

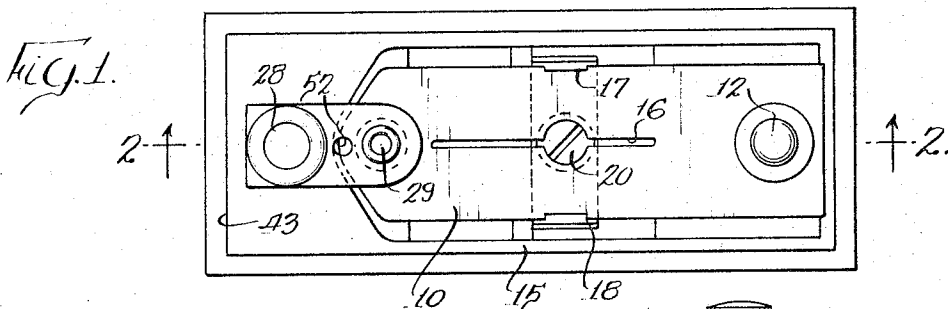
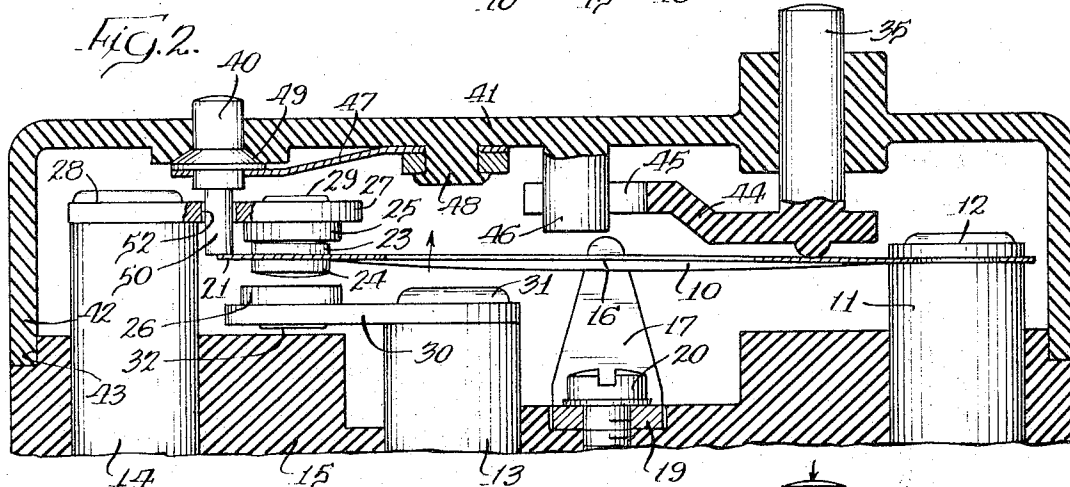
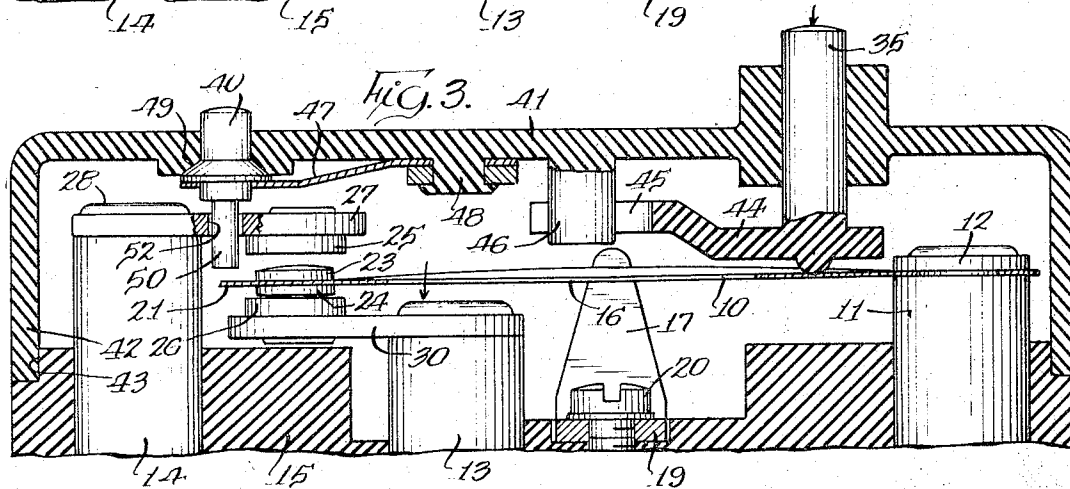
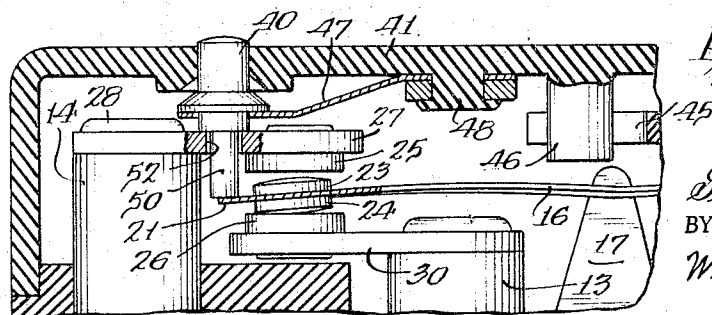
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FOOL-PROOF SNAP ACTION RESET SWITCH

