June 1, 1943. E. T. PLATZ ET AL 2,320,357

CIRCUIT BREAKER

Filed Sept. 5, 1941 4 Sheets-Sheet 1

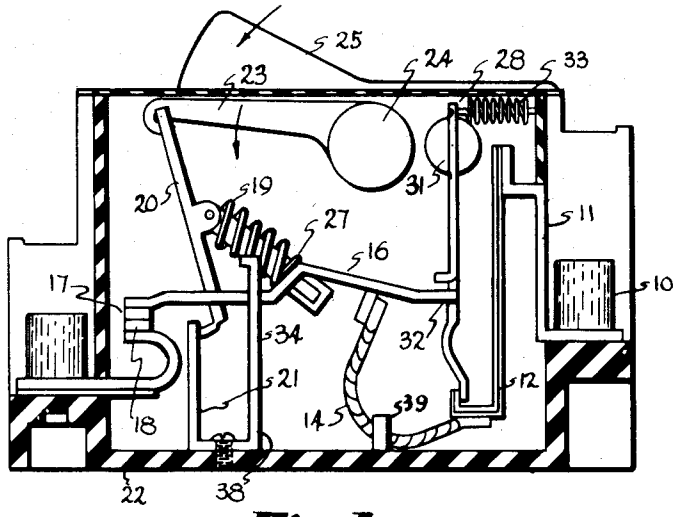


Fig. 1 ON

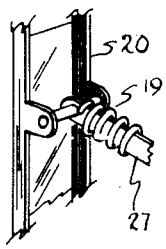


Fig. 6

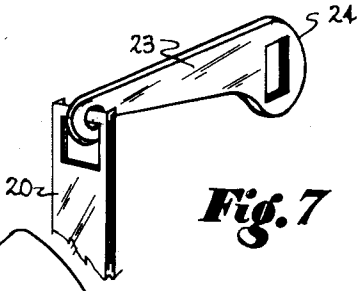


Fig. 7

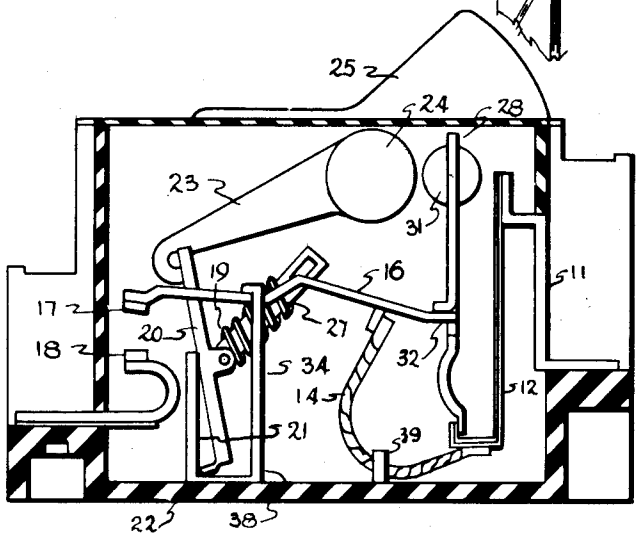


Fig. 2 OFF

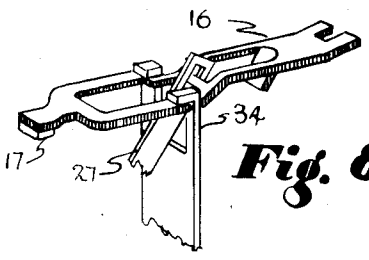


Fig. 8

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CIRCUIT BREAKER

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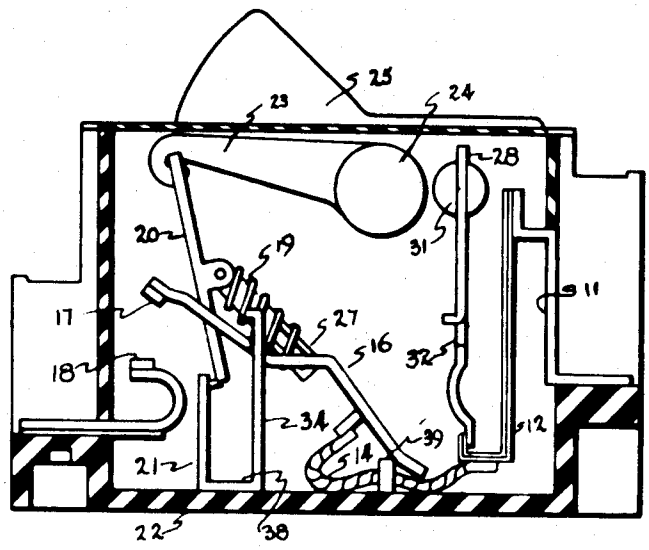


