March 6, 1951 A. PROCTOR 2,543,804

GROUNDING ARRANGEMENT FOR HIGH-FREQUENCY TRANSFER SWITCHES

Filed Aug. 20, 1947

3 Sheets-Sheet 1

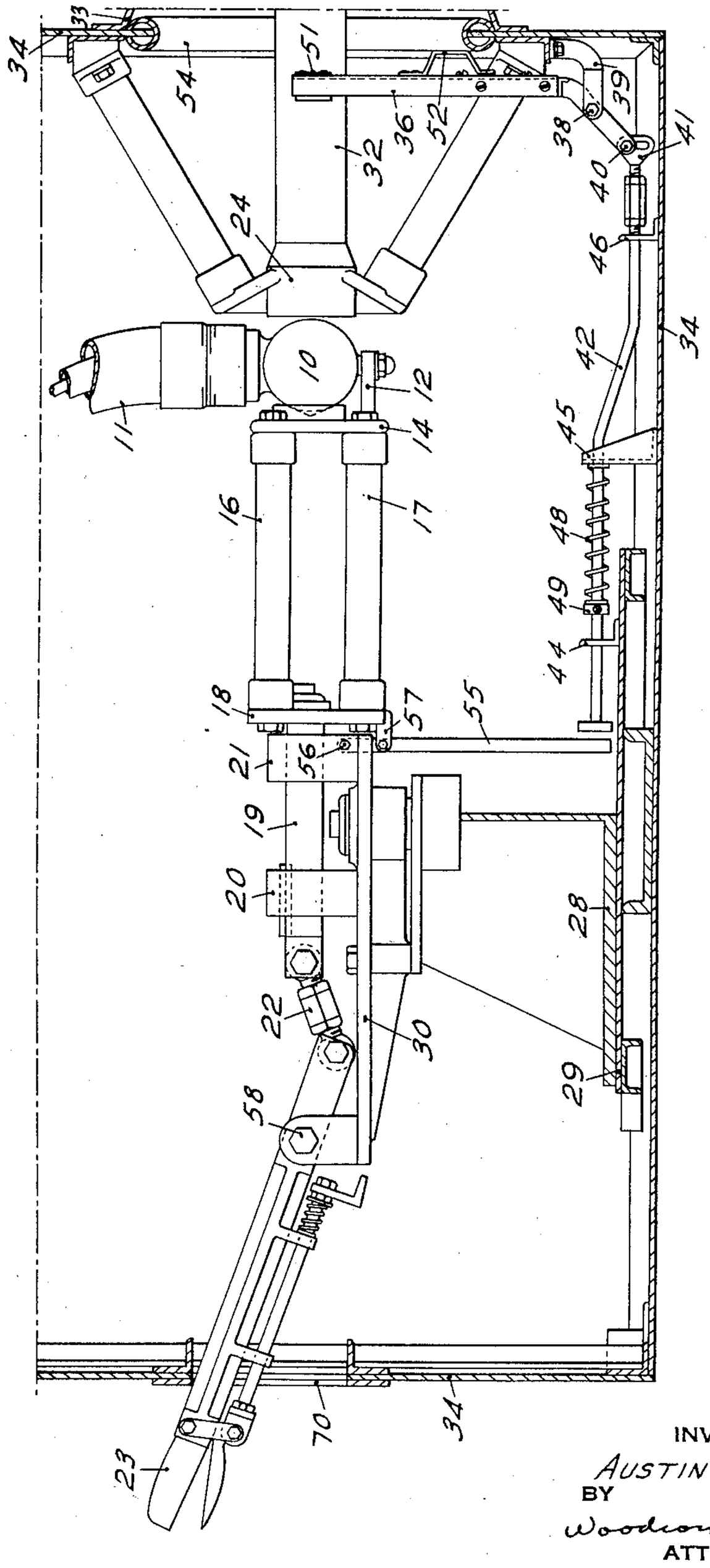


Fig. 1.