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FOOL-PROOF SNAP ACTION RESET SWITCH
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Continuation of abandoned application Ser. No. 190,740, Apr. 27, 1962. This application Apr. 21, 1965, Ser. No. 449,751

10 Claims. (Cl. 200—72)

This is a continuation of copending application, S.N. 190,740, filed Apr. 27, 1962, now abandoned. The present invention relates to a reset switch and more particularly to a reset switch in which action of the reset button will not result in the closing of a circuit unless the malfunction which caused the reset switch to be thrown has been corrected.

Reset switches have been used for many years in the electrical control art to break electrical circuits when a malfunction occurs in a particular machine or electrical circuit. The present conventional forms of these switches consist of a normally closed two position electrical switch having a plunger adapted to throw the switch whenever a malfunction sensing device connected to the plunger depresses it to indicate that a malfunction has occurred in a particular machine or electrical circuit. Whenever a reset button adapted to reclose the switch is depressed, the contacts of the switch are closed regardless of whether the malfunction has been corrected. Generally speaking, the switches are so designed so that the switch will remain closed only as long as the reset button is held depressed if the malfunction has not yet been corrected. An experienced operator will not normally press a reset button and hold it in a depressed position. He generally has enough knowledge of the machinery or equipment which he is operating to know that holding a reset button depressed may be dangerous to both personnel and equipment. However, the reset type of safety switch is being utilized to an ever increasing extent in private homes, offices and dwellings where the personnel having access to the reset switch do not comprehend the danger of holding down a reset button after a malfunction has occurred in machinery or equipment which the switch has been installed to protect. Not only have cases of personnel holding reset buttons depressed with resulting damage to personnel and equipment become more frequent, but in a number of cases reset buttons have been taped or otherwise secured down in a reset position without correcting the malfunction which caused the reset switch to be thrown. The present invention overcomes the disadvantage found in the present conventional reset switches by providing a reset switch in which operation of the reset button will close the circuit only if the malfunction which caused the switch to be thrown and thereby caused a circuit to be opened has been corrected.

Therefore, it is an object of the present invention to provide a new and improved reset switch.

An additional object is to provide a reset switch wherein operation of its reset button will not cause the circuit to be closed through the switch unless the malfunction which initiated the operation of the switch to its non-normal position has been corrected.

A further object is to provide a positive action switch having one actuating member for throwing the switch from its normal to its non-normal position in response to the sensing of a malfunction in machinery or electrical circuits and a second actuating member which is capable of resetting the switch from its non-normal position to its normal position only after the first actuator has been released by the malfunction sensing device to return to its normal position.

