

Nov. 5, 1935.

G. R. LANGLEY ET AL

2,020,069

INTERLOCK MECHANISM

Filed Nov. 25, 1933

3 Sheets-Sheet 1

Fig. 1.

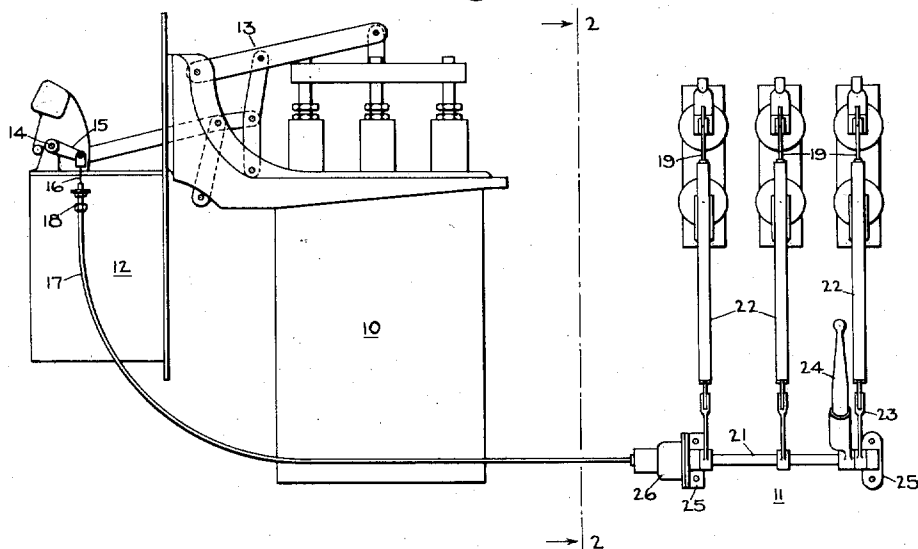
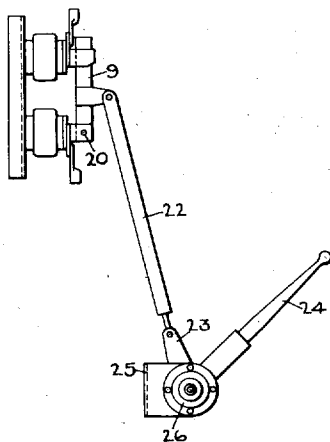


Fig. 2.



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Fig. 3.

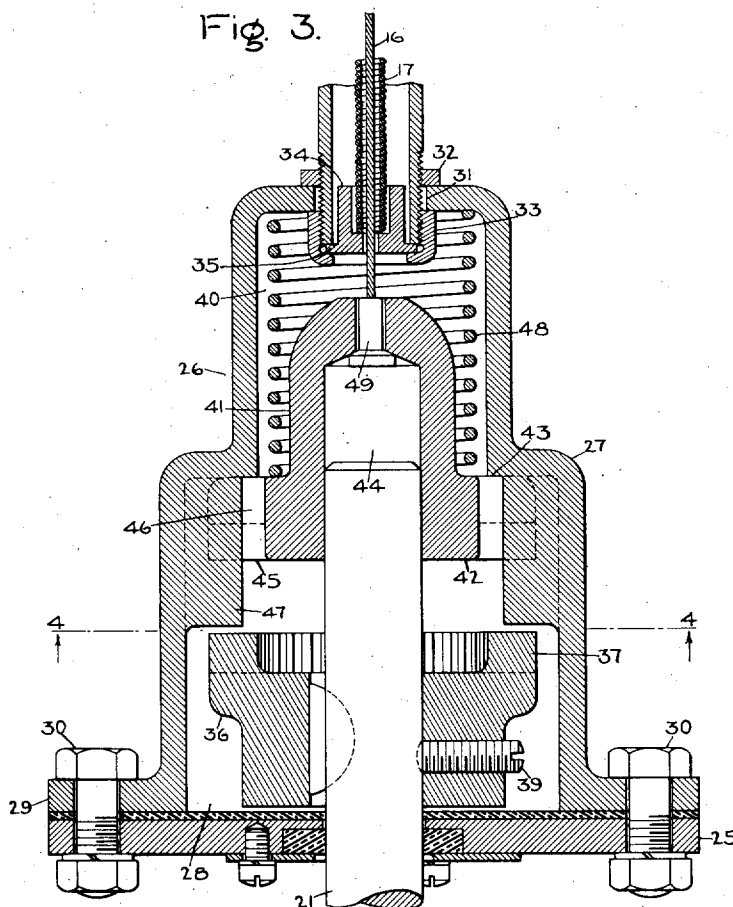
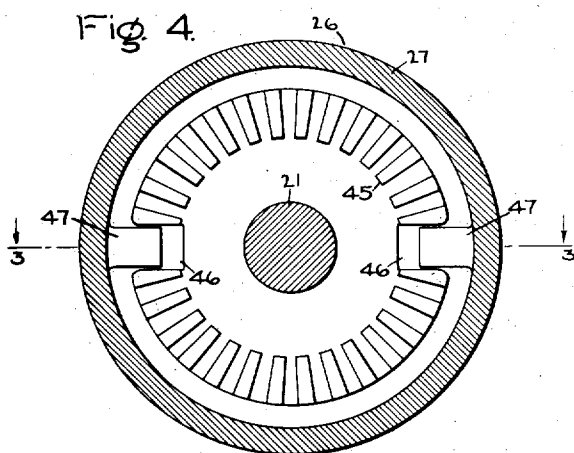


