Sept. 21, 1948. J. W. SEAMAN 2,449,820

TRIPPING AND INTERLOCKING DEVICE FOR CIRCUIT BREAKERS

Filed March 7, 1946

Fig. 1.

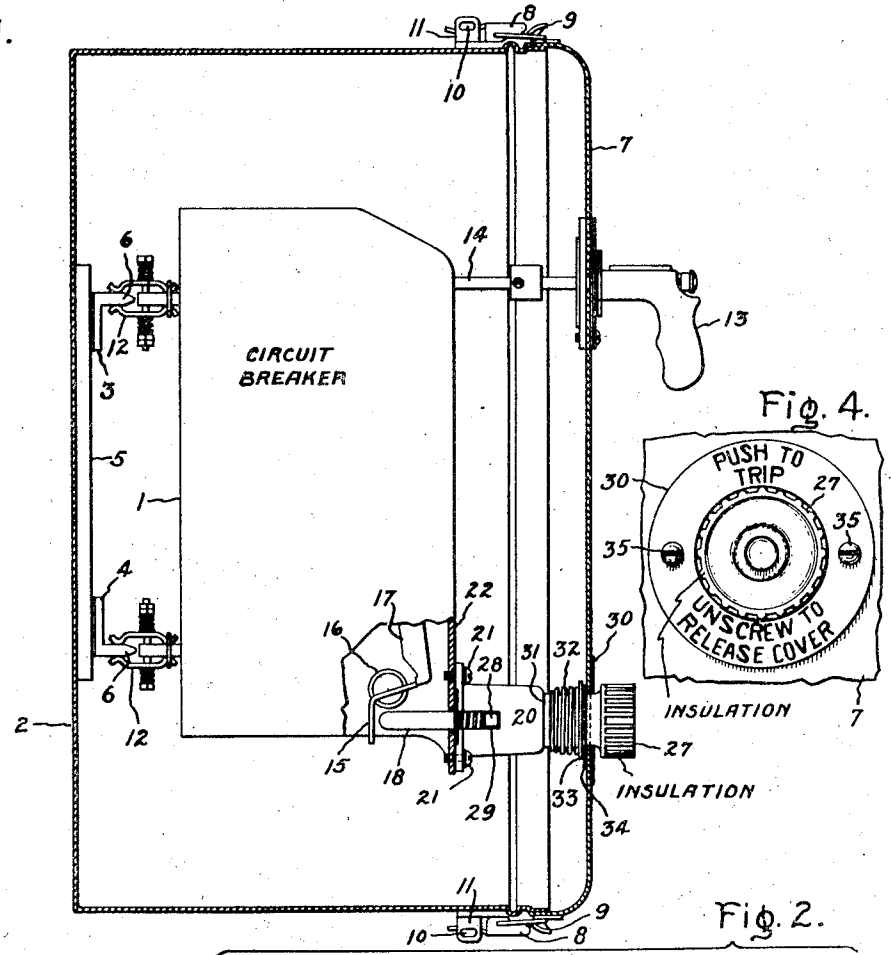



Fig. 4.




Fig. 2.

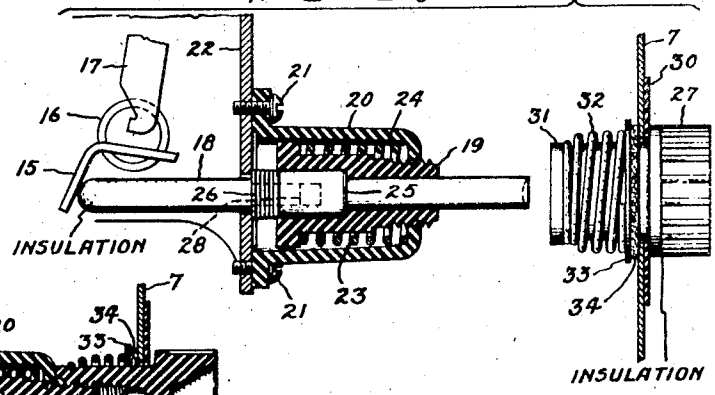
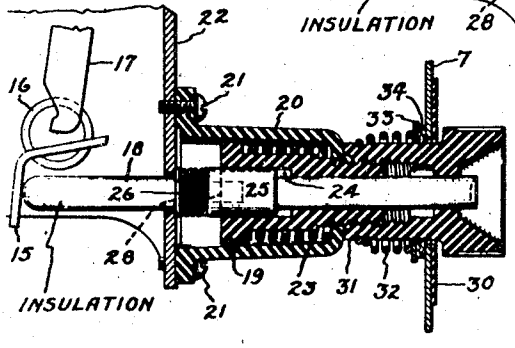



Fig. 3.