Fig. 3 TRIPPED

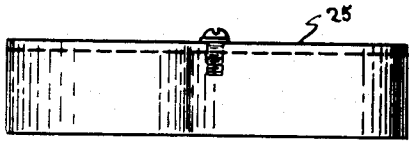


Fig. 9

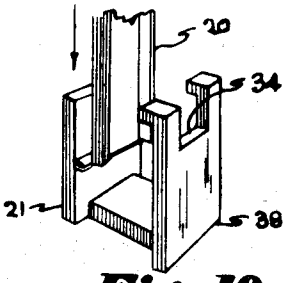


Fig. 10

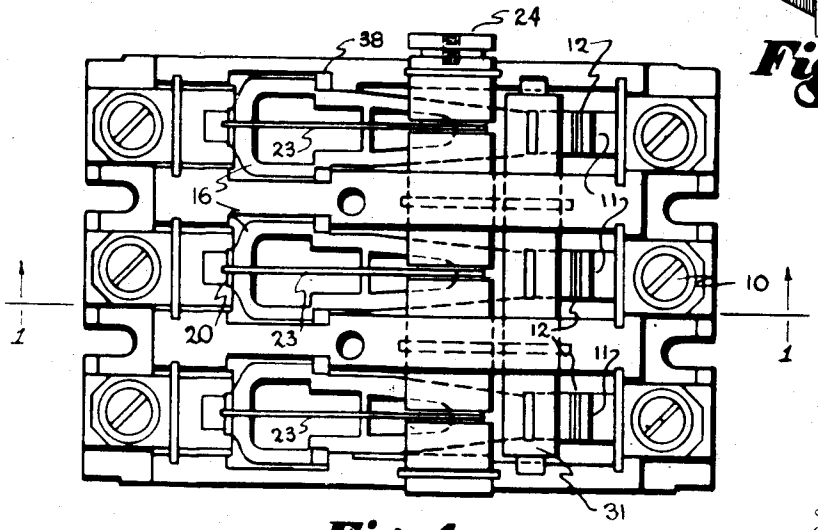


Fig. 4



Fig. 5

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CIRCUIT BREAKER

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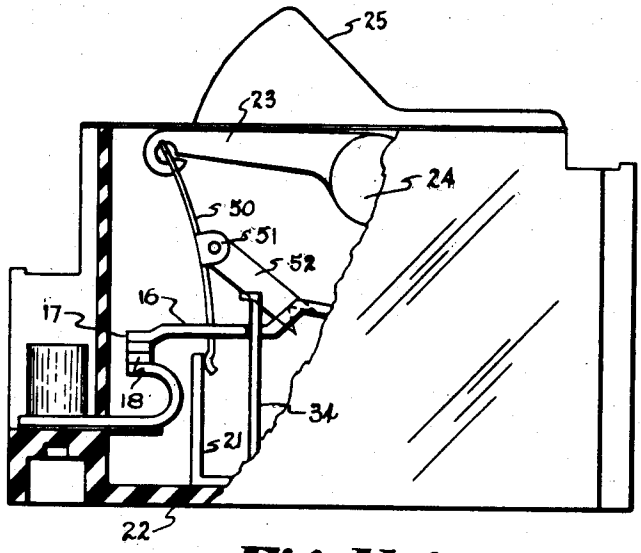


