Dec. 13, 1955 G. R. MOHR ET AL 2,727,113

RADIO FREQUENCY CONTACTS

Filed Sept. 6, 1951 2 Sheets-Sheet 1

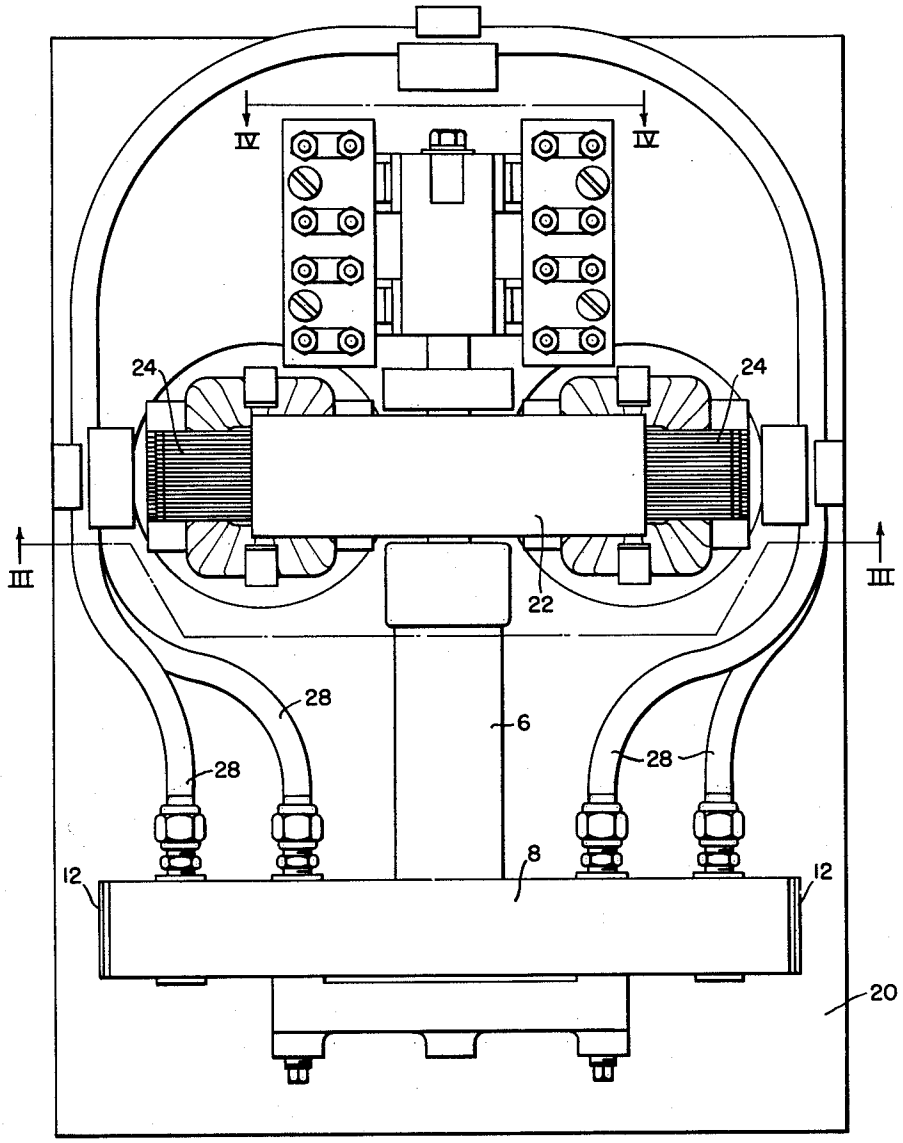


Fig. 1.

WITNESSES:

Robert A. Baird

Maurice W. Dodd

INVENTORS
Glenn R. Mohr &
Maurice J. Gelpi.

BY F. E. Browder
ATTORNEY

Dec. 13, 1955 G. R. MOHR ET AL 2,727,113

RADIO FREQUENCY CONTACTS

Filed Sept. 6, 1951 2 Sheets-Sheet 2

Fig. 2.