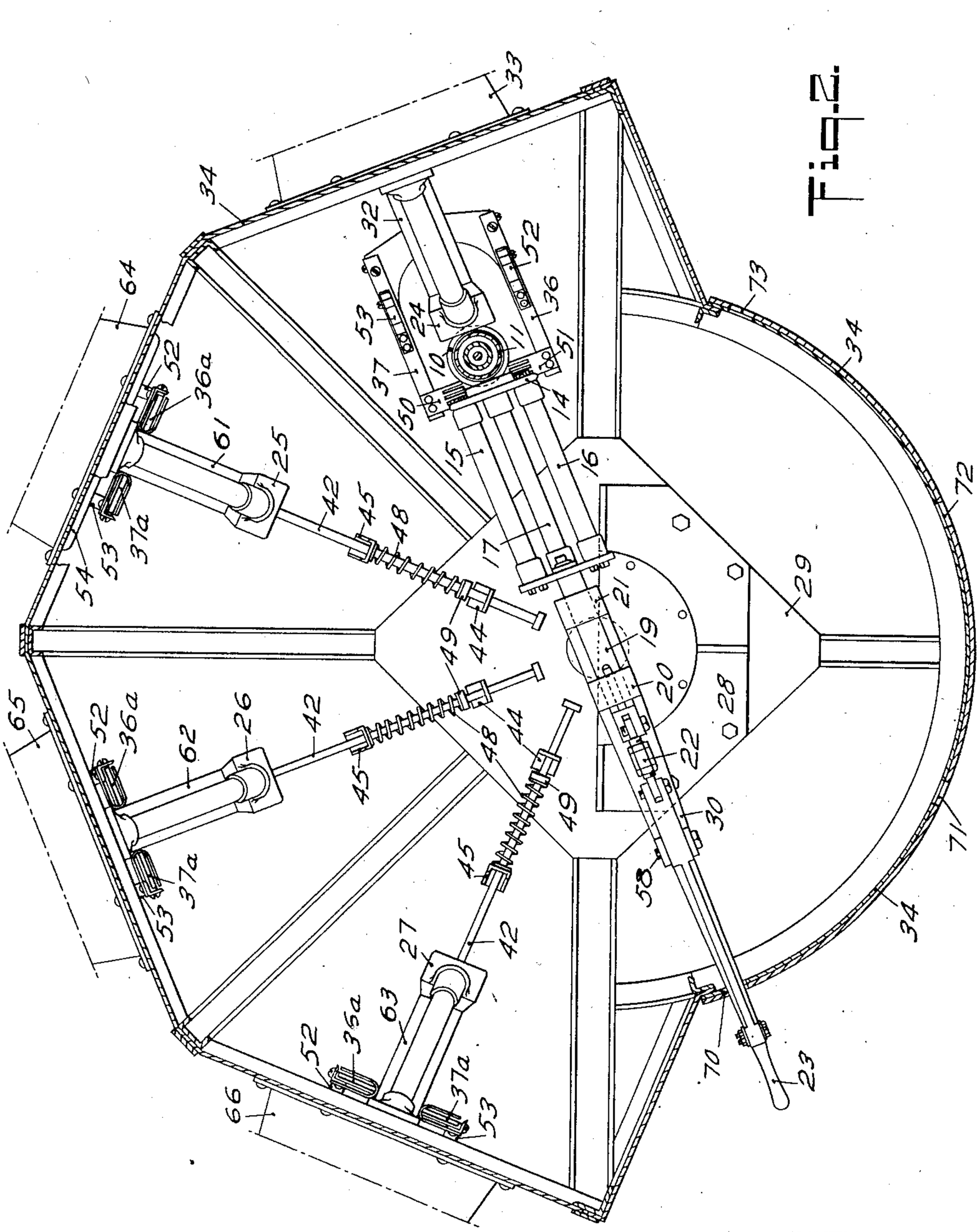
INVENTOR
AUSTIN PROCTOR
BY
Woodcock and Phelan
ATTORNEYS

