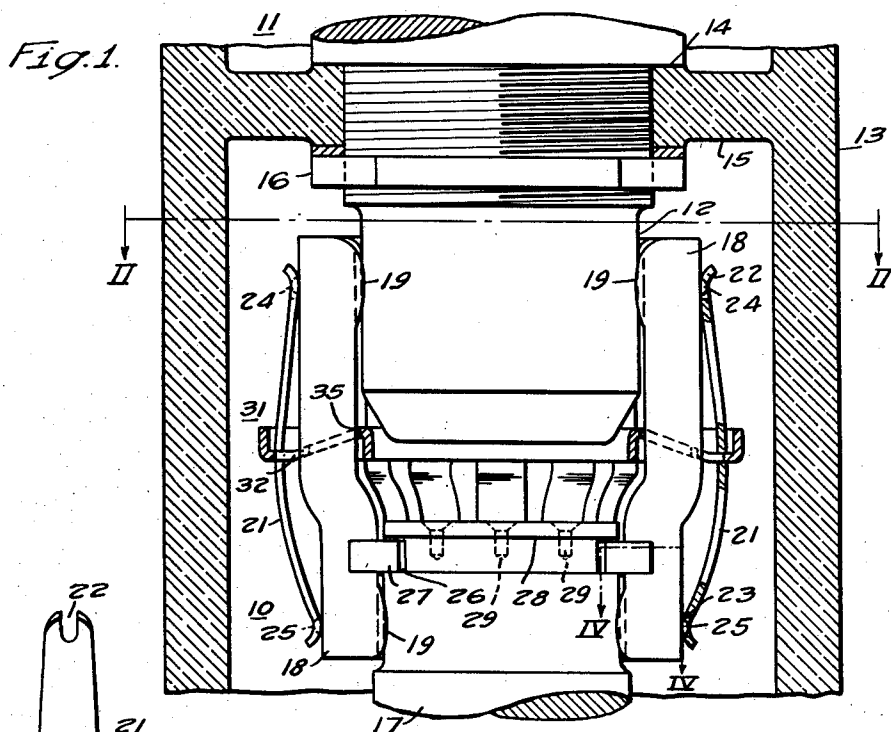
M. J. RUBEL

2,376,818

DISCONNECTING CONTACT

Filed Jan. 6, 1943

2 Sheets-Sheet 1



WITNESSES:

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May 22, 1945.

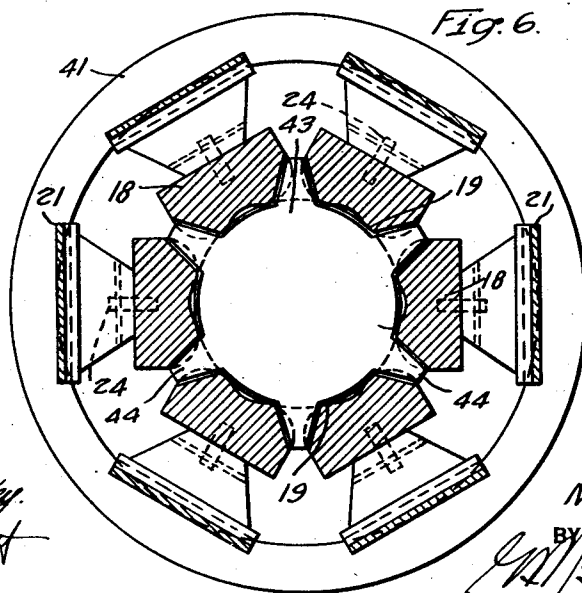
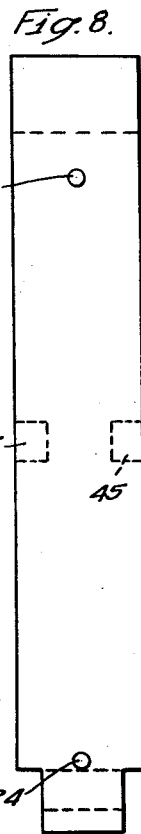
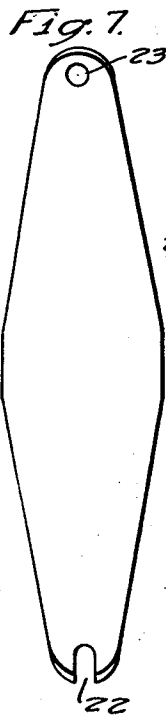
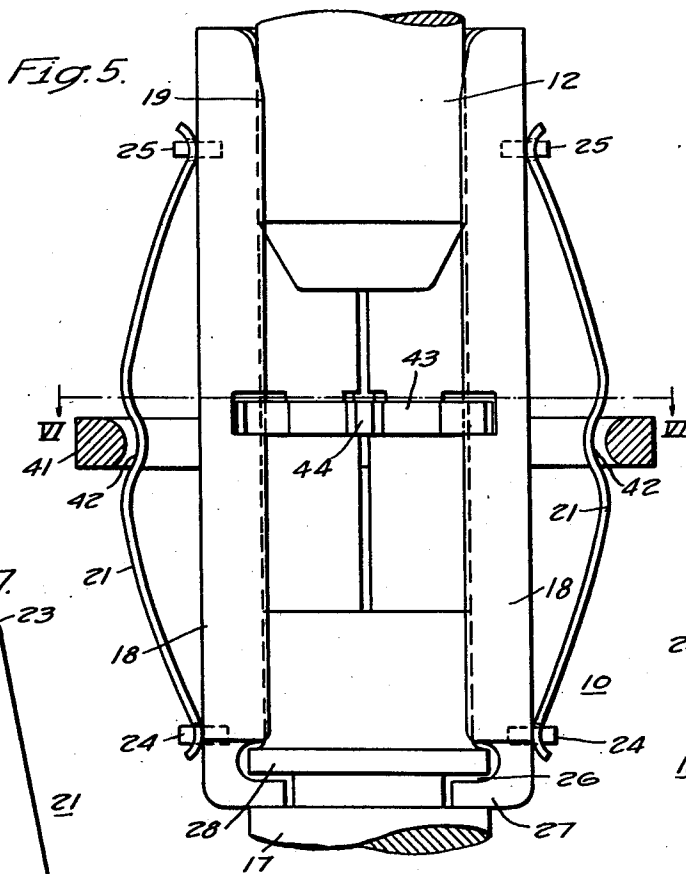
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2,376,818