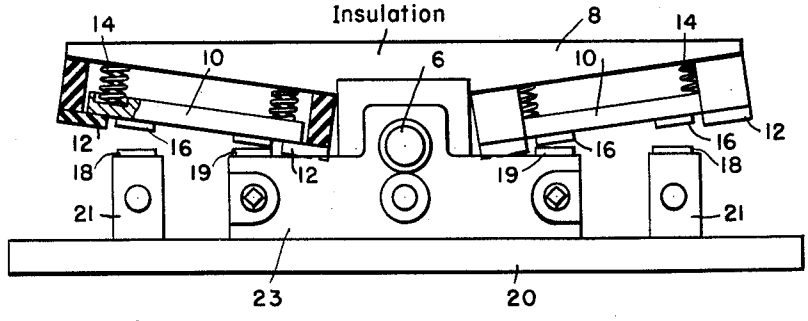


Fig. 3.

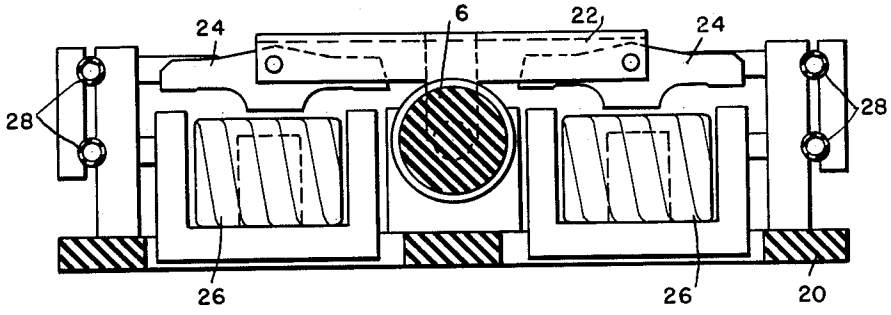
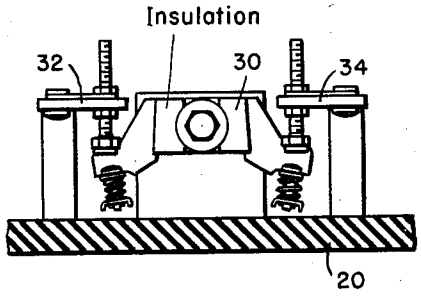


Fig. 4.



WITNESSES:

E. A. McCloskey.

Maurice W. Dodd

INVENTORS
Glenn R. Mohr and
Maurice J. Gelpi.

BY F. E. Browder

ATTORNEY

United States Patent Office 2,727,113 Patented Dec. 13, 1955

2,727,113

RADIO FREQUENCY CONTACTS

Glenn R. Mohr and Maurice J. Gelpi, Baltimore, Md., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application September 6, 1951, Serial No. 245,336

4 Claims. (Cl. 200—166)

Our invention relates to switches and, more particularly, to radio frequency transfer switches.

It is an object of our invention to provide a large current switch for radio frequency which has a long life.

It is another object of our invention to provide a radio frequency transfer switch capable of operating under a large current over a long period of time.

Still another object of our invention is to provide a radio frequency transfer switch having pressure springs which are protected from the radio frequency fields.

An ancillary object of our invention is to provide means for protecting back-up springs in a high frequency switch from the high frequency field.

In accordance with one embodiment of our invention, we provide a transfer switch comprising a rotating shaft which is caused to rotate in response to the action of one of a pair of electromagnets. Connected to the shaft is a lever arm extending outward on both sides of the shaft. On each side of the shaft connected to the aforementioned arm is a contact assembly. The contact assembly comprises a pair of projections extending outward from the arm and extending slightly toward each other at their outer extremity so as to obtain an L-shaped configuration. A contact piece is supplied which rests on the support projections. A pair of pressure springs are provided on one side of the contact bar so as to press the contact bar against the support projections and a pair of moving contact pieces are provided on the other side of the contact bar. The support projections of the supporting arm are constructed of dielectric material and the contact bar and contact pieces are constructed of electrically conducting material. By this arrangement, the contact bar shields the pressure springs from the R. F. fields of the currents passing through the contact bar and a further advantage is obtained by removing the spring from the concentrated portions of the electromagnetic field. A plurality of secondary switches are also connected to this shaft so as to be operated in response to the rotation of said shaft.

The novel features which we consider characteristic of our invention are set forth with more particularity in the appended claims. The invention, however, with respect to both the organization and the operation therefor, together with other objects and advantages may be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figure 1 is a plan view of apparatus embodying our invention;

Fig. 2 is an end elevation view partly in section of the apparatus shown in Fig. 1.