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## TRIPPING AND INTERLOCKING DEVICE FOR CIRCUIT BREAKERS

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10 Claims. (Cl. 200—50)

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My invention relates to improvements in tripping and interlocking devices for circuit breakers which are mounted behind barriers such, for example, as the movable covers of housings in which circuit breakers are often mounted, dead front switchboards and the like.

As a measure of safety, circuit breakers are frequently mounted behind a barrier so as to be inaccessible especially to inexperienced persons in order to protect them from injury by coming into contact with energized current conducting parts. Thus circuit breakers are sometimes mounted behind dead front switchboards and also, as in metal-clad switchgear, in housings having covers either hinged or totally removable so that experienced personnel may have access to the circuit breaker structure for adjustment, maintenance and repair. However, the very fact that the barrier must be movable for access to the circuit breaker by experienced persons creates a hazard for the inexperienced. In order to eliminate this hazard, it is necessary to interlock the circuit breaker and the barrier so that the barrier cannot be moved to give access to the circuit breaker before effecting the opening thereof and so that the barrier must be restored to the shielding position before the circuit breaker can be reclosed. This interlock feature is especially desirable in drawout mounted circuit breakers in order to prevent any make or break, particularly under abnormal circuit conditions, of circuits at the disconnecting contacts. Obviously, in order to be satisfactory, any mechanism for these interlock purposes should be simple, foolproof, compact, economical and easy to incorporate in both new and installed circuit breaker mounting structures.

An object of my invention is to provide for a circuit breaker, which is installed behind a movable barrier, an improved tripping and interlocking device such that the barrier cannot be moved from the shielding position to give access to the circuit breaker before effecting the opening thereof and the circuit breaker cannot be reclosed before restoring the barrier to the shielding position. Another object of my invention is to provide an improved tripping and interlocking device which is simple, economical, foolproof and compact. A further object of my invention is to provide an improved tripping and interlocking device which is easy to incorporate in both new and installed circuit breaker mounting structures. These and other objects of my invention will appear in more detail hereinafter.

My invention will be better understood from

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the following description when considered in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 is a side elevation, partly in section, of a metal enclosed drawout type circuit breaker mounting provided with a tripping and interlocking device embodying my invention, the parts being shown in the circuit breaker closed condition; Fig. 2 is a side elevation, partly in section and to a larger scale, of the tripping and interlocking device in the tripping position with the cover released and removed from the housing; Fig. 3 is a side elevation, partly in section and to a larger scale, showing the device as actuated to trip the circuit breaker while the cover is in the closed or shielding position; and Fig. 4 is a front view to a larger scale of a portion of the housing cover showing the interlocking operator, the tripping element and a dial with operating indicia thereon.

For the purpose of illustrating my invention, I have illustrated an embodiment thereof as applied to a circuit breaker 1 which is removably mounted in a housing 2. As far as my invention is concerned, the particular type of circuit breaker is immaterial. However, as an example, a circuit breaker of the type disclosed in United States Letters Patent 2,258,232 may be used. On the inside of the rear wall 2 of the housing, two busses 3 and 4 are mounted on insulating supporting means 5 suitably secured to the rear wall of the housing. Each bus is provided with a terminal contact 6. The housing 2 is provided with a removable cover 7 which, while in place, acts as a barrier to prevent access to the circuit breaker 1. The cover 7 is held in place by suitable means such as toggle clamps 8 mounted on the housing and arranged to engage projections 9 on the cover. As shown, the clamps 8 can be locked in the closed position by any suitable means such as a padlock, not shown, inserted through an opening 10 of a lug 11 secured to the housing 2.

