March 20, 1956 F. E. FLORSCHUTZ ET AL 2,739,205

CIRCUIT BREAKER WITH CONTACT INSPECTION DEVICE

Filed Nov. 29, 1952 4 Sheets-Sheet 1

Fig. 1.

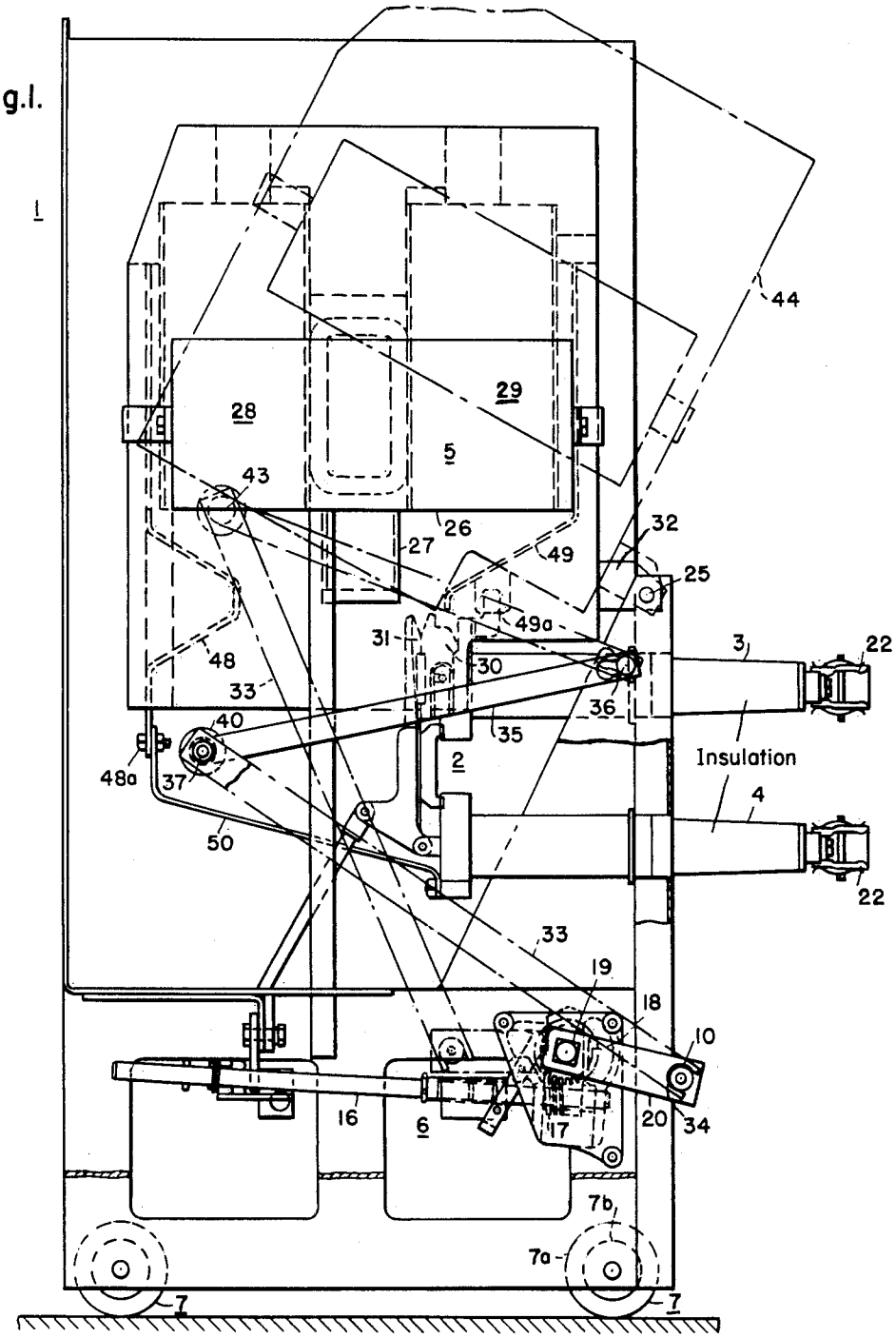

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Fig.2.