DISCONNECTING CONTACT

Filed Jan. 6, 1943

2 Sheets-Sheet 2



WITNESSES:

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2,376,818

DISCONNECTING CONTACT

Max J. Rubel, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application January 6, 1943, Serial No. 471,444

9 Claims. (Cl. 200—166)

My invention relates, generally to electric switches and, more particularly, to the disconnecting contact members of electric switches suitable for disconnecting removable circuit breakers and similar apparatus from the current conductors of a power system.

A conventional disconnecting contact assembly of the type disclosed in Patent No. 2,265,006, issued December 2, 1941, to M. J. Rubel and H. H. Rugg, utilizes circular or garter springs wrapped around the contact segments or fingers to exert radial contact pressure on the contact fingers. There is a possibility of a garter spring breaking and grounding the circuit breaker or the bus.

Furthermore, as a practical matter, there is a design limitation on the capacity of a contact with which garter springs can be utilized, since the effective radial pressure on the contact fingers decreases as the number of contact fingers increases. This function is expressed by the formula:

$$P_c = P_s \times 2 \sin \frac{180}{n}$$

P_c = contact pressure

P_s = garter spring pressure

n = number of contact fingers.

Therefore, there is a rather definite limitation on the current-carrying capacity of disconnecting contacts utilizing circular or garter springs.

In order to avoid the use of garter springs, it has been proposed to utilize flat springs for applying radial pressure to the contact fingers of a disconnecting contact of the circular type. For example, in the disconnecting contact assembly disclosed in Patent No. 2,300,893, issued November 3, 1942, to B. I. Hayford, the contact members are disclosed by a cylindrical sleeve which also functions to maintain the contact fingers in spaced relation. A flat spring is disposed between each of the contact fingers and the sleeve to provide contact pressure between the contact fingers and the round studs or conductors which are bridged by the contact fingers. However, the foregoing structure is rather difficult to manufacture and assemble.

An object of my invention, generally stated, is to provide a disconnecting contact assembly which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of my invention is to provide a disconnecting contact assembly which

may be designed for any desired current-carrying capacity.

Another object of my invention is to provide a disconnecting contact assembly which may be easily assembled.

A further object of my invention is to improve the conductivity between the contact fingers and the curved surface of the conductors of a disconnecting contact assembly.

Still another object of my invention is to provide for retaining the contact fingers and their associated springs in position in a disconnecting contact assembly.

A still further object of my invention is to prevent the possibility of accidental disengagement of the contact assembly from its supporting member.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of my invention, ridges are provided on the portions of each of the plurality of contact fingers which engage a round stud, thereby securing a definite double point contact with the curved surface of the stud. The contact fingers and the pressure springs are retained in position by a spacing ring which is so disposed that there is a biasing force in the direction of the stud on which the fingers are mounted, thereby preventing the possibility of accidental disengagement of the contact assembly.