Fig. 11 ON

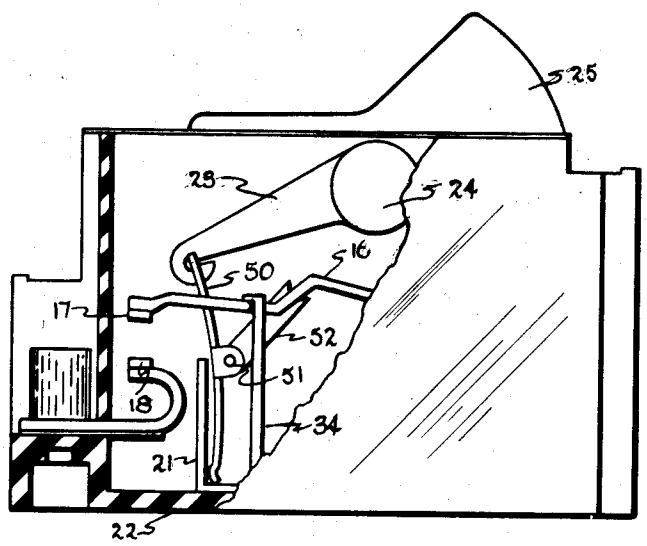


Fig. 12 OFF

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CIRCUIT BREAKER

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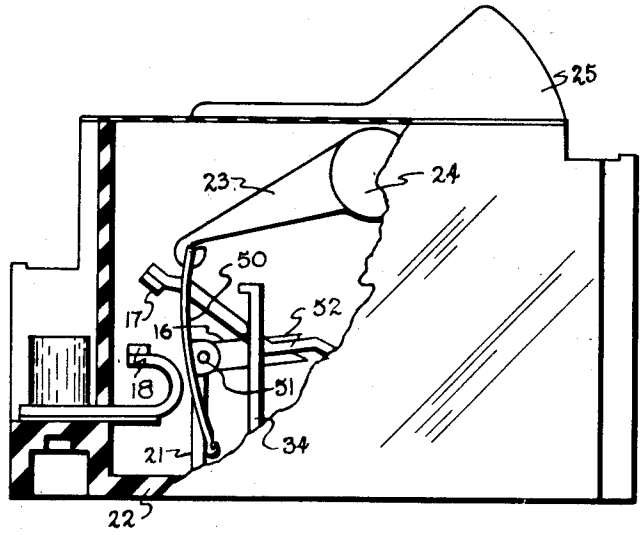


Fig. 14 FIRST PART OF RESET

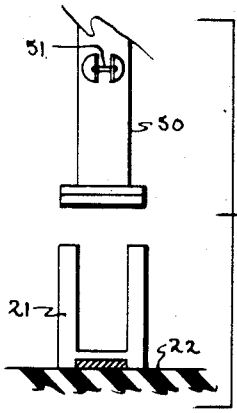


Fig. 15

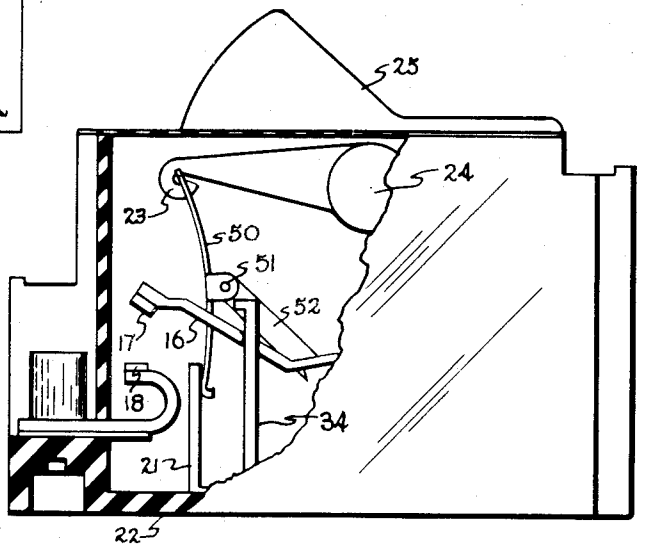


Fig. 13 TRIPPED

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Patented June 1, 1943 2,320,357

UNITED STATES PATENT OFFICE

2,320,357

CIRCUIT BREAKER

Elwood T. Platz and William H. Frank, Detroit, Mich., assignors to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Application September 5, 1941, Serial No. 409,732

9 Claims. (Cl. 200—116)

This application relates to circuit breakers.