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A primary object of the present invention is to provide in the aforementioned positive action switch an arrangement whereby the second actuating member engages a flexible operating arm of the positive action switch beyond the electrical contacts carried by the flexible arm so that if the arm is free to flex after the release of the first actuator the contacts will act as a pivot point about which the center portion of the flexible arm will be rotated by pressure of the second actuator acting on a point of the arm beyond the contact and whereby the switch cannot return to its normal position after the center portion of the flexible arm has been returned to its normal position until the second actuating member has been released.

A still further object of the present invention is to provide a switch having a normal and a non-normal position and two actuators wherein both actuators must be released before the switch can assume its normal position.

A still further object of the present invention is to provide a switch having a normal and a non-normal position and two actuators wherein one actuator is capable of forcing the switch from its normal to its non-normal position and the second actuator is capable of causing the switch to assume its non-normal position and to also cause it to assume its normal position whenever said first actuator is in a release condition.

Further objects and advantages will become apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a top view of an embodiment of the present invention with its cover and actuators removed.

FIG. 2 is a side sectional view of the embodiment of the present invention shown in FIG. 1 taken along the line 2—2.

FIG. 3 is a side elevational view of the embodiment of the invention shown in FIG. 1 taken along the line 2—2 but with several of the operating parts in a different position than shown in FIG. 2.

FIG. 4 is a partial cross sectional view of the embodiment of the invention shown in FIG. 2 along the line 2—2 but with some of the operational parts shown in positions which differ from their positions as shown in FIGS. 2 and 3.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail an embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

In the past, it has been the practice in designing reset switches to provide structures wherein the reset button or actuator will overpower the switch element which is usually an arm of some type so that the switch is returned to its normal position and the circuit is closed. Thus, in the prior art, the operation which reset the switch arm to its normal position simultaneously caused the closure of the circuit which had been broken by the operation of a malfunction actuator in the switch. Therefore, the possibility has always existed that damage will be done to personnel and equipment if the reset button or actuator were pushed or held down prior to the repair of the malfunction which originally caused the switch to be opened. As will presently be described in greater detail, the present invention completely removes the hazard of either pressing or holding down a reset button or actuator before the malfunction has been repaired. In addition, it provides an additional manual method of disconnecting the circuit if the switch should not be properly operated to

open a circuit upon the occurrence of a malfunction. In the present invention, operation of the reset button or actuator resets the switch element to its normal position while maintaining the circuit contacts open. The circuit is not closed until the reset actuator is released. Further, operation of the reset button or actuator will return the switch element to its normal position only if the pressure of the malfunction actuator has been released by the repair of the malfunction. Therefore, the present invention has three major advantages over the prior art, which are resetting of the switch element only if the malfunction has been repaired, holding of the circuit contacts open whenever the reset actuator is pressed, and the manual pressing of the reset actuator to open the circuit whenever such action is required in an emergency.

Referring now to the figures, a flexible arm in the form of a thin blade 10 has one end rigidly secured to a mounting post 11 by a rivet 12. The post 11, a post 13 and a post 14 are all rigidly secured in an electrically non-conductive base 15 through which the posts project for external electrical connection (not shown). The base 15 may be constructed of plastic or any other suitable electrically non-conductive material. The blade 10 has a center slot 16 cut therein and has its sides held under compressive stress by arms 17 and 18 of a U-shaped clamp 19 which is secured to the base 15 by a screw 20. The compressive stress placed on the blades by the arms 17 and 18 forces the edges of the slot 16 toward each other and thereby a free end 21 of the blade 10 is forced to assume a position either above or below the normal plane of the blade as is more fully described in United States Letters Patent 2,789,173 issued Apr. 16, 1957. When the free end 21 of the blade 10 is above the normal plane of the blade, the slot 16 is buckled upwardly as shown in FIG. 2. When the free end 21 is below the plane of the blade, the slot area 16 is buckled downwardly as shown in FIG. 3. These are then the two static positions which the blade 10 and thereby its free end 21 will assume provided there is no other force acting on the free end 21 as will presently be described in greater detail. FIG. 4 illustrates a third positional situation into which the blade 10 may be forced. The slot 16 is buckled downwardly and the free end 21 is also below the plane of the blade.