Fig. 4.



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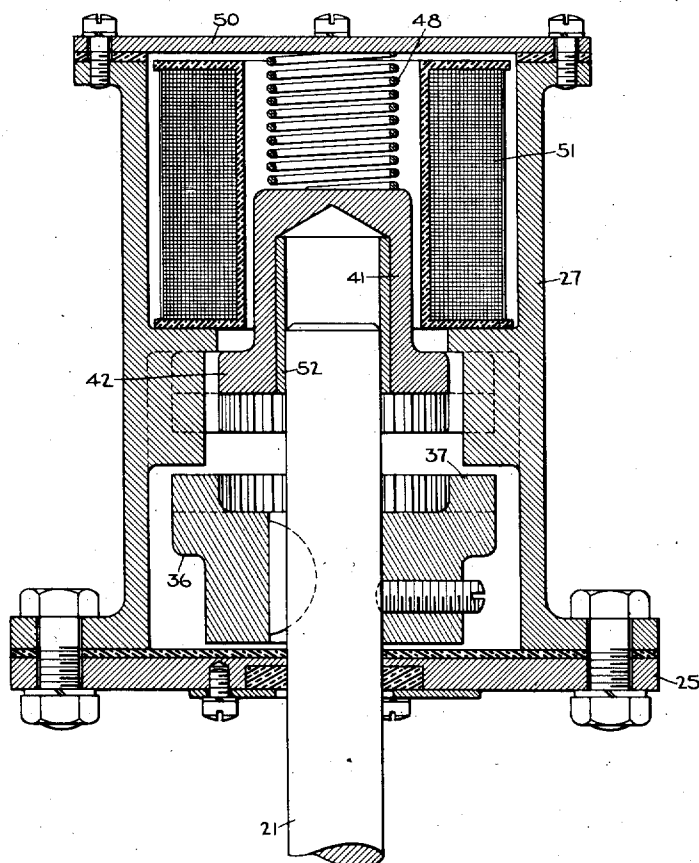
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3 Sheets-Sheet 3

Fig 5.



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UNITED STATES PATENT OFFICE

2,020,069

INTERLOCK MECHANISM

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Application November 25, 1933, Serial No. 699,756
In Canada May 10, 1933

5 Claims. (Cl. 200—5)

Our invention relates to interlock mechanisms, more particularly to interlocking connections for electrical switchgear.

In electric power switching installations it is customary to provide a circuit breaker for opening the circuit under load and also to provide a disconnecting or isolating switch whereby the circuit breaker may be electrically isolated for safe inspection and repair. As the disconnecting switch is not designed for opening the circuit under load it is desirable to provide an interlock mechanism between the circuit breaker and the disconnecting switch so that the disconnecting switch cannot be opened or closed while the circuit breaker is closed.

A principal object of our invention is the provision of an improved interlock mechanism of the aforesaid character which can be easily applied irrespective of the relative physical location of the circuit breaker and disconnecting switch, readily be made weatherproof and which is of sturdy construction and reliable in operation.