The circuit breakers hereof employ an overcenter type of spring means as part of the operative connection between the handle and the contact, whereby actuation from the handle to the contact, for switching, and for relatching, is through the overcenter spring means.

They also employ spring means for moving the contacts on overload when these are released by the overload release holdings means.

In addition the circuit breakers herein described are of the multipole type and employ spring means for providing contact pressure on the various poles, with the parts arranged for independence of contact pressure on the various poles.

In the circuit breakers hereof, an important feature is the use of a single spring means, on each pole, for operatively connecting the handle and the contact, and for providing overload release actuation.

Another important feature is the use of a single spring means on each pole, for operatively connecting the handle and the contact, and for providing contact pressure on that pole, independent of the pressure on other poles.

Still another important feature is the use of a single spring means on each pole for operatively connecting the handle and the contact, for opening the circuit on overload, and for providing contact pressure on each pole, independent of the pressure on other poles.

Thus it may be said that the invention in this application relates to mechanisms wherein a single means is used for two or more functions in a circuit breaker, with at least one of the functions, in any case, being the function of operatively connecting the handle and the contact.

Another feature of the invention hereof is the attaching of a common operating handle for all three poles to the exposed stub end of a common operating shaft, whereby the assembly of the handle to the breaker is independent of the assembly of the breaker as a whole.

In one modification herein disclosed the spring means above mentioned includes a link mounted compression spring whereas, in the other modification herein described the spring means includes a bowed leaf compression spring. In each modification, the spring means is of overcenter construction.

Another feature is the provision of a bearing for determining the overlap of the contact arm or bar and the holding means, under spring stress, the bearing also pivoting the arm on overload release movement.

These modifications are disclosed in the appended drawings. In these drawings,

Figs. 1, 2, and 3 are closed circuit, open circuit, and overload released position views, respectively, of one embodiment.

Fig. 4 is a partial plan view of that embodiment, with cover removed, and parts omitted for clarity.

Figs. 5 to 10 show details of that embodiment.

Figs. 11 12, 13, and 14 are closed circuit, open circuit, overload released and reset position views, respectively, of a second embodiment.

Fig. 15 shows parts in detail.

Figures 1 to 10

In this embodiment there is a line terminal connector **10** to which is connected, through a connecting bar **11** a bimetal element **12** whose lower end is connected to a flexible lead **14** having a free end connected to a contact arm **16** having a movable contact **17** adapted to butt against a stationary contact **18** at the load end of the circuit breaker.

The operating spring means of the device includes a compression spring **19** connected to a toggle element, such as the link or bar **20** whose lower end slides vertically against a guide part **21** fastened to the base **22** of the casing. The upper end of the toggle element **20** is connected to an operating lever **23** keyed to an operating shaft **24** on whose exposed stub end is a rocker handle **25** for rocking the shaft on its axis and thus rocking the operating lever **23** for manipulation of the parts previously described.

Because the circuit breaker herein disclosed is a multipolar circuit breaker, there are three sets of the parts **10—23** connected to the operating shaft **24**, which provides for simultaneous multi-polar operation through the common handle **25**.

The operating springs **19** are mounted upon links **27** having their free ends pivotally connected to the contact arms **16**.

The overload releasable holding means for the contact arms **16** includes trip bars **28** mounted on a common trip shaft **31**, which mounts the three trip bars for the three poles. The lower ends of the trip bars are formed as shown at **32** for releasably holding the ends of the contact arms **16**.

Spring **33** restrains counter-clockwise rotation of the trip shaft **31** and the trip bars **28**. Upon release of the holding connections at **32**, the contact arms pivotally move about the pivotal sup-

ports 34, which form, with guides 21, the inserted elements 38.

The operation of this form of circuit breaker will now be described:

Rotation of the handle and shaft 24, will cause the operating levers 23 to rotate and swing links 20, springs 19 and links 27 over-center, to rotate the contact arms with a snap action as indicated, on pivot points 32. The upper ends of elements 38 provide stops to determine the open circuit positions of the arms 16 which pivot on such stops when in such positions.