Fig. 3 is a view in elevation partly in section of the apparatus shown in Fig. 1, taken along the line III—III of Fig. 1;

Fig. 4 is a cross-sectional showing of the apparatus shown in Fig. 1, taken along the line IV—IV of Fig. 1.

In accordance with the embodiment of our invention shown in the drawings, we provide a shaft 6 of dielectric material which has attached thereto, near one end thereof, a cross arm 8 preferably of dielectric material which extends outward from the shaft 6 on either side of the shaft 6. Connected to the cross arm 8 on either side of the shaft 6 are two contact assemblies each of which comprises a contact bar 10, each of which is a short bar of conducting material; a pair of lift projections 12 which are preferably constructed of dielectric material and which are connected to the cross arm 8 and extend downward and partially under the contact bar 10 so as to support the contact bar 10. Springs 14 are provided for exerting pressure on contact bars 10, which springs are located between the cross arm 8 and the contact bars 10 so as to exert a force having a tendency to increase the separation between the cross arm 8 and the contact bars 10. The width of the contact bars 10 is preferably substantially greater than the diameter or width of the pressure springs 14 so that the bar 10 shields the spring 14 from R. F. fields. Fastened to the contact bar 10 on the opposite side of the contact bar from that on which the pressure spring 14 is located are a pair of moving contact pieces 16. The moving contact pieces 16 are supplied to make electrical contact with a pair of stationary contact pieces 18 and 19. The contacts 18 each have separate supporting blocks 21, and the contacts 19 are supported by a single large block 23.

The stationary contact pieces have connections (not shown) associated therewith for supplying current thereto or deriving current therefrom. For example, when the apparatus is being employed as a transfer switch, each of the separately supporting blocks 21 shown in Fig. 2 as separately supporting contacts 18 are connected to load circuits. The center block 23, which supports contacts 19, is connected to a prime source of power. Conversely, a different source of power could be connected to each of the contacts 18 and a single load connected to contacts 19 which are supported by block 23. Thus by operation of the switch either source of power could be connected to the load circuit.

The shaft 6 is mounted on a base plate 20 so that its axis remains relatively stable but so that it may be readily rotated about its axis.

Connected to the shaft 6 at another point along the length of the shaft 6 from the point at which the cross arm 8 is connected is a lever arm 22 which extends outward on both sides of the shaft 6. Connected to the lever arm 22 near each extremity thereof is a piece of magnetic material 24 such as a piece of iron. In the region of each piece of magnetic material 24 is an electromagnet 26 capable of exerting a force on the pieces of magnetic material 24 by means of a magnetic field generated by the electromagnet. The electromagnets 26 are located substantially the same distance from the axis of the shaft 6 as are the pieces of magnetic material 24. Thus when a current is supplied to the electromagnets 26, a force is exerted on the pieces of magnetic material 24 which tends to cause the shaft to rotate about its axis. When the shaft 6 rotates in response to one of the electromagnets 26 being activated, the cross arm 8 is caused to rotate a short distance about the shaft 6. When the cross arm 8 rotates one end of the cross arm 8 moves downward toward the base plate 20. As that end of the cross arm 8 moves down toward the base plate 20, the moving contact members 16 are caused to engage the stationary contact members 18 and 19 and thereby complete a circuit which extends from a first of the stationary contact pieces 18 through a first of the moving contact pieces 16, through the contact bar 10 and a second moving contact piece 16 to a second stationary contact piece 19. Thus when the shaft is rotated in a clockwise direction, when looking at the apparatus as shown in Fig. 2, the right side of the cross arm 8 will close the contacts 16, 18 and 19 on the

right side of the shaft, thereby completing a circuit therethrough. It will be readily seen that when the contacts **16, 18** and **19** on the right side of the shaft **6** are closed, the contacts on the left side of the shaft **6** must of necessity be opened. This apparatus, therefore, has the advantage when employed as a transfer switch that an operator cannot inadvertently supply power to the second load circuit when power is being applied to the first load circuit.