Our invention will be more fully set forth in the following description referring to the accompanying drawings, and the features of novelty which characterize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawings, Fig. 1 is an elevational view of a typical switching installation in which our invention is incorporated; Fig. 2 is a view of the aforesaid installation taken along the line 2—2 of Fig. 1 as indicated; Fig. 3 is a longitudinal view, partly in section, of the interlock mechanism taken on the line 3—3 of Fig. 4; Fig. 4 is a transverse cross section taken on the line 4—4 of Fig. 3, and Fig. 5 is a longitudinal view, partly in section, of a modified form of interlock mechanism embodying our invention.

Referring to Fig. 1, 10 represents in general an oil circuit breaker with its operating mechanism and 11 represents in general a manually operated gang disconnecting switch. The oil circuit breaker may be located in a weather-proof switch house and the disconnecting switch mounted in any convenient neighboring location, depending on the requirements of the situation. Reference character 12 represents a motor operating mechanism for the oil circuit breaker having connecting switch operating links 13.

The interlock mechanism connected to the oil circuit breaker includes a shaft 14 which has secured thereto an arm 15. A Bowden wire connection 17 has its flexible wire 16 secured to the

end of the arm 15 and its outer casing or sheath secured as at 18 to a fixed part of the oil circuit breaker mechanism.

On operation of the circuit breaker to open position the shaft 14, which may form a movable part of the operating mechanism, rotates the arm 15 in a counter-clockwise direction, thereby exerting a pull on the wire 16 for a purpose presently described. It will be apparent that any suitable connection to a movable part of the circuit breaker operating mechanism may be employed, which connection will result in a pull on the wire 16 when the circuit breaker is operated to open position.

The disconnecting switch 11, referring to Figs. 1 and 2, comprises three switch blades 19, each pivoted as at 20. Each blade is connected to an operating shaft 21 by a link 22 and crank arm 23 secured to the shaft. The shaft 21 has an operating handle 24 and is journaled in supporting brackets 25. The interlock mechanism is represented at 26 and has connected thereto the other end of the Bowden wire 17.

Referring now to Figs. 3 and 4 which show the interlock mechanism 26 on a larger and detailed scale, 27 is a housing which may be a casting having an open end 28 and provided with flanges 29 at that end so that the assembly may be secured to the bracket support 25 as by means of the bolts 30. The upper end of the casing 27 has an opening 31 through which the Bowden wire 17 extends. In this case the wire is enclosed in a conduit or pipe which is secured to the casing as by the nuts 32 and 33. A guide member 34 for the wire 16 has a flange 35 which is clamped between the nut 33 and one end of the pipe 17. The outer flexible but not compressible sheathing of the Bowden wire is seated in the member 34 as illustrated.

For the purpose of operatively interconnecting the interlock mechanism and the disconnecting switch the housing 27 is mounted in such relation to the disconnecting switch shaft 21 that the shaft projects into it as illustrated. A hub-like member 36 having radially extending teeth 37 on its upper face is splined to the shaft 21 and is also secured thereto against longitudinal movement by the set screw 39. The upper end of the housing 27 has a reduced bore 40. A movable locking member having a body portion 41 and an annular flange 42 is located in the housing, the body portion 41 extending into the reduced bore 40 and the annular flange limiting movement in the upward direction by abutting the shoulder 43. The member 41 is provided

with a bore 44 throughout the greater part of its length which freely receives one end of the shaft 21.

For the purpose of locking shaft 21 the member 41 is slidable from the upper position illustrated in Fig. 3 to a lower position where teeth 45 provided on its lower face mesh with the corresponding teeth 37 on the member 36. In this position both members 36 and 41 are locked with respect to rotation. To this end the flange 42 is provided with a pair of diametrically opposite radial slots 46 into which extend wings or lugs 47 integral with the housing 27. Accordingly longitudinal motion of the member 41 on the shaft 21 is permitted, but rotation is prevented.

The locking member 41 is resiliently biased towards locking position as by a coil spring 48 located in the reduced bore 40 of the housing and bearing at opposite ends against the upper end of the housing and the flange 42 respectively. As the member 41 is prevented from rotating by its engagement with the wings 47 it is obvious that in the engaged or meshed position of the cooperating toothed members 42 and 36 the shaft 21 is locked against rotation.

The wire 16 which extends as previously explained through the conduit portion of the Bowden wire 17 from the operating mechanism of the oil circuit breaker is secured by an enlarged head portion at 49 as illustrated to the member 41. It is clear from the above description that when the oil circuit breaker is in its closed position and the wire 16 correspondingly slack the spring 48 presses the two cooperating members 41 and 36 together so that their teeth mesh thereby preventing rotation of the shaft 21 and movement of the disconnecting switch in either the opening or closing direction. Operation of the oil circuit breaker to its open position retracts the member 41 by means of wire 16 against the pressure of the spring 48 and permits rotation of shaft 21 and operation of the disconnecting device. It is clear that failure of the wire 16 or its associated parts will result in the spring automatically moving the member 42 to locking position. Accordingly, the disconnecting switch is locked until the interlock mechanism is repaired.