A pair of electrical contacts 23 and 24 are rigidly secured to the blade 10 between the slot 16 and the free end 21 to engage an electrical contact 25 and an electrical contact 26 respectively when the free end 21 is in one or the other of its two static positions. Electrical contact 25 is secured in a stationary position and electrically connected to the post 14 by an electrical conductive arm 27 which is rigidly secured to the post 14 by a rivet 28 and to the contact 25 by a rivet 29. Similarly, the contact 26 is held stationary and electrically connected to the post 13 by an electrically conductive arm 30 which is secured to the post 13 by a rivet 31 and to the contact 26 by a rivet 32. The structure of the embodiment of the invention shown in the drawings thus far described provides a switch element in the form of an arm or blade 10 which, because of the slot 16 and the stress set upon its edges by the U-shaped clamp 19, must at all times assume one of two static positions for both the slot 16 and the free end 21. One may be referred to as a normal position and the other may be referred to as a malfunction position. When the switch element is in one static position, an electrical circuit is closed between the post 11 and the post 14 and when the switch is in its other position, an electrical circuit is closed between the post 11 and the post 14.

Most apparatus or equipment, in which a reset switch is utilized, would have a normally closed circuit completed through the posts 11 and 14. Therefore, the normal positions for the portions of the blade 10 are to have the slot 16 buckled upwardly and the free end 21 above the plane of the blade, and the malfunction positions are to have the slot 16 buckled downwardly and the free end 21 below the plane. In those applications of a

reset switch in which it is desired to have a normally open circuit which is closed upon a malfunction, the posts 11 and 13 are serially connected instead of the posts 11 and 14. Thus, a normally open circuit is provided. Those skilled in the art will quickly recognize that the embodiment of the invention illustrated in the figure provides for a normally closed and a normally open circuit whenever an application of a reset switch would require two such circuits. In such a situation, the normally closed circuit will serially connect the posts 11 and 14 therein and the normally open circuit will serially connect the posts 11 and 13 therein.

A malfunction actuator 35 and a reset actuator in the form of a reset button 40 are slidably mounted in a switch cover 41 whose edge 42 is seated and secured in a circumferential recess 43 of the base 15. The actuators 35 and 40 and the cover 41 may be constructed of plastic or any other suitable nonconductive material. The malfunction actuator 35 has an arm portion 44 with a forked end 45 therein which surrounds a projection 46 of the cover 41 to prevent excessive rotation of the actuator as it slides in its mounting in the cover 41.

A resilient arm 47 has one end secured to the cover 41 by a rivet 48 and the other end engaging a projection 49 of the reset button 40 to aid in maintaining the button 40 in its upper position with the projection 49 against the cover 41 as shown in FIG. 2 whenever the reset button is not being actuated.

A lower extension portion 50 of the reset button 40 passes freely through an aperture 52 in the arm 27 to engage when depressed the free end 21 of the blade 10.

The malfunction actuator 35 is connected to a malfunction sensing device (not shown) which forces the malfunction actuator 35 downwardly whenever a malfunction occurs in the machine or circuit in which the reset switch is incorporated. The malfunction safety device holds the actuator 35 depressed as long as the malfunction is present. The reset button 40 is accessible to an operator for resetting the switch or in certain emergency situations for opening the normally closed circuit and/or closing the normally open circuit directly by an operator or indirectly through suitable linkage adapted to depress the reset button 40 downwardly when the operator desires to reset the switch or to manually operate it.