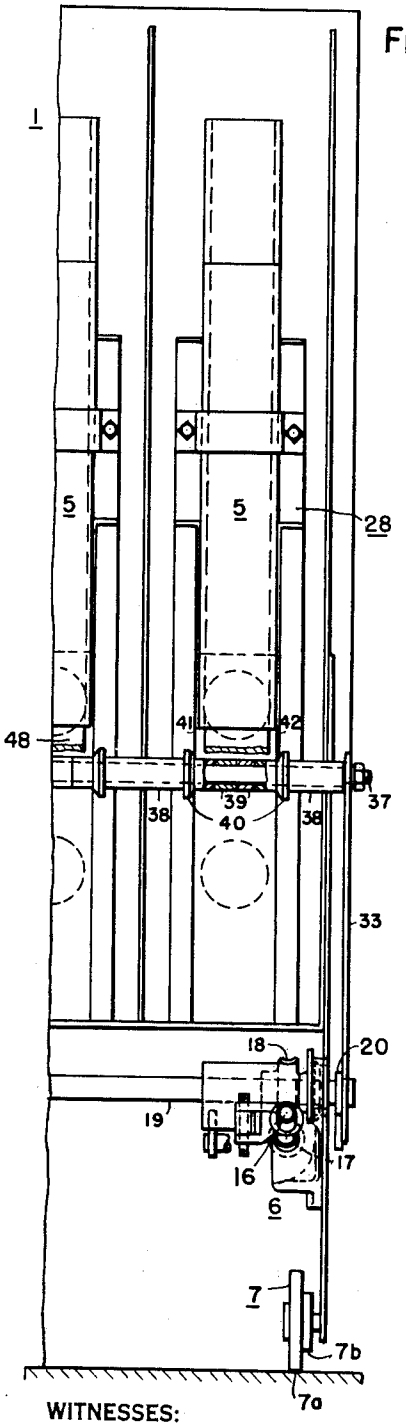

Fig.9.

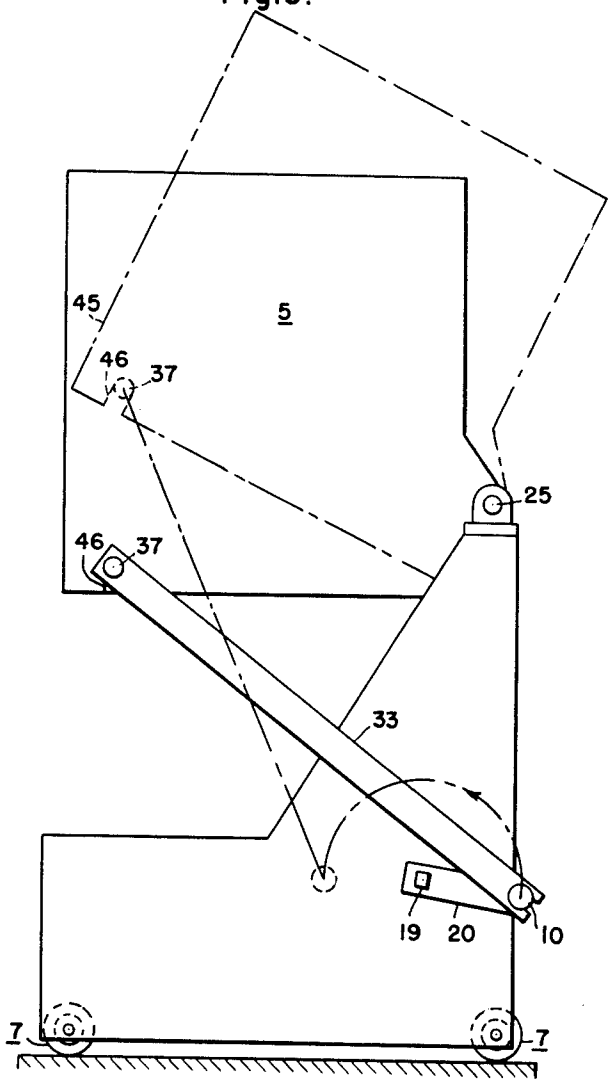

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Fig.3.