March 6, 1951 A. PROCTOR 2,543,804

GROUNDING ARRANGEMENT FOR HIGH-FREQUENCY TRANSFER SWITCHES

Filed Aug. 20, 1947 3 Sheets-Sheet 2

Fig. 2



INVENTOR
AUSTIN PROCTOR
BY
Woodcock and Phelan
ATTORNEYS

March 6, 1951 A. PROCTOR 2,543,804

GROUNDING ARRANGEMENT FOR HIGH-FREQUENCY TRANSFER SWITCHES

Filed Aug. 20, 1947 3 Sheets-Sheet 3

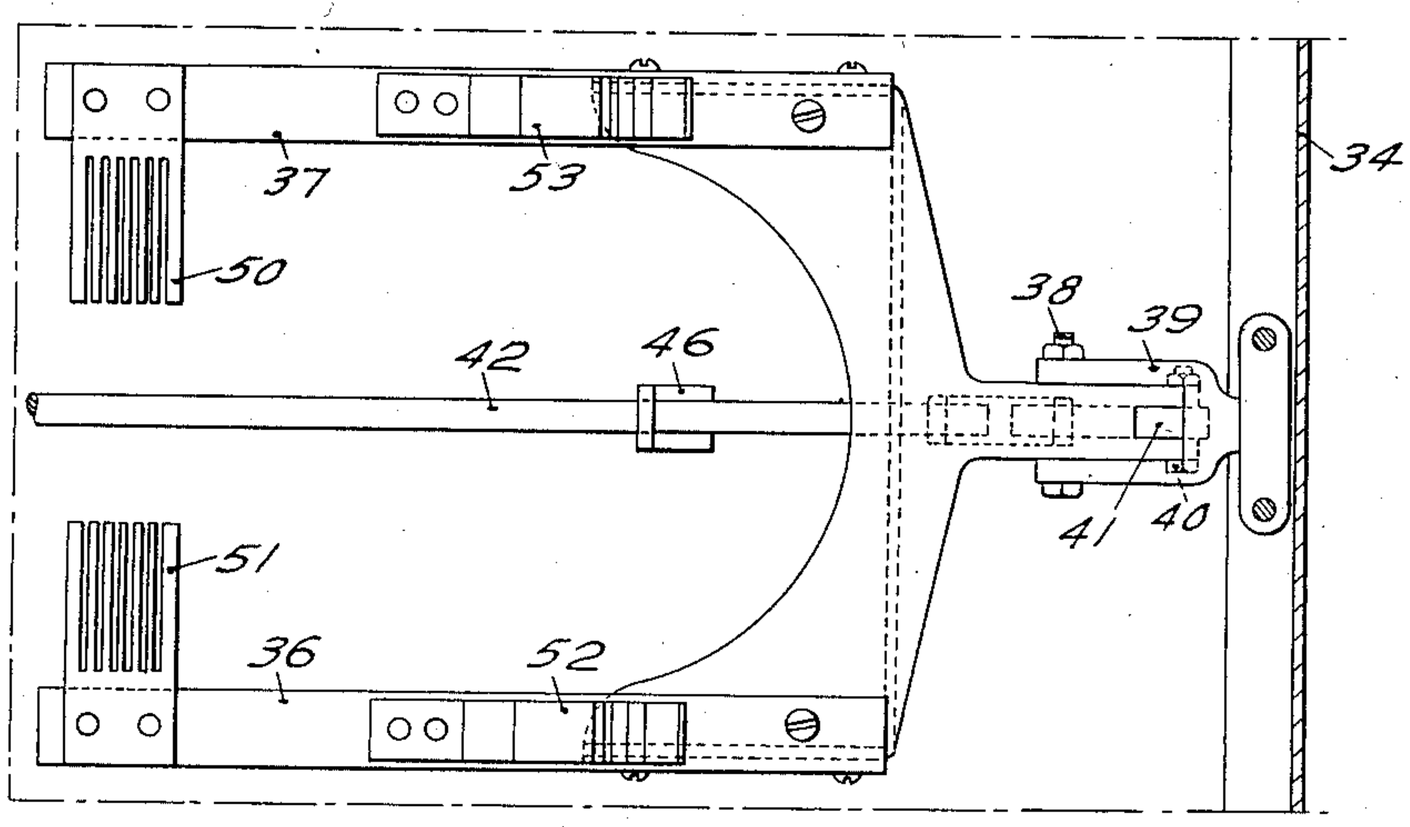


Fig. 3.