As far as my invention is concerned, the particular type of circuit breaker is immaterial, but, as shown, the circuit breaker is provided with drawout contacts 12 which are arranged for sliding engagement with the bus contacts 6. Also the circuit breaker 1 is shown as including an operating handle 13 which is rotatably mounted on the cover 7 and which is arranged for releasable clutching engagement with the circuit breaker operating shaft 14. Also, as shown, the circuit includes a rotatably mounted tripping member such as a latch 15 which is supported on a shaft 16 and which is arranged to engage an element

17 of the circuit breaker mechanism to hold the circuit breaker in the circuit closed position.

For preventing removal of the cover 7 from its closed or shielding position so that access cannot be had to the circuit breaker 1 while in the circuit closed position, I provide, in accordance with my invention, means in the form of interlocking control mechanism arranged to cause a tripping actuation of the latch 15 before an access movement of the cover 7 can be effected. As shown, this means comprises a tripping control member 18 and a cooperating monitor member 19, mounted in a support 20 for movement between interlocking and tripping positions, respectively shown in Figs. 1 and 2, and for a limited movement relatively to each other so that the circuit breaker 1 can be tripped manually while the cover 7 is in its closed position. Also, as shown, the support 20 is of electrically insulating material and is mounted between the latch 15 and the cover 7 and independently of the cover. For this purpose, the support 20 may be secured as by screws 21 to the circuit breaker frame 22. In the illustrated embodiment of my invention, the members 18 and 19 are telescoping with the outer monitor member 19 acting as a guide for the inner control member 18 which is so positioned as to act as a tripping element or rod linearly movable in the monitor guide 19 in the path of movement of the tail of the latch 15 so as to effect clockwise rotation thereof when moved from right to left as viewed in the several figures of the drawing. For greater safety to personnel, the members 19 and 20 may be of elec.rically insulating material, as shown.

For simultaneously moving both of the members 19 and 20 to the tripping position before the cover 7 can be removed, I provide a relatively strong biasing means such as a spring 23 which is mounted within the hollow support 20 between the outer end thereof and a flange on the outer member 19 and around the outside of this member. Also the inner end of the monitor member 19 is counter bored or enlarged at 24 slidably to receive an enlarged portion 25 on the inner member 18 which acts as a tripping rod. For returning the tripping rod 18 to the interlocking or off tripping position shown in Fig. 1, I provide a relatively weak biasing means such as a spring 26 which as shown is around the rod 18 between the inner end of the enlarged portion 25 and the circuit breaker frame 22 or whatever base to which the support is attached. The resilient biasing means or springs 23 and 26 thus constitute a differential biasing means wherein the stronger spring 23 preponderates to tend to move both of the members 18 and 19 in the tripping direction.

For actuating the members 18 and 19 to the interlocking position shown in Fig. 1 only while the cover 7 is in the closed position, I provide means which is adapted to be operated to move the outer member 19 from the tripping position to the interlocking position whereby to effect movement of the inner member 18 to the interlocking position under the effect or action of the relatively weak spring 26. For this purpose, I provide an operator 27 which is adapted to be movably mounted on the cover 7 and, as shown, is arranged to be rotatable in one direction for actuating engagement with the outer member or monitor guide 19 to effect movement thereof to the interlocking position against the force of the relatively strong spring 23 when the cover is in the closed position. For this purpose, the front end of the monitor 19 projects through an opening in the support 20 and is threaded for engagement with a threaded inner end portion of the operator 27. In order to prevent rotation of the monitor 19, it is interlocked with the support 20, for example, by suitable means such as lugs 28 on the inner flanged end of the guide arranged to move in slots 29 in the support 20.

For simplicity in rotatably mounting the handle or operator 27 on the cover 7 and also providing a dial 30 with operating indicia thereon, the inner cylindrical portion of the operator or handle is provided with a ridged portion 31 and around the cylindrical portion is mounted a resilient retaining means such as a spring 32 which extends between the ridged portion 31 and a bearing washer 33 to maintain the assembly. Between the bearing washer 33 and the inside of the cover 7, there is mounted a cushioning washer 34 such as felt which serves to keep out dust, etc. The construction is such that the spring 32 can readily be manipulated on and off the barrel portion of the operator without any tools. The dial 30 is secured to the housing 2 by suitable means such as screws 35 so as to maintain the indicia "Push to trip" and "Unscrew to release cover" clearly oriented.