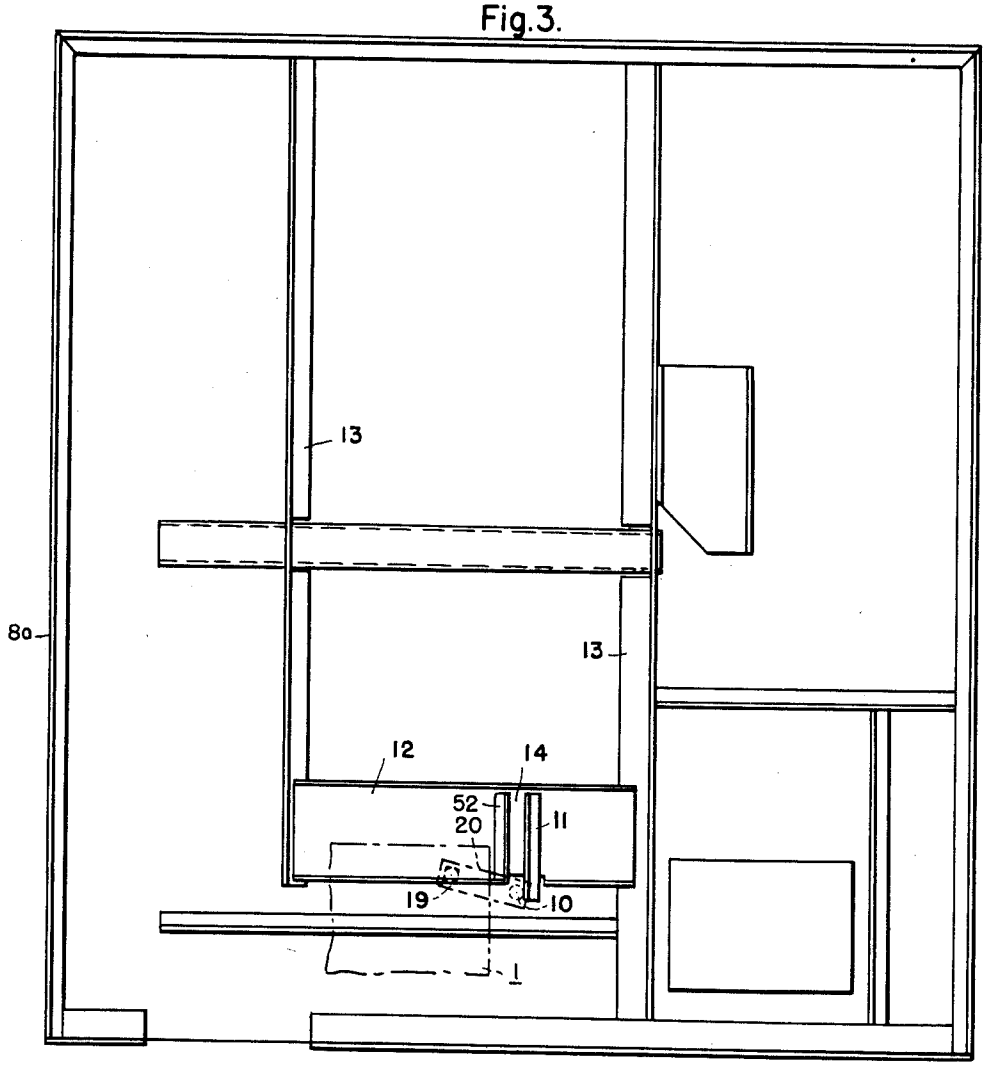

Fig.4.

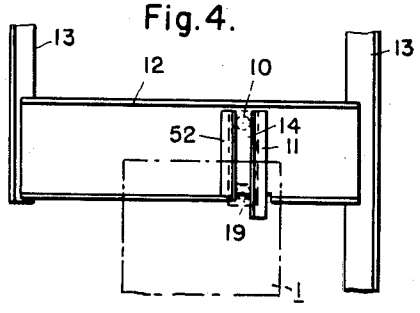

Fig.5.

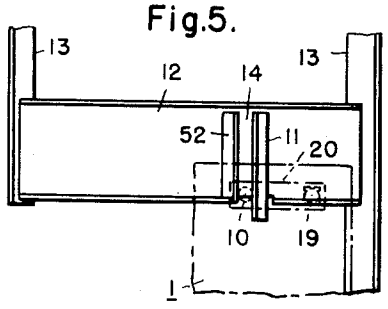

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Fig.6.