The operation of the embodiment of the reset switch illustrated in the drawings will now be described. When the machine or circuit in which the reset switch is incorporated is operating normally, the moving parts are positioned as shown in FIG. 2 with the actuator 35 resting on but not applying force to the blade 10. The slot portion 16 is buckled upwardly and the free end 21 is in its upward position with contact 23 engaging contact 25. When a malfunction occurs, the actuator 35 is depressed, applying force to the blade 10 at a point between the slot 16 and the post 11 causing the blade 10 to buckle downwardly as shown in FIG. 3. The downward buckling of the blade causes the free end 21 to assume its downward or malfunction position with contact 24 engaging contact 26 and the contacts 23 and 25 disengaged. Thus, a circuit serially incorporating the posts 11 and 14 is opened and a circuit incorporating the posts 11 and 13 is closed. When it becomes desirable to reset the switch after the malfunction has been corrected so that the force applied by the malfunction actuator 35 is removed from the blade 10, the reset button 40 is depressed until the extension portion 50 thereof applies force against the free end 21. Such downward force on the free end 21 rotates a portion of the blade 10 between the contacts 23 and 24 and clamp 19 upwardly as shown in FIG. 4 while utilizing the contact 26 as a fulcrum. Raising of the portion between the clamp 19 and the contacts 23 and 24 will cause the slot 16 to buckle upwardly if there is no downward force being applied by the malfunction actuator 35. As illustrated in FIG. 4, the slot portion 16 of the

blade will not buckle upwardly if force is still being applied by the downward depression of the actuator 35. However, if the malfunction has been removed, the free end 21 will follow the push button 40 upwardly as force is removed from the push button until the contacts 23 and 25 engage each other. This places the switch back in its normal position. Thus, FIG. 2 illustrates the switch in its normal position with the slot portion 16 buckled upwardly and the free end 21 in its upward position. FIG. 3 illustrates the switch in its malfunction position with the slot portion 16 buckled downwardly and the free end 21 in its downward position. Therefore, an upward buckling of the slot portion 16 is its normal position and the upward position of the free end 21 is its normal position while the downward buckling position of the slot portion 16 is its malfunction position and the downward position of the free end 21 is its malfunction position. FIG. 4 illustrates the situation where both actuators are applying force to the blade 10 so that both the slot portion 16 and the free end 21 are in their malfunction position even though the force furnished by the reset button 40 is applied to raise the portion of the blade 10 between the clamp 19 and the contacts 23 and 24. Therefore, the downward depression of the reset button 40 always tends to buckle the slot 16 upwardly and also always opens the normally closed circuit. The slot portion 16 will not buckle upwardly unless pressure has been removed from the malfunction actuator 35.

To summarize, the malfunction actuator 35 can hold the slot portion 16 and the free end 21 in their malfunction positions while the reset button 40 can move the free end 21 to its malfunction position and buckle the slot portion 16 upwardly when force is not being applied by actuator 35 to allow the free end 21 to move to its normal position as force on the reset button 40 is released. In this manner, the reset button 40 is always utilized to force the free end 21 and with it the contacts 23 and 24 to their malfunction position and to condition the blade 10 to return the free end 21 to its normal position as pressure is released from the push button 40 only if force has already been released by the malfunction actuator 35. Thus, taping or holding down the push button 40 only continues to maintain the switch in its malfunction position. The slot portion 16 senses the force of actuator 35 and will not assume an outward buckle position which tends to return the free end 21 to its normal position unless force has been removed by the actuator 35 prior to the application of force to the free end 21. Forcing either or both actuators downwardly places the switch in its malfunction position while only the sequence of removing force from the malfunction actuator 35 prior to the removing of force from the reset button 40 will cause the switch to resume its normal position. Thereby operating either actuator in an emergency will put the switch in its malfunction condition and taping down either actuator will only maintain it in that malfunction position rather than bringing it back to a normal condition which might prove detrimental to either personnel or equipment.

What is claimed:

1. A reset switch comprising:

- a rigid structure,
- a flexible switch member secured to the rigid structure and having a first portion which assumes either a first or a second position and a second portion which assumes either a first or a second position, said second portion being urged to assume its first position by said first portion when said first portion is in its first position and to assume its second position by said first portion when said first portion is in its second position,
- means for forcing the first portion of said member to assume either its first or second position relative to said structure,
- an abutment positioned on said structure to be engaged

by said second portion of said flexible switch member when it assumes its second position,

an actuating member engageable with said first portion of the switch member to move it into its second position, and

a reset actuator, when said actuating member is not being operated to cause said first portion to move into its second position, causing said first portion of the switch member to move into its first position by forcible engagement with said second portion of the switch member at a location relative to said abutment that allows said second portion to pivot about said abutment, said reset actuator holding said second portion in its second position whenever it is forcibly engaging said second portion.