INVENTOR
AUSTIN PROCTOR
BY
Woodcock and Phelan
ATTORNEYS

Patented Mar. 6, 1951

2,543,804

UNITED STATES PATENT OFFICE

2,543,804

GROUNDING ARRANGEMENT FOR HIGH-FREQUENCY TRANSFER SWITCHES

Austin Proctor, Louisville, Ky., assignor to The Girdler Corporation, Louisville, Ky., a corporation of Delaware

Application August 20, 1947, Serial No. 769,660

7 Claims. (Cl. 200—4)

1

This invention relates to an improved grounding arrangement for high-frequency switches of the type particularly applicable for use with high-frequency systems and has for an object the provision of a grounding arrangement by means of which every one of a plurality of stationary contacts will be automatically connected to ground except during final movement of a movable contact into contact-engagement with a selected stationary contact.

As explained in Zottu Patent No. 2,419,307, a transfer switch is necessary if a high-frequency generator is to be utilized to supply energy, first, to one load, and then to other selected loads for the reason that the large size of conductors required for the transmission lines makes difficult, if not impractical, the connection and disconnection of one load to the other. The transfer switch of the Zottu patent includes a reasonably satisfactory means for grounding all of the stationary contacts other than the one selected by an operator, but leaves something to be desired in that none of the stationary contacts is connected to ground during transfer of the movable contact from one circuit-controlling position to another, a situation which is to be avoided.

In carrying out the present invention, in one form thereof, a grounding arrangement is provided which automatically operates to maintain each of a plurality of stationary contacts at ground potential and in which all stationary contacts are connected to ground during all movements of a movable contact from one stationary contact to another. More particularly, the grounding arrangement automatically operates not only to ground each stationary contact, but also the inner and outer conductors of associated concentric lines and to maintain them at ground potential until the final movement of a movable contact into a selected circuit-controlling position.

For further objects and advantages of the invention, reference is to be had to the following description and to the accompanying drawings in which the invention has been illustrated as applied to a transfer switch which forms the subject matter of an Ellsworth and Gilbert patent application, co-workers of mine, filed August 20, 1947, Serial No. 769,698.

In the drawings:

Fig. 1 is a fractional view of a switch embodying the invention with the operating handle in open position;

Fig. 2 is a plan view of the switch with the operating handle in closed position; and

2

Fig. 3 is a plan view of the grounding arms in their retracted positions.

Referring to he drawings, the invention in one form has been shown as applied to a transfer switch comprising a movable contact 10 secured to a flexible conductor 11 and pivotally supported on an arm 12 extending from a bracket 14. The bracket 14 forms a part of an operating mechanism including three insulators 15, 16 and 17 which are connected to a bracket 18 which is, in turn, secured to a rod 19 slidably mounted in bearings 20 and 21. A toggle, including a toggle link 22 and an operating handle and lever 23, serves to move the movable contact 10 toward and away from a cooperating stationary contact 24. Additional stationary contacts 25, 26 and 27 may be seen in Fig. 2, though, of course, a greater number of stationary contacts may be utilized. The operating mechanism, including the bearings 20 and 21, are supported on a turntable or subframe 30 which is pivotally carried by a bracket 28 resting upon a base 29.