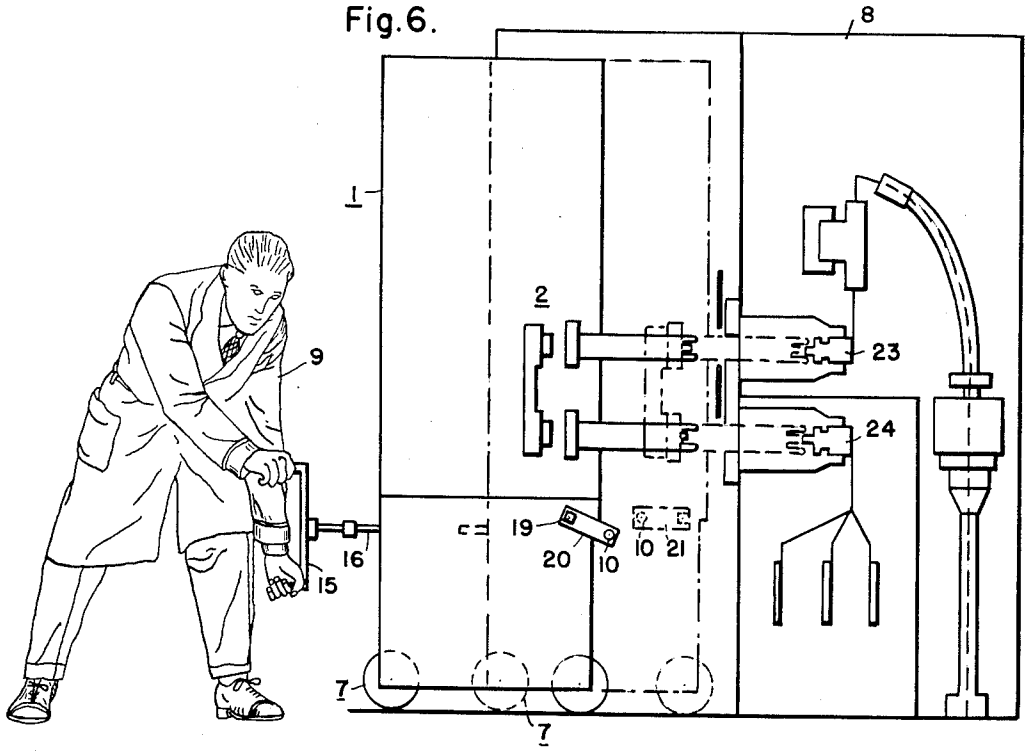


Fig.7.

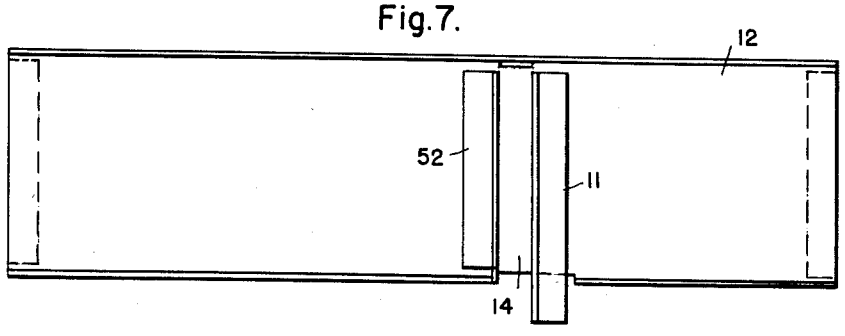
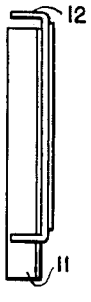


Fig.8.



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2,739,205

CIRCUIT BREAKER WITH CONTACT INSPECTION DEVICE

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Application November 29, 1952, Serial No. 323,221

18 Claims. (Cl. 200—147)

This invention relates to circuit interrupters in general, and, more particularly, to a contact inspection device more particularly adapted for use with a circuit interrupter of the type having a levering-in or drive-in device for moving the same into an operative position within a cubicle or other enclosed housing.

A general object of our invention is to provide an improved contact inspection device which may be utilized with the already existing levering-in or drive-in device. Such drive-in device, when manually operated, causes the interrupter to move into final position within the cubicle.

Still a further object is to provide an improved contact inspection device which may be readily attached to, and detached from, the interrupter, and which may utilize the motive power already existing in the form of a manually-operated levering-in or drive-in device.