2. A reset switch comprising:

- a rigid structure,
- a flexible switch arm secured at one end to the rigid structure, having the other end free to assume a first and a second position and having a center portion which assumes a first or a second position, said free end being urged to assume its first position by said center portion when said center portion is in its first position and to assume its second position by said center portion when said center portion is in its second position.

means for causing said center portion of the switch arm to assume one or the other of its said positions,

an actuating member engageable with said center portion of the switch arm to move it into its second position, and

a reset actuator causing said center portion of said switch arm to move into its first position by forcible engagement with said free end of the arm when said actuating member is being operated to cause said center portion to move into its second position, said reset actuator holding said free end in its second position when it is forcibly engaging said free end portion.

3. A positive action switch comprising:

- a rigid mounting structure,
- a flexible arm having an end portion secured to the mounting structure, a free end portion, and an intermediate portion between said end portions weakened in resistance to lateral compressive stress, said arm being flexibly movable between two static positions,
- a first electrical contact secured to said mounting structure,
- a second electrical contact secured to the intermediate portion of said arm and contacting said first contact when said arm is at one of said static positions,
- an actuating member slidably mounted in said mounting structure to apply force against said arm to move it to one of said static positions, and
- a reset member slidably mounted in said mounting structure to contact said free end portion for resetting said arm to the other static position whenever said actuating member is not applying force against said arm.

4. A positive action switch comprising:

- a rigid mounting structure,
- a flexible arm having an end portion secured to the mounting structure, a free end portion, and an intermediate portion between said end portions weakened in resistance to lateral compressive stress, said arm being flexibly movable between two static positions,
- a first electrical contact secured to said mounting structure,
- a second electrical contact secured to the intermediate portion of said arm and contacting said first contact when said arm is at one of said static positions,
- an actuating member slidably mounted in said mounting structure to apply force against said arm between the secured end portion and said intermediate portion, and

- a reset member slidably mounted in said mounting structure for forcibly contacting said free end portion to move said center portion to a position from which it urges the free end portion to move to one of said static positions as said reset member releases forcible contact against said free end portion.
5. A positive action reset switch comprising:
 a rigid structure,
 a resilient blade having one end portion rigidly mounted on said rigid structure, having another end portion free to move with a positive action and having an intermediate portion between said end portions weakened in resistance to lateral compressive stress,
 an actuating member engageable with the intermediate portion for applying to the intermediate portion a lateral compressive force sufficient to buckle said plate laterally, and
 a reset member engageable with the free end portion for applying to said free end portion of the blade a lateral force sufficient to buckle said blade laterally.
6. A positive action reset switch comprising:
 a rigid structure,
 a resilient blade having one end rigidly mounted on said rigid structure with its other end free to move with a positive action, said blade intermediate its ends being slotted lengthwise,
 clamping means engaging the side edges of the blade to exert a pressure on the blade against said side edges and tending to reduce the width of said slot whereby said free end normally moves in one direction or the other out of the normal unstressed plane of the blade,
 an actuating member intermediate said clamping means and said fixed end for moving the blade to cause positive movement of said free end in one direction,
 an abutment mounted on said rigid structure to engage the blade intermediate said clamping means and said free end whenever said free end has moved in one direction out of the normal unstressed plane of the blade, and
 a reset member for applying to said free end of the blade a lateral force to rotate a length of the blade around said abutment as it acts as a fulcrum.

7. A positive action reset switch as specified in claim 6, wherein said abutment is an electrical contact, and said blade has another electrical contact mounted thereon which contacts said abutment when the free end of the blade has been moved in said one direction.
8. In combination with the blade as specified in claim 6, a first electrical contact mounted