As shown, the switch is in an open circuit position with the movable contact 10 ready for movement into engagement with the stationary contact 24. It is to be observed that the conductor 32, to which the stationary contact 24 is secured, forms the inner conductor of a concentric transmission line, the outer grounded conductor 33 of which is bolted to or otherwise suitably secured to the housing 34 of the transfer switch. With the parts in their illustrated positions, it is to be observed that the inner conductor 32 is connected to the outer grounded conductor 33 of the concentric or coaxial line by means of contact arms 36 and 37, Fig. 3. Though one arm would be enough to complete the aforesaid grounding connection, the use of two arms affords double protection in the establishment of a good grounding circuit at each stationary contact. As shown in Fig. 1, the contact arm 36 is pivoted at 38 on a bracket 39, the lower end of arm 36 being pivoted by a pin 40 to the vertically slotted end of a turn buckle 41 secured to the end of a rod 42. The rod 42 is supported in bearing members 44, 45 and 46 for slidable movement and is biased by means of a spring 48 acting on a collar 49 secured to the rod 42 for maintaining the contact arms 36 and 37 in their illustrated positions. Each of contact arms 36 and 37 includes two sets of inwardly extending resilient contact fingers 50 and 51. These slidably and wipingly engage the inner conductor 32. Each of contact arms 36 and 37 also includes resilient contact members 52 and 53 which, it will be observed, Fig. 1, are riveted to

the contact arm at one end thereof, the opposite end being free to provide wiping and sliding contact engagement with a circular ring **54** connected to and forming a part of the housing, as well as of the outer conductor **33** of the associated concentric line. Thus, with the parts in the positions shown, the housing of the switch, the outer conductor which is grounded, and the inner conductor are all connected together and all remain at ground potential until the arms **36** and **37** have been moved out of the circuit-closing positions.

The actuating lever **55** for arms **36** and **37** is pivoted to the subframe **30** as at **56** and is attached to a link **57** extending from the bracket **18**. Each of the actuating rods **42**, one for each stationary contact, has one end disposed for engagement by the actuating lever **55**. Accordingly, when the operating handle **23** is moved downwardly about its pivotal support **58**, the toggle is straightened, the rod **19** and the bracket **18** move toward the stationary contact to rotate the lever **55** into engagement with the end of the actuating rod **42**. This rod acting upon the lower end of the grounding switch member **36** rotates it about its pivot **38** in a counterclockwise direction and out of its circuit-closing position. When the movable contact **10** has been moved into engagement with the stationary contact **24**, the grounding arms **36** and **37** will extend substantially horizontally from their pivotal support and well away from the contacts **10** and **24**. Thus, it will be seen that the stationary contact **24**, the housing **34** of the switch and the grounded outer conductor of the coaxial line will all be connected together until the movable contact **10** has been moved substantially into its circuit-closing position with respect to stationary contact **24**.

The foregoing arrangement is deemed highly desirable since the switch may be operated from the position illustrated in Fig. 1 for engagement with any selected one of stationary contacts **24** to **27**. During such movement, as for example, from indexing slot **70** to indexing slots **71**, **72** or **73**, Fig. 2, it is desirable that all stationary contacts then be at ground potential and this is accomplished regardless of the wishes of the operator. It is fail-safe.

With each of stationary contacts **25**, **26** and **27** supported from inner conductors of coaxial or concentric lines **61**, **62** and **63** are associated arms **36***a* and **37***a*, which are structurally and operationally identical with the arms **36** and **37**. Accordingly, when the movable contact **10** engages the stationary contact **24**, the remaining grounding arms **36***a* and **37***a* connect to ground the housing **34** and they connect each of the inner conductors of the respective coaxial lines to the outer grounded conductors **64**, **65** and **66** thereof. In Fig. 2 the parts have been illustrated with the operating handle **23** in the closed circuit position with the movable contact **10** pressed into engagement with the stationary contact **24**, and of course with the arms **36** and **37** moved out of their grounding positions as, for example, rotated about pivot **38** to substantially horizontal positions.

While a preferred embodiment of the invention has been described, it will be understood that modifications may be made therein within the scope of the appended claims.