In circuit interrupters of relatively high capacity, the arc-chute structure is generally necessarily heavy and cumbersome, and when inspection of the contacts is desired, or inspection of internal parts of the arc chute is desired, it is generally necessary to utilize some sort of lifting crane to raise the arc chute away from the contact structure so that the latter may be visually inspected. One object of our invention is to eliminate any such crane device, and to eliminate the necessity for a chain-pulley system for attachment to the arc chute to raise the same and thereby permit accessibility to the contact structure for maintenance or replacement.

It is another feature of our invention to utilize the already existing drive-in device which is associated with a circuit interrupter housed within a cubicle. As well known by those skilled in the art, such cubicle may be of indoor or outdoor construction, and is provided to render the resulting structure more safe to the operator and also to provide a more pleasing appearance for the installation. Since this existing levering-in or drive-in device is only used during the drawing-out operation, or in the forcing-into-operative-position operation, it is obviously not utilized when the interrupter is out of its cell. Thus, by an application of our invention, we utilize this drive-in device for moving the arc chute to a position where the contact structure is accessible.

Further objects and advantages will readily become apparent upon reading the following specification, taken in conjunction with the drawings, in which:

Figure 1 is a side elevational view of a multipole circuit interrupter, somewhat diagrammatic, and partially broken away and showing the interrupter out of its cell and in the position in which the linkage has been attached to the interrupter for the purpose of raising the arc chute;

Fig. 2 is a fragmentary front elevational view of the multipole circuit interrupter shown in Fig. 1;

Fig. 3 is an elevational view of one of the side framework members illustrating the stop and raceway bracket for the circuit interrupter, a portion of the circuit breaker

being fragmentary and diagrammatically illustrated in the position in which it is initially stopped by the stop bracket;

Fig. 4 is a fragmentary view similar to that shown in Fig. 3, but indicating the position in which the interrupter has been forced by partial actuation of the levering-in or drive-in device;

Fig. 5 is a view similar to that shown in Fig. 4 but indicating the final operative position of the circuit interrupter with respect to the cubicle;

Fig. 6 diagrammatically illustrates a station attendant effecting manual operation of the levering-in device just after the point at which the interrupter has been halted by the stop bracket;

Fig. 7 is an enlarged elevational view of the levering-in device plate and stop bracket;

Fig. 8 is an end elevational view of the levering-in device plate of Fig. 7; and

Fig. 9 is a diagrammatic representation of an alternative form of our invention.

Referring to the drawings, and more particularly to Fig. 1 thereof, the reference numeral 1 generally designates a circuit interrupter out of its cubicle or cell, and including contact structure 2, terminal studs 3, 4, an arc chute 5, in which the arc is extinguished, and a levering-in or drive-in device 6. The circuit interrupter 1, as well known by those skilled in the art, is assembled in framework manner, and is mounted for movement on a plurality of wheels 7. The wheels 7 may have two rims, an outer rim 7a for moving on the floor and an inner rim 7b, of smaller diameter, for engaging with a track, not shown, associated with the cell or cubicle 8, more clearly shown in Fig. 6 of the drawings.

The cubicle or cell 8 not only provides greater safety for a station attendant 9 (Fig. 6), but also such a cell construction improves the appearance and permits substitution of the interrupter 1, whereby a spare may be utilized at a time when maintenance work is being done on the original interrupter.

To move a circuit interrupter 1 into the cell 8, it is necessary to roll interrupter 1 into position until the inner rims 7b engage a pair of tracks within the cell, at which time the attendant 9 may push the interrupter back into the cell until a pair of rollers 10, only one of which is shown in Figs. 1 and 6, engage a stop bracket 11, more clearly shown in Figs. 3–5 and 7, 8 of the drawings. The stop bracket 11 is of angular structure, as indicated in Figs. 7 and 8, and is welded to a drive-in channel plate 12, the latter being secured to angle members 13 associated with the side framework 8a of the cubicle 8, as more clearly shown in Fig. 3 of the drawings.

When the two rollers 10 have struck the stop brackets 11 by movement of the interrupter 1 into the cell 8 by the attendant 9, he then engages a crank 15, as shown in Fig. 6, with a drive-in rod 16 (Fig. 1), which, through a suitable worm pinion 17 and worm gear 18, effects rotation of a drive-in shaft 19 extending laterally and horizontally across the rear of the interrupter 1. At the outer ends of the drive-in shaft 19 are a pair of drive-in levers 20, to which the rollers 10 are fixedly secured.