Assuming now the parts positioned as shown in Fig. 1 with the circuit breaker closed and latched with the operator 27 in retracting engagement with the monitor guide 19 so that both the guide and the inner tripping rod 18 are in the interlocking position, then the operator 27 is turned in a position to release the monitor guide 19. Inasmuch as the operator 27 is fixed relatively to the rest of the parts, the monitor guide 19 moves inwardly under the strong bias of the spring 23 and carries with it the tripping rod 18 to the tripping position shown in Fig. 2 wherein the tripping rod is in contact with the tail of the tripping latch and has turned this latch clockwise to release the circuit breaker mechanism element 17 so that the circuit breaker may open. If the circuit breaker is multi-pole and has more than one mechanism element 17, then the shaft 16 may constitute a trip shaft for each element since the shaft 16 will also be moved clockwise with the rotation of the latch 15. When the operator 27 is finally released from the monitor guide 19, then the circuit breaker operating handle 13 may be pulled outwardly from its clutch engagement with the operating shaft 14. The toggle clamps 8 may then be released and the cover 7 removed.

Inasmuch as the relatively strong spring 23 maintains the tripping rod 18 in the tripping position as long as the monitor guide 19 is in the tripping position shown in Fig. 2, the breaker cannot be reclosed because the trip shaft 16 cannot return to a position to engage the circuit breaker mechanism element 17. Thus, in order to close the breaker, it is necessary to restore the cover to the closed position whereupon the operator 27 can be rotated to retractably engage the monitor guide 19 and thereby permit outward movement of the tripping rod 18 to the interlocking position under the bias of the relatively weak spring 26. The circuit breaker may then be reclosed.

If at any time while the cover 7 is in the closed position and it is desired to trip the circuit breaker, then it is necessary merely to push inwardly on the tripping rod 18 against the bias of the relatively weak spring 26 thereby moving the tripping rod to the tripping position shown in Fig. 3 with the trip latch 15 disengaged from the circuit breaker mechanism element 17 to permit the movement of the mechanism to the circuit open position.

While I have shown and described my invention in considerable detail, I do not desire to be limited to the exact arrangements shown, but seek to cover in the appended claims all those modifications that fall within the true spirit and scope of my invention.

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

1. In a tripping and interlocking device for a circuit breaker provided with a tripping member and inaccessibly mounted behind a barrier movable from a shielding position to give access to the circuit breaker, means arranged to cause a tripping actuation of the tripping member before an access movement of the barrier can be effected comprising a support adapted to be mounted between the tripping member and the barrier and independently of the barrier, a guide positioned on said support for a limited movement relatively thereto in a predetermined direction to effect a tripping actuation of the circuit breaker tripping member, relatively strong means biasing said guide for movement in said predetermined direction, a tripping element mounted on said guide for a limited movement relatively thereto and movable therewith in said predetermined direction to actuate the tripping member of the circuit breaker, relatively weak means biasing said tripping element for movement away from its tripping position, and an operator adapted to be movably mounted on the barrier in a position to engage and move said guide in the opposite direction to the bias of said relatively strong biasing means when said operator is actuated in one direction while the barrier is in the shielding position whereby to effect movement of the tripping element from the tripping position under the action of said relatively weak biasing means and when said operator is actuated in the opposite direction to permit movement of the tripping element to the tripping position under the preponderating action of said relatively strong biasing means and to release the barrier for movement from the shielding position.

2. In a tripping and interlocking device for a circuit breaker provided with a tripping member and inaccessibly mounted behind a barrier movable from a shielding position to give access to the circuit breaker, means arranged to cause a tripping actuation of the tripping member before an access movement of the barrier can be effected comprising a support adapted to be mounted between the tripping member and the barrier and independently of the barrier, a guide positioned on said support for a limited linear movement relatively thereto, one end of said guide projecting beyond the support toward the barrier, means for preventing rotation of said guide relatively to said support, relatively strong means biasing said guide for movement in a predetermined direction to effect a tripping actuation of the circuit breaker tripping member, a tripping element mounted on said guide for a limited rectilinear movement relatively thereto and movable therewith in said predetermined direction to actuate the circuit breaker tripping member, relatively weak means biasing said tripping element for movement away from its tripping position, and an operator adapted to be rotatably mounted on the barrier in a position to engage and move the projecting end of said guide in the opposite direction to the bias of said relatively strong biasing means when said operator is rotated in one direction while the barrier is in the shielding position whereby to effect movement of said tripping element from the tripping position under the action of said relatively weak biasing means and to prevent movement of the barrier and when said operator is reversely rotated to release the guide whereby to effect movement of the tripping element to the tripping position under the preponderating action of said relatively strong biasing means and to release the barrier for movement from the shielding position.