Since the contact bars **10** lie between the pressure springs **14** and the contact pieces **16**, and since the cross arm **8** and the lift projections **12** are of dielecrtic material, a current passing through the contact pieces **16, 18** and **19** and the contact bars **10** will not produce substantial radio frequency field in the region of the pressure springs **14** because the springs **14** are located outside the electric field of the circuit. The pressure springs **14** are, therefore, protected from the R. F. fields and will not be heated and injured thereby.

Water pipes **28** are connected to the mountings **21, 23** for the stationary contacts **18** and **19** so as to cause cooling water to pass therethrough.

A plurality of secondary cross arms **30** are also connected to the shaft **6** so as to be rotated in response to the rotation of the shaft **6**. These secondary cross arms **30** are made of dielectric materials and are adapted to contact electrical contact boards **32, 34** when the shaft **6** is rotated through a predetermined number of degrees. Preferably the apparatus should be so constructed that when one side of the main switch comprising the contacts **16, 18** and **19** is closed, one side of each of the secondary switches comprising the secondary cross arms **30** and the electrical contact boards **32, 34** is closed.

Although we have shown and described specific embodiments of our invention, we are aware that other modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and the spirit of the invention.

We claim as our invention:

1. An electrical switch comprising a contact bar having end portions, and a pair of contact members positioned between said end portions a supporting member for said contact bar, a pair of springs positioned between said supporting member and said contact bar, said springs respectively being positioned such that each of the springs is connected with one of said end portions of the contact bar and with said pair of contact members being positioned between said pair of springs, and a pair of spaced stationary contacts adapted for connection with said contact bar to supply radio frequency current through said contact bar and between said stationary contacts, with each of said springs having a diameter and said contact bar having a width greater than said diameter such that said bar is operative to shield said pair of springs from the radio frequency field established by said current.

2. In electrical switching apparatus, the combination of a cross arm having a plane surface, a pair of spaced support projections extending from said cross arm in a direction substantially perpendicular to said surface, a contact bar positioned between said support projections and supported thereby, a pair of pressure springs positioned between said cross arm and said contact bar, said pair of springs being positioned substantially parallel to said pair of support projections, said pair of springs being in addition positioned between said support projections, with a pair of contact members being connected to said contact bar, with said pair of contact members being positioned between said pressure springs.

3. In electrical switching apparatus, the combination of a cross arm having a plane surface, a pair of spaced support projections extending from said cross arm in a direction substantially perpendicular to said surface, a contact bar positioned between said support projections and supported thereby, a pair of pressure springs positioned between said cross arm and said contact bar, said pair of springs being positioned substantially parallel to said pair of support projections, said pair of springs being in addition positioned between said support projections, with a pair of contact members connected to said contact bar and being positioned between said pressure springs, with said contact members being in addition positioned on one side of said contact bar and said springs being positioned on the opposite side of the contact bar.

4. In electrical switching apparatus, the combination of a cross arm having a plane surface, a pair of spaced support projections extending from said cross arm in a direction substantially perpendicular to said surface, a contact bar positioned between said support projections and supported thereby, a pair of pressure springs positioned between said cross arm and said contact bar, said pair of springs being positioned substantially parallel to said pair of support projections, said pair of springs being in addition positioned between said support projections, characterized by each of the support projections including outer extremity portions, with the respective outer extremity portions extending toward each other such that each of said support projections thereby has an L-shaped configuration, with the respective outer extremity portions being positioned substantially parallel to said cross arm and further respectively extending toward each other.

References Cited in the file of this patent

UNITED STATES PATENTS

1,559,110	Leddick	Oct. 27, 1925
2,081,618	Dunn	May 25, 1937
2,100,102	Dyer et al.	Nov. 23, 1937
2,109,211	Dyer	Feb. 22, 1938
2,133,160	Barlow	Oct. 11, 1938
2,227,160	Seaman	Dec. 31, 1940
2,276,698	Pierce	Mar. 17, 1942
2,384,988	Ellis et al.	Sept. 18, 1945
2,424,308	Ellis et al.	July 22, 1947
2,448,650	Aitken	Sept. 7, 1948
2,491,696	Venditty	Dec. 20, 1949
2,538,370	Lerstrip	Jan. 16, 1951

FOREIGN PATENTS

147,084	Austria	Sept. 25, 1936
591,594	Germany	Jan. 24, 1934
663,157	Germany	July 30, 1938
803,235	France	Sept. 25, 1936
818,454	France	Sept. 27, 1937