On the arising of an overload in any one pole, or more, the trip bars 28 are caused to move counter-clockwise, to release the holds at 32 for the contact arms which then rotate clockwise about the portions 34 of guide elements 38, as pivots, with the rotative forces being imparted to the arms 16 by the compression springs 19, to open the circuit, all without requiring any movement of the parts 20, 23, 24, or 25; thus the release or trip is free of the handle. Stop 39 teminates movement of arm 16.

For resetting, the handle is moved from the position of Fig. 3 to that of Fig. 2, whereupon the right ends of the contact arms are once more caused by the springs 19 to interlock, at 32, with the tripping bars 28, the reset action terminating with the parts in the open circuit position of Fig. 2.

The embodiment of Figs. 11–14 is generally similar to that of Figs. 1 to 10, differing therefrom however in the details of construction of the spring means. Whereas, the embodiment of Figs. 1 to 10 employs a toggle link 20, a link 27 and a coiled spring 19 for each pole, in the embodiment of Figs. 11–14, each spring means consists of a bowed leaf compression spring 50, connected at its mid-point 51, by a rigid link 52, to the contact arm 16.

It will be observed that each spring arrangement (19—20—27 of Figures 1 to 10, or 50—51—52 of Figures 11 to 14) is of overcenter construction, and operatively connects the handle 25 and the contact 16, thus giving a snap action that is not restrainable by the handle. Also, each of such spring arrangements provides the overload actuation for the contacts. Also each such spring arrangement provides a contact pressure on its pole independent of the contact pressures on the other poles. Also, relatching of the arms 16 to the parts 28 is effected thru the springs.

All of the parts, except handle 25, may be interassembled in a sealed casing, to leave the stub end of shaft 24 exposed for later assembly of a handle.

Now having described the modifications herein disclosed, reference should be had to the claims which follow for a determination of the inventions hereof.

We claim:

1. A circuit breaker having a casing in the form of a long narrow deep well, a separable cover closing the open top thereof, two parallel shafts extending across and journalled in the sides of the well and disposed near the open top thereof, under the cover, a handle outside the well and cover and connected to one of said shafts, and a holding means connected to the other of said shafts and disposed within the well, circuit responsive means for moving the holding means and its shaft, a contact arm within the well having a contact on one end and having its opposite end connected to said holding means, the latter and its shaft and the circuit responsive means being at an end of the well, and an overcenter arranged spring operatively connecting the handle shaft and said contact arm whereby all handle movements are transmitted to said arm through said spring.

2. A circuit breaker having a casing in the form of a long narrow deep well, a separable cover closing the open top thereof, two parallel shafts extending across and journalled in the sides of the well and disposed near the open top thereof, under the cover, a handle outside the well and cover and connected to one of said shafts, and a holding means connected to the other of said shafts and disposed within the well, circuit responsive means for moving the holding means and its shaft, a contact arm within the well having a contact on one end and having its opposite end connected to said holding means, the latter and its shaft and the circuit responsive means being at an end of the well and an overcenter arranged spring operatively connecting the handle shaft and said contact arm whereby all handle movements are transmitted to said arm through said spring, the casing having a pivotal bearing for the arm between the pring and the contact end for permitting the arm to rock on such bearing, due to spring stress, when the arm is released by the holding means, for opening the circuit.

3. In a circuit breaker, a handle, a stop independent thereof, a stationary contact, an elongated movable contact arm, an overload releaseable holding means for holding the arm at one end, and a single spring means operatively connecting the handle and the arm and shiftable by the handle across the said end of the arm to and from either of two positions, in one of which it biases the arm to rock on said end against the contact, and in the other of which it biases the arm to rock on said end away from the contact, whereby handle actuation causes arm movement by acting through that spring means, with the same spring means rocking the arm about the stop as an axis away from the contact when the arm is released by the holding means.

4. In a circuit breaker, a handle, a stop independent thereof, a stationary contact, an elongated movable contact arm, an overload releaseable holding means for holding the arm at one end, and a single spring means operatively connecting the handle and the arm and shiftable by the handle across the said end of the arm to and from either of two positions, in one of which it biases the arm to rock on said end against the contact, and in the other of which it biases the arm to rock on said end away from the contact, whereby handle actuation causes arm movement by acting through that spring means, with the same spring means rocking the arm about the stop as an axis away from the contact when the arm is released by the holding means, the spring means also being movable by the handle across the arm end, following an overload release of the arm by the holding means, and upon movement of the handle thereafter out of closed circuit position, for restoring the arm into holding engagement with the holding means.