What is claimed is:

1. A transfer switch having a plurality of stationary contacts and a rotatable contact selectively movable into and out of engagement respectively with a selected one of said stationary contacts, at least one grounding arm for each stationary contact, pivotal mounting means for said arm, biasing means normally holding said arm in position to connect its associated stationary contact to ground, and actuating structure including a reciprocative member for moving said rotatable contact into engagement with a selected stationary contact and for rotating the associated one of said grounding arms out of grounding position with respect to said selected stationary contact while leaving all other of said grounding arms connected for grounding their respective stationary contacts, and for again grounding said selected contact before rotation of said rotatable contact toward another stationary contact.

2. The combination set forth in claim 1 in which each stationary contact forms an extension of the inner conductor of a concentric line and in which the outer conductor of said concentric line is grounded, each grounding arm having contacts for engaging and completing connections between said inner and outer conductors of said concentric line.

3. A transfer switch having a plurality of stationary contacts and a rotatable contact selectively movable into and out of engagement respectively with a selected one of said stationary contacts, at least one grounding arm for each stationary contact, means pivotally supporting each grounding arm for rotation into and out of grounding position with its associated stationary contact independently of each other grounding arm, means including a reciprocative actuating rod for biasing each grounding arm to its circuit-closing position, actuating mechanism selectively operable to move said rotatable contact into and out of circuit-closing position with a selected one of said stationary contacts, and means forming a driving connection between said actuating mechanism and said actuating rod for rotating said grounding arm associated with the selected stationary contact from its circuit-closing position to a circuit-opening position, thereby to remove said grounding connection as the rotatable contact is being moved towards its circuit-closing position.

4. The combination set forth in claim 3 in which each stationary contact is supported from the inner conductor of a concentric line and in which the outer conductor thereof is connected to ground, and in which two grounding arms for each stationary contact are respectively provided with resilient contact members for interconnecting the inner and outer conductors of each concentric line.

5. The combination set forth in claim 3 in which each stationary contact is supported on a conductor extending through an opening formed in the housing of the switch and in which each of said grounding arms includes resilient contact members for interconnecting said inwardly extending conductor and the housing of said switch.

6. A transfer switch having at least one stationary contact and a movable contact operable into and out of engagement with said stationary contact, actuating mechanism for said movable contact including a rod connected to said movable contact and slidably mounted for moving said movable contact toward and away from said stationary contact, an electrically conducting grounding arm for said stationary contact, a pivotal support for said arm disposed in spaced relation with respect to said stationary contact, a rod

engaging one end of said arm and slidably mounted for rotating said arm out of grounding position with said stationary contact, means operable by said actuating mechanism for engaging said last-named rod to rotate said arm out of grounding engagement with said stationary contact as said movable contact is moved toward and into engagement with said stationary contact, said arm having spaced contact structures carried thereby, one for electrically engaging said stationary contact and the other for completing an electrical connection to ground said stationary contact when said arm is in said grounding position, and resilient means operable upon movement of said movable contact away from said stationary contact for moving and biasing said arm to said grounding position.

7. A transfer switch for high voltage high-frequency electrical energy having a plurality of stationary contacts and a rotatable contact selectively movable into and out of engagement respectively with a selected one of said stationary contacts, at least one grounding arm for each stationary contact, pivotal mounting means for said arm, biasing means including a reciprocative member associated with each stationary contact for normally holding said arm in position to connect its associated stationary contact to ground, indexing means for aligning said rotatable contact with a selected stationary contact, said indexing

means having an index station for each said stationary contact, and actuating structure including leverage structure and a reciprocative rod for moving said rotatable contact into engagement with said selected stationary contact and for operating the associated one of said reciprocative members to rotate the associated one of said grounding arms out of grounding position with respect to said selected stationary contact while leaving all other of said grounding arms connected for grounding their respective stationary contacts, and for again grounding said selected stationary contact upon disengagement of said rotatable contact before rotation of the latter to another indexing station for engagement with another stationary contact.

AUSTIN PROCTOR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
983,380	Lord	Feb. 7, 1911
1,515,578	Glaser	Nov. 11, 1924
2,277,555	Meuer	Mar. 24, 1942
2,337,130	Rubel	Dec. 21, 1943
2,419,307	Zottu	Apr. 22, 1947
2,427,940	Ayres	Sept. 23, 1947