For a fuller understanding of the nature and objects of my invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, partially in section and partially in elevation, of a disconnecting contact assembly embodying my invention;

Fig. 2 is a view in section, taken along the line II—II of Fig. 1;

Fig. 3 is a view, in elevation, of one of the springs utilized in the disconnecting contact assembly;

Fig. 4 is a view, in section, taken along the line IV—IV of Fig. 1;

Fig. 5 is a view, in elevation of a modification of the invention;

Fig. 6 is a view, in section, taken along the line VI—VI of Fig. 5;

Fig. 7 is a view, in elevation, of one of the springs utilized in the structure shown in Fig. 5; and

Fig. 8 is a view, in elevation, of one of the contact fingers utilized in the structure shown in Fig. 5.

Referring to the drawings, and particularly to Figure 1, the disconnecting contact assembly shown therein comprises two parts, a movable contact 10 and a stationary contact 11. The stationary contact 11 comprises a round stud 12 that is mounted in a porcelain bushing 13. The stud 12 is provided with a shoulder 14 that is disposed on one side of a partition 15, in the bushing 13. A nut 16 may be threaded onto the stud 12 on the other side of the partition 15, thereby securely fastening the stud 12 in the bushing 13.

The movable contact 10 comprises a round stud 17, which may be part of a circuit breaker structure (not shown), and a plurality of contact fingers 18 disposed around the periphery of the stud 17. In order to improve the conductivity between the contact fingers and the curved surfaces of the round studs, the end portions of each finger are provided with longitudinal ridges 19 which engage the studs. Since two ridge are provided at each end of a finger, a definite double point contact is secured with each round stud, provided the distance between ridges is less than the diameter of the stud.

As shown in Figs. 1 and 2, an individual spring 21, of a flat type, is provided for each one of the contact fingers 18. As shown in Fig. 3, a slot 22 may be provided at one end of each spring and a hole 23 may be provided near the other end. A pin or projection 24 may be provided near one end of each finger for the slot 22 and a similar pin or projection 25 may be provided near the other end for the hole 23. In this manner lateral movement of the spring relative to the finger is prevented but a slight longitudinal movement is permitted when the spring is compressed.

A groove 26 is provided near the end of the stud 17 for receiving an inwardly extending projection 27 on each of the contact fingers 18, thereby retaining the fingers on the stud when the movable contact 10 is disengaged from the stationary contact 11. The groove 26 is preferably formed by reducing the diameter of the end of the stud 17 and securing a plate 28 on the end of the stud by means of screws 29. In this manner all of the fingers may be placed on or removed from the stud 17 as an assembled unit.

In order to retain the contact fingers in their correct angular position around the periphery of the stud 17, a spacing ring 31 is provided. As shown in Fig. 1, the ring 31 is of a reversed Z shape in cross section and is provided with suitably shaped openings 32 for the contact fingers 18 and the springs 21. Suitable projections or shoulders 33 are provided at the top of each opening 32 for notches 34 disposed near the middle of the edges of each spring 21. In this manner longitudinal movement of the spring and the contact finger through the ring 31 is prevented after they are assembled in the ring and the point of application of pressure on the spring is definitely fixed.

When the movable contact 10 is disengaged from the stationary contact 11, the fulcrum point 35 of each finger 18 on the ring 31 at the bottom of the opening 32 is offset from the center of the finger and also from the point of application of pressure on the spring 21. In this manner the exerted spring pressure is definitely biased in the direction of the circuit breaker stud 17, thereby preventing the possibility of accidental disengagement of the contact fingers from the stud 17. Furthermore, the contact fingers 18, the springs

21 and the ring 31 can be assembled together as a unit and then slipped over the end of the stud prior to the attaching of the plate 28, which, as explained hereinbefore, retains the fingers on the stud.

In the modification of the invention shown in Figs. 5, 6, 7 and 8, in which like parts are designated by the same reference characters as in Figs. 1 to 4, pressure is applied to the springs 21 by a ring 41 which encircles the springs at their midpoint. A depression 42 is provided in each of the springs 21 for the ring 41.

The contact fingers 18 may be equally spaced around the periphery of the stud 17 by means of a spacing plate 43 having radially extending projections 44 thereon. As shown, beveled notches 45 are provided in opposite sides of each finger for the projections 44. In this manner the fingers are maintained in spaced relation and in a radial position. The spacing plate 43 is retained in position by the notches 45.