5. In a circuit breaker, a handle, a stop independent thereof, a stationary contact, an elongated movable contact arm, an overload releasable holding means for holding the arm at one end, and a single spring means operatively connecting the handle and the arm and shiftable by the handle across the said end of the arm to and from either of two positions, in one of which it biases the arm to rock on said end against

the contact, and in the other of which it biases the arm to rock on said end away from the contact, whereby handle actuation causes arm movement by acting through that spring means, with the same spring means rocking the arm about the stop as an axis away from the contact when the arm is released by the holding means, the arm having a contact engaging portion at one end, and at its other end being releasably connected to the overload releasable holding means, and operatively connected at a mid point to one end to the spring means, whose other end is connected to the handle, with the stop being between the contact engaging portion and said mid point where it is connected to the spring means.

6. In a circuit breaker, a handle, a stop independent thereof, a stationary contact, an elongated movable contact arm, an overload releasable holding means for holding the arm at one end, and a single spring means operatively connecting the handle and the arm and shiftable by the handle across the said end of the arm to and from either of two positions, in one of which it biases the arm to rock on said end against the contact, and in the other of which it biases the arm to rock on said end away from the contact, whereby handle actuation causes arm movement by acting through that spring means, with the same spring means rocking the arm about the stop as an axis away from the contact when the arm is released by the holding means, the spring means also being movable by the handle across the arm end, following an overload release of the arm by the holding means, and upon movement of the handle thereafter out of closed circuit position, for restoring the arm into holding engagement with the holding means, the arm having a contact engaging portion at one end, and at its other end being releasably connected to the overload releasable holding means, and operatively connected at a mid point to one end of the spring means, whose other end is connected to the handle, with the stop being between the contact engaging portion and said mid point where it is connected to the spring means.

7. In a switch, a plurality of movable contacts and a plurality of stationary contacts, with the movable contacts independently engaging the stationary contacts, the contacts being of the butt pressure type, one spring means for each movable contact, with the spring means for each contact biasing its movable contact, independently of the other spring means or movable contacts, against the corresponding stationary contact, for producing independence of contact pressure, the same spring means being movable and arranged to provide contact actuation as well as contact pressure for each movable contact, and a common actuator for all the spring means for moving them simultaneously and thus causing the contacts to move simultaneously.

8. In a switch, a plurality of movable contacts and a plurality of stationary contacts, with the movable contacts independently engaging the stationary contacts, the contacts being of the butt pressure type, one spring means for each movable contact, with the spring means for each contact biasing its movable contact, independently of the other spring means or movable contacts, against the corresponding stationary contact, for producing independence of contact pressure, the same spring means being movable and arranged to provide contact actuation as well as contact pressure for each movable contact, and a common actuator for all the spring means for moving them simultaneously and thus causing the contacts to move simultaneously, the circuit breaker having a stop and an overload releasable holding means for each movable contact, with the same spring means that provides contact actuation and contact pressure for each movable contact also providing the overload actuation for that movable contact by rocking it about its stop when the holding means releases that movable contact.

9. In a switch, a plurality of movable contacts and a plurality of stationary contacts, with the movable contacts independently engaging the stationary contacts, the contacts being of the butt pressure type, one spring means for each movable contact, with the spring means for each contact biasing its movable contact, independently of the other spring means of movable contacts, against the corresponding stationary contact, for producing independence of contact pressure, the same spring means being movable and arranged to provide contact actuation as well as contact pressure for each movable contact, and a common actuator for all the spring means for moving them simultaneously and thus causing the contacts to move simultaneously, the circuit breaker having a stop and an overload releasable holding means for each movable contact, with the same spring means that provides contact actuation and contact pressure for each movable contact also providing the overload actuation for that movable contact by rocking it about its stop when the holding means releases that movable contact, and also providing the actuation force for re-engaging the contact with its holding means, after an overload release thereof, and in response to a handle movement after an overload release.

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