3. In a tripping and interlocking device for a circuit breaker provided with a tripping member and inaccessibly mounted behind a barrier movable from a shielding position to give access to the circuit breaker, means arranged to cause a tripping actuation of the tripping member before an access movement of the barrier can be effected comprising two relatively movable elements adapted to be supported between the circuit breaker and the barrier and independently of the barrier and arranged for limited movement relatively to each other, one of said elements being movable in a tripping direction to actuate the circuit breaker tripping member and the other of said elements being movable in the tripping direction to effect a tripping movement of said one element, differential biasing means for simultaneously actuating both of said elements in the tripping direction arranged to effect movement of said one element from the tripping position when said other element is moved in the reverse direction, and means for effecting the reverse movement of said other element comprising an operator adapted to be movably mounted for actuation from the front of the barrier in a position to prevent movement of the barrier and to engage and reversibly move said other element when actuated in one direction whereby to effect movement of said one element from the tripping position and when actuated in the opposite direction to effect movement of said one element to the tripping position under the action of said differential biasing means and to release the barrier for movement from the shielding position.

4. In a tripping and interlocking device for a circuit breaker provided with a tripping member and inaccessibly mounted behind a barrier movable from a shielding position to give access to the circuit breaker, means arranged to cause a tripping actuation of the tripping member before an access movement of the barrier can be effected comprising two relatively movable telescoping elements adapted to be supported on the circuit breaker structure between the circuit breaker and the barrier and arranged for limited movement relatively to each other, the inner element being movable in tripping direction to actuate the circuit breaker tripping member and the outer element being movable in the tripping direction to effect a tripping movement of the inner element, differential resilient means for simultaneously actuating both elements in the tripping direction arranged to effect movement of the inner element from the tripping position when the outer element is moved in the reverse direction, and means for effecting the reverse movement of the outer element comprising an operator adapted to be rotatably mounted on said barrier for operation from the front thereof and arranged for threaded engagement with said outer element when the barrier is in the shielding position whereby when rotated in one direction to effect movement of the inner element from the tripping position and when rotated in the opposite direction to effect move-

ment of the inner element to the tripping position under the action of said differential biasing means and to release the barrier for movement from the shielding position.

5. In a tripping and interlocking device for a circuit breaker provided with a tripping member and inaccessibly mounted behind a barrier movable from a shielding position to give access to the circuit breaker, means arranged to cause a tripping actuation of the tripping member before an access movement of the barrier can be effected comprising a tubular support adapted to be secured to the circuit breaker structure adjacent the tripping member and between the structure and the barrier and independently of the barrier, a tubular guide positioned in said support for a limited rectilinear movement therein and having one end threaded and projecting through the support towards the barrier, the bore in said guide having an enlarged rear portion, means for preventing rotation of said guide relatively to said support, relatively strong resilient means biasing said guide for rectilinear movement toward the circuit breaker structure, a trip rod positioned in said guide for a limited rectilinear movement therein movable to the tripping position toward the circuit breaker to actuate the tripping member thereof and having an enlarged portion slidably fitting the enlarged portion of the bore of said guide, relatively weak resilient means biasing said trip rod for movement toward the barrier, and a threaded handle adapted to be rotatably mounted on the barrier in a position retractably to engage the threaded end of said guide against the bias of said relatively strong resilient means when rotated in one direction while the barrier is in the shielding position whereby to permit movement of said trip rod from the tripping position under the bias of said relatively weak resilient means and when rotated in the opposite direction to release the guide whereby to effect movement of said rod to the tripping position under the preponderating bias of said relatively strong resilient means and to release the barrier for movement from the shielding position.