Thus, rotation by the station attendant 9 of the crank 15 effects counterclockwise rotation of the drive-in lever 20 to cause thereby also the rollers 10 to move in a counterclockwise direction about the shaft 19 within the raceway 14 to thereby force the interrupter 1 into its operative position within the cell 8, as indicated in Figs. 5 and 6 of the drawings. The raceway 14 is provided by the stop bracket 11 and an angular member 52 welded to the plate 12. The dot-dash lines 21 of Fig. 6 indicate

the final operative position of the interrupter 1, in which the rollers 10 have been rotated over 180° in a counterclockwise direction about the drive-in shaft 19. This final driving-in motion of the interrupter 1 into the cell 8 effects engagement of the disconnect contacts 22, associated with the terminal studs 3 and 4, with stationary contacts or terminal studs 23, 24, more clearly shown in Fig. 6.

The foregoing arrangement provides a great mechanical advantage for forcing the interrupter 1 finally into its operative position by actuation of the gear mechanism 17, 18, and moreover provides a means for associating interlocking mechanism, not shown, with the drive-in rod 16 to perform various functions, not pertinent to our present invention.

From the foregoing, it will be apparent that when the interrupter 1 has been removed from its cell 8, the drive-in mechanism 6 is not being used. It is a purpose of our invention to provide a movable arc chute 5 and a detachable mechanism such as a linkage, which will interconnect the drive-in device 6 with the arc chute 5 to cause the raising thereof to enable visual inspection of the contact structure 2. As more clearly shown in Fig. 1, the arc chute 5 may be rotated about a pivot 25. It may be of the type set out and claimed in United States patent application Serial No. 720,165, filed January 4, 1947, now U. S. Patent 2,616,007, issued October 28, 1952, to Russell E. Frink and Robert C. Dickinson, and assigned to the assignee of the instant application.

Such an arc chute, if constructed according to the aforesaid patent, involves a relatively heavy H-type magnet 26 having depending pole pieces 27 associated therewith, together with a pair of arc-chute stack structures 28, 29, which effect subdivision of the established arc drawn between the stationary contact 30 and the movable contact 31. Arc horns 48 and 49 are provided. Arc horn 48 has a detachable bolted connection 48*a* with a conductor 50, the latter being fixedly secured to the lower terminal stud 4. The arc horn 49 has a separable blade and jaw connection 49*a* with the stationary contact 30. The initially established arc is divided into two portions, each of which is moved by the magnetic structures 26, 27 upwardly on arc horns 48, 49 into the arc-chute stack structures 28, 29 in which extinction is assured. Each stack 28, 29 may comprise a plurality of spaced rectangularly-shaped ceramic slotted plates, not shown, which effect restricting and cooling of the arc portions. Reference may be had to the aforesaid patent for details of the arc-chute structure, but for the purpose of the present application it is merely necessary to know that the arc chute 5 has a bracket 32 secured thereto by which the arc chute is pivotally mounted at the pivot 25.

An important advantage of using the H-type magnet of the foregoing application is that no coil connections are required to the magnet 26, the latter having a floating potential. Rotation of the arc chute 5 is, therefore, readily achieved.

In the form of the invention shown in Figs. 1 and 2, a pair of compression links 33, at the two opposite sides of the breaker and having slots 34 at their lower ends, are engaged with the rollers 10. At the upper ends of the compression links 33 are pivotally connected the ends of a pair of tension links 35, the latter having their other ends pivotally mounted on fixed pins 36 by a detachable connection. A rod 37 extends across the circuit breaker beneath the arc chutes and interconnects the two pairs of compression links and tension links 33, 35, as more clearly shown in Fig. 2.

Surrounding the laterally extending rod 37 are spacing sleeves 38, 39 and a pair of bevelled rollers 40, spaced laterally apart, and arranged to engage the lower sides 41, 42 of the arc chutes 5. As shown in Fig. 2, there are a pair of bevelled rollers 40 for each of the several arc chutes 5 of the interrupter 1.