It will be noted that the spacing plate is so located with reference to the ring 41 that the exerted spring pressure is biased toward the stud 17 when the moving contact is disengaged from the stationary contact. The spacing plate limits the inward movement of the disengaged ends of the contact fingers, thereby preventing collapsing of the contact assembly. When the contact is in the engaged position, the spacing plate 43 floats between the fingers and does not function as a fulcrum point.

In the present structure the groove 26 is cut in the stud 17 and the end portion 28 is integral with the stud. The contact assembly may be placed on the stud 17 by compressing the upper ends of the fingers 18 together sufficiently to permit the projections 27 to pass over the end of the stud and into the groove 26.

From the foregoing description, it is apparent that I have provided an improved disconnecting contact which is simple in structure, low in cost and has a higher current-carrying capacity than previous contacts of a similar type. Furthermore, the present contact may be made in any desired size without overstressing any of its members.

Since numerous changes may be made in the above described construction and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a ring encircling said fingers at substantially their midpoint, a flat spring disposed between each of said fingers and said ring for maintaining contact pressure between the stud and the finger, each of said springs having means therein at substantially its midpoint for retaining said ring in position, means on the fingers for positioning the springs on the fingers, and means for retaining the contact fingers in spaced relation around said stud.

2. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a ring encircling said fingers at substantially their midpoint, a flat spring disposed between each of said fingers and said ring for maintaining contact pressure between the stud and the finger, each of said springs having means therein at substantially its mid-

point for retaining said ring in position, means on the fingers for positioning the springs on the fingers, means on the stud cooperating with means on the fingers for limiting longitudinal movement of the fingers, and means for retaining the contact fingers in spaced relation around said stud.

3. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a ring encircling said fingers at substantially their midpoint, a flat spring disposed between each of said fingers and said ring for maintaining contact pressure between the stud and the finger, each of said springs having a depression therein at substantially its midpoint for retaining said ring in position, means on the fingers for positioning the springs on the fingers, means on the stud cooperating with means on the fingers for limiting longitudinal movement of the fingers, and means disposed inside of the fingers for retaining the fingers in a radial position and in spaced relation around the stud.

4. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a ring encircling said fingers at substantially their midpoint, a flat spring disposed between each of said fingers and said ring for maintaining contact pressure between the stud and the finger, each of said springs having a depression therein at substantially its midpoint for retaining said ring in position, means on the fingers for positioning the springs on the fingers, and means on the stud cooperating with means on the fingers for limiting longitudinal movement of the fingers, a floating plate disposed inside of said fingers for equally spacing said fingers in a radial position, said plate having radially extending projections thereon, and said fingers having notches therein for said projections.

5. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a ring encircling said fingers at substantially their midpoint, a flat spring disposed between each of said fingers and said ring for maintaining contact pressure between the stud and the finger, each of said springs having a depression therein at substantially its midpoint for retaining said ring in position, means on the fingers for positioning the springs on the fingers, means on the stud cooperating with means on the fingers for limiting longitudinal

movement of the fingers, and a floating plate disposed inside of said fingers for equally spacing the fingers in a radial position, said plate being offset from said ring a predetermined distance.

6. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a floating spacing ring having an opening therein for each of said fingers, a flat spring disposed in each of said openings between the finger and the ring for maintaining contact pressure between the stud and the finger, each of said springs having means therein at substantially its midpoint cooperating with means on the ring for retaining said ring in position, and means on the fingers for positioning the springs on the fingers.

7. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a floating spacing ring having an opening therein for each of said fingers, a flat spring disposed in each of said openings between the finger and the ring for maintaining contact pressure between the stud and the finger, each of said springs having means therein at substantially its midpoint cooperating with means on the ring for retaining said ring in position, means on the fingers for positioning the springs on the fingers, and means on the stud cooperating with means on the fingers for limiting longitudinal movement of the fingers.

8. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a spacing ring having an opening therein for each of said fingers, a flat spring disposed in each of said openings between the finger and the ring for maintaining contact pressure between the stud and the finger, the cross section of said ring being such that the bottoms of said openings are offset from the tops of the openings a predetermined distance.

9. A disconnecting contact comprising, a round stud, a plurality of contact fingers disposed around the periphery of the stud, a spacing ring having an opening therein for each of said fingers, a flat spring disposed in each of said openings between the finger and the ring for maintaining contact pressure between the stud and the finger, said ring being a reversed Z shape in cross section, thereby offsetting the bottoms of said openings a predetermined distance from the tops of the openings.

MAX J. RUBEL.