6. In a circuit breaker tripping and interlocking device, a tubular support adapted to be secured to the circuit breaker structure, a tubular guide positioned in said support for a limited rectilinear movement therein between a tripping position and an interlocking position and having one end threaded and projecting through the support at the end thereof away from the circuit breaker, the bore in said guide having an enlarged rear portion, interengaging means on said support and said guide for preventing rotation of the guide relatively to the support, relatively strong resilient means biasing said guide for movement to the tripping position, a tripping rod slidably positioned in said guide and having an enlarged portion fitting the enlarged portion of the bore of the guide for limiting the movement of the rod relatively to the guide, relatively weak resilient means biasing said trip rod away from the tripping position, and a threaded handle adapted to be rotatably mounted in a position retractably to engage the threaded end of said guide against the bias of said relatively strong resilient means when rotated in one direction whereby to permit movement of said trip rod from the tripping position under the bias of said relatively weak resilient means and when rotated in the opposite direction to release the guide whereby to effect movement of the guide and the trip rod to the tripping position under the preponderating bias of said relatively strong resilient means.

7. An interlocking control mechanism having in combination, a control member and a relatively movable monitor member mounted for movement between a predetermined control position and another position and provided with interlocking elements for insuring joint movement of each member with the other member in a corresponding direction between said positions, relatively weak biasing means tending to move the control member to the other position with the monitor member interlocked to move jointly therewith, relatively strong biasing means connected with the monitor member for moving the interlocked members jointly to the predetermined control position against the bias of said relatively weak biasing means, an interlocking element connectible with the monitor member to move the monitor member from the predetermined position to the other position against its bias and thereby effect movement of the control member jointly therewith under the bias of said relatively weak biasing means, and manual means for separately returning the control member to the predetermined control position against its bias.

8. An interlocking control mechanism having in combination a control member and an outer telescoping monitor member mounted for movement between a predetermined control position and another position and having interlocking elements for effecting joint movement of each member with the other member in a corresponding direction between said positions, relatively weak biasing means tending to move the control member to the other position with the monitor member interlocked therewith, relatively strong biasing means connected with the monitor member for jointly moving the interlocked control member therewith to the predetermined control position against the bias of said relatively weak biasing means, an interlocking element detachably connectible with the monitor members to move said monitor members from the predetermined position to the other position against its bias and thereby effect joint movement therewith of the control member from the predetermined position under the bias of said relatively weak biasing means, and manual means for separately returning the control member to the predetermined position against its bias.

9. An interlocking control mechanism having in combination, a control rod and an outer telescoping monitor member having a threaded end intermediate the ends of the rod and mounted for non-rotatable sliding movement therewith between a predetermined control position and another position and provided with interlocking elements for insuring joint movement of each with the other in a corresponding direction between said positions, relatively weak biasing means tending to move the control rod to the other position with the monitor member interlocked to move jointly therewith, relatively strong biasing means connected with the monitor member for jointly moving the interlocked control rod therewith to the predetermined control position against the bias of said relatively weak biasing means, a rotatable interlocking element operable into threaded engagement with said end portion of said monitor member to move the monitor member from the predetermined control position to the other position against its bias

and thereby effect joint movement of the control member from the predetermined control position to the other position under the bias of said relatively weak biasing means, and manual means for separately returning the control member to the predetermined position against its bias.

10. An interlocking control mechanism having in combination, a circuit breaker push trip rod having a tripping position and another position, a telescoping monitor member intermediate the ends of said rod and provided with a threaded end, means for mounting said monitor member for non-rotatable sliding movement with said rod and including interlocking elements for insuring joint movement of each with the other in a corresponding direction between said positions, relatively weak biasing means tending to move the trip rod to the other position with the monitor member interlocked to move jointly therewith, relatively strong biasing means connected with the monitor member for sliding the monitor member with the trip rod interlocked therewith to the tripping position against the bias of the relatively weak biasing means, and



an annular rotatable interlocking member for telescoping over one end of the trip rod into threaded engagement with said threaded end of the monitor member for moving the monitor member against its bias and thereby effect movement of the trip rod from the tripping position under the bias of said relatively weak biasing means into position for manual operation against its bias.

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