Thus, engagement by the operator 9 of the crank 15 to effect rotation of the drive-in device 6 will cause counterclockwise rotation of the rollers 10 about the drive-in shaft 19 to effect upward movement of the rod 37 to the position indicated by the dotted lines 43 of Fig. 1. During this upward motion of the rod 37, the spacing sleeves 39 will engage the lower side of the arc chutes 5, with the rollers 40 guiding its movement, to effect clockwise rotation of the arc chutes 5 about the pivot 25 to the position designated by the dotted lines 44 of Fig. 1. In this position 44, the operator 9 may visually inspect and replace the contact structure 2 without interference with the arc chute 5.

It will be observed that our invention utilizes an existing mechanism which provides all the mechanical advantage needed to rotate the heavy arc chute 5. All that is required are a few interconnecting links 33, 35 and a rod 37, which may be attached to the rollers 10 and to the pivots 36 when the breaker 1 is out of its cell 8, and at a time when the levering-in device 6 is not being used. The result is elimination of any crane or chain pulley arrangement, which might otherwise be required to raise the arc chute 5 for contact inspection.

Fig. 9 shows an alternative form of our invention using the same principles as set out heretofore, but eliminating the tension links 35. This is done by providing the outer free end 45 of each arc chute 5 with a slot 46 which is engaged by the rod 37 during its upward movement. The compression links 33 and their attachment to the rollers 10 may be the same as that provided heretofore. This modified form merely eliminates the tension links 35, and in effect forces the arc chute 5 itself to become a tension member during its upward rotative travel about the pivot 25.

From the foregoing, it will be apparent that we have provided a novel contact inspection device which effects moving or raising of the arc chute for contact inspection purposes, while utilizing an existing drive-in mechanism. It involves few parts readily attached to and detached from the interrupter, and is a distinct help to a station attendant in servicing the interrupter 1 when it is out of its enclosing cell 8.

Although we have shown and described specific structures, it is to be clearly understood that the same were merely for the purpose of illustration, and that changes and modifications may readily be made therein by those skilled in the art without departing from the spirit and scope of the invention.

We claim as our invention:

1. An arc-chute mover for use with a circuit interrupter having a drive-in device to facilitate inspection of the arc chute and associated contact structure, including linkage means interconnecting the drive-in device with the arc chute, the drive-in device being normally actuable to force the circuit interrupter into an operative position, and the actuation of the drive-in device with the linkage means moving the arc chute for inspection purposes while the remainder of the circuit interrupter is relatively stationary.

2. An arc-chute mover for use with a circuit interrupter having a rotatable drive-in device to facilitate maintenance and inspection, including detachable linkage means interconnecting the rotatable drive-in device with the arc chute, the drive-in device being normally actuable to force the circuit interrupter into an operative position, and the actuation of the drive-in device moving the arc chute and the linkage means for inspection purposes while the remainder of the circuit interrupter is relatively stationary.

3. The combination with a circuit interrupter having a movable contact and a movable arc chute, a manually operable device on the circuit interrupter, a mechanism giving a mechanical advantage mechanically interconnecting the manually operable device with the arc chute, said manually operable device and mechanism being independent of the movable contact whereby the arc chute

may be moved by operation of the manually operable device without movement of the movable contact.

4. The combination with a circuit interrupter having a manually-operated rotatable drive-in device and a movable rotatable arc chute, of detachable linkage means mechanically interconnecting the drive-in device with the arc chute, whereby the arc chute may be rotated for visual inspection and the drive-in device being normally actuable to force the circuit interrupter into an operative position.

5. An arc-chute lifter for use with a circuit interrupter having a manually-operated rotatable drive-in device and a rotatable arc chute, including detachable linkage means interconnecting the rotatable drive-in device with the rotatable arc chute, the actuation of the drive-in device causing rotation of the arc chute, and the drive-in device being normally actuable to force the circuit interrupter into an operative position.

6. An arc-chute lifter for use with a circuit interrupter having a rotatable drive-in device and a rotatable arc chute, including detachable linkage means interconnecting the rotatable drive-in device with the rotatable arc chute, the actuation of the drive-in device causing rotation of the arc chute, said linkage means including a compression link and a tension link, and the tension link having one end thereof pivoted adjacent the axis of rotation of the arc chute.

7. An arc-chute lifter for use with a circuit interrupter having a manually-operated rotatable drive-in device and a rotatable arc chute, including detachable linkage means interconnecting the rotatable drive-in device with the rotatable arc chute, the actuation of the drive-in device causing rotation of the arc chute, said linkage means including a compression link abutting the free end of the arc chute and the drive-in device being normally actuable to force the circuit interrupter into an operative position.