Referring more particularly to the construction of the mechanism, the cooperating locking members 36 and 42 are provided with a considerable number of teeth 45 which are comparatively narrow in a transverse direction. This construction insures meshing of the teeth of the members. If in movement of the member 42 towards the member 36 the teeth fail to mesh the first slight movement of the shaft 21 in an attempt to open or close the disconnect switch will permit them to mesh properly. The lost motion present in the disconnecting switch operating mechanism will be sufficient to permit this action before movement of the switch contacts takes place. It is therefore apparent that the disconnecting switch is locked against operation in opening or closing direction except when the circuit breaker is in open position.

In the modification shown in Fig. 5, the control of the locking member 41 is electrical instead of mechanical. The spring 48 abutting plate 50 closing the upper end of the housing 27 normally presses the member 41 into engagement with its cooperating member 37 in the same manner as shown in the construction of Fig. 3. In the construction of Fig. 5 retraction of the member 41 is effected by electromagnetic

means. The member 41 is in this case made of magnetic material and its upper end forming a plunger or core projects into the solenoid 51. The member 41 is here shown with a liner 52 of anti-friction material.

In the operation of the electromagnetic interlock device, suitable contacts are provided on a movable part of the oil circuit breaker operating mechanism. On movement of the oil circuit breaker to its open position these contacts will be closed and a circuit completed through the solenoid 51. Energization of the solenoid attracts the member 41 from engagement with the members 36 and permits the operation of the disconnecting switch shaft 21. The member 41 is held in the retracted position while the solenoid is energized and on breaking of the circuit and deenergization of the solenoid, as by closing of the circuit breaker or accidental damage to the magnet control circuit, the disconnect switch is locked by member 41 in whatever position it occupies at the time.

It should be understood that our invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of our invention.

What we claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination with a circuit breaker and an associated disconnecting switch including a rotatable operating shaft, of means interlocking the operation of said shaft with respect to said circuit breaker comprising a locking member movable with respect to said shaft, said locking member having a plurality of portions adapted to mesh with corresponding portions connected to said shaft, means resiliently biasing said member into meshed position so as to lock said shaft, and means for moving said member to a non-locking position when said circuit breaker is in open position, said biasing means normally maintaining said member in locking position.
2. The combination with a circuit breaker and an associated disconnecting switch including a rotatable operating shaft, of means interlocking the operation of said shaft with respect to said circuit breaker comprising a locking member restrained with respect to rotative movement, said member movable longitudinally of said shaft, means resiliently biasing said member at all times tending to lock said shaft with respect to rotation thereof, and means for opposing the bias of said resilient means and moving said member to a non-locking position upon opening of said circuit breaker.

3. The combination with a circuit breaker and an associated disconnecting switch including a rotatable operating shaft, of means interlocking the operation of said shaft with respect to said circuit breaker comprising a locking member movable longitudinally of said shaft, a coacting locking member secured to said shaft, a spring normally biasing said first-named member into coacting engagement with said second-named member for locking said shaft, and means for opposing the bias of said spring and moving said first-named member to a non-locking position upon opening of said circuit breaker.

4. The combination with a circuit breaker and an associated disconnecting switch including a rotatable operating shaft, of means interlocking the operation of said shaft with respect to said circuit breaker comprising a locking member slid-

ably mounted for longitudinal movement on said shaft, means restraining said locking member with respect to rotation thereof, a coacting locking member secured to said shaft, said locking members having meshing interlocking surfaces, a spring normally biasing said first-named locking member into locking engagement with said second-named member so as to lock said shaft, and means for opposing the bias of said spring in moving said first-named member to a non-locking position upon opening of said circuit breaker.

5. The combination with a circuit breaker and

an associated disconnecting switch, of means interlocking the operation of said disconnecting switch with respect to said circuit breaker comprising a locking member, means resiliently biasing said member towards a locking position, and a flexible mechanical connection interconnecting said locking member and a movable element of said circuit breaker for moving said locking member against the bias of said resilient means to a non-locking position upon opening of said circuit breaker.

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