8. An arc-chute rotator for use with a circuit interrupter having a drive-in device, including one or more detachable compression links interconnecting the drive-in device with the free end of the arc chute, whereby the arc chute may be rotated for inspection purposes and the drive-in device being normally actuable to force the circuit interrupter into an operative position.

9. An arc chute rotator for use with a circuit interrupter having a rotatable drive-in device, including a pair of detachable compression links, the drive-device being normally actuable to force the circuit interrupter into an operative position, the free end of the arc chute having a slot provided therein, a rod connecting the ends of the links, the other ends of the links being connected with the drive-in device, and rotation of the drive-in device effecting engagement of the rod with the slot to effect thereby rotation of the arc chute.

10. A circuit interrupter including a movable frame, a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, a movable arc chute structure having an H-type blowout magnet at a floating potential, a drive-in device for moving the frame into and out of operative position, and a mechanism interconnecting the drive-in device and the arc chute structure for moving the arc chute structure away from the contacts by actuation of the drive-in device.

11. A circuit interrupter including a movable frame, said frame having a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, an arc extinguishing structure movably mounted relative to the frame, a drive-in device for moving the frame into and out of operative position, and mechanism interconnecting the drive-in device and the arc extinguishing structure for moving the arc extinguishing structure away from the contacts by actuation of the drive-in device.

12. A circuit interrupter including a movable frame, a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, an arc-extinguishing structure movably mounted relative to the frame, a rotatable drive-in device for moving the frame into and out of operative postion, and detachable mechanism interconnecting the rotatable drive-in device and the arc-extinguishing structure for moving the arc-extinguishing structure away from the contacts by actuation of the drive-in device.

13. A circuit interrupter including a movable frame, a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, an arc-extinguishing structure rotatably mounted relative to the frame, a rotatable drive-in device for moving the frame into and out of operative position, and detachable linkage means interconnecting the drive-in device and the arc-extinguishing structure for rotating the arc-extinguishing structure away from the contacts by actuation of the drive-in device.

14. The combination of a switchgear cell and a circuit interrupter including a movable frame movable thereinto and thereout of, said frame having a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, an arc extinguishing structure movably mounted relative to the frame, a drive-in device for moving the frame into and out of operative position within the switchgear cell, and mechanism interconnecting the drive-in device and the arc extinguishng structure from moving the arc extinguishing structure away from the contacts by actuation of the drive-in device.

15. The combination of a switchgear cell and a circuit interrupter including a movable frame movable thereinto and thereout of, said frame having a pair of bushings having terminal studs therethrough, a pair of disconnect contacts at the outer ends of the terminal studs, stationary and movable contacts for completing a circuit between the inner ends of the terminal studs, an arc extinguishing structure movably mounted relative to the frame, a drive-in device for moving the frame into and out of operative position within the switchgear cell, and detachable mechanism interconnecting the drive-in device and the arc extinguishing structure for moving the arc extinguishing structure away from the contacts by actuation of the drive-in device.

16. A circuit interrupter having a movable contact and a movable arc chute, said arc chute including arc extinguishing members, a complete magnetic circuit and a coil for energizing the magnetic circuit all mounted for movement as a unit, a manually operable device on the circuit interrupter, a mechanism giving a mechanical advantage mechanically interconnecting the manually operable device with the arc chute, said manually operable device and mechanism being independent of the movable contact whereby the arc chute may be moved by operation of the manually operable device without movement of the movable contact.

17. A circuit interrupter including a movable truck, an arc extinguishing device mounted upon the truck and having a movable contact associated therewith, said arc extinguishing device including a movable arc chute, a manually operable device mounted on the truck, a mechanism mounted upon the truck giving a mechanical advantage mechanically interconnecting the manually operable device with the movable arc chute, said manually operable device and mechanism being independent of the

movable contact, whereby the arc chute may be moved by operation of the manually operable device without movement of the movable contact.

18. A circuit interrupter including a movable truck, an arc extinguishing device mounted upon the truck and having a movable contact asosciated therewith, said arc extinguishing device including a movable arc chute, a manually operable drive-in device mounted upon the truck and actuable to drive the truck into an operative position, the manually operable drive-in device being independent of the movable contact, and means interconnecting the manually operable drive-in device with the movable arc chute to effect the movement of the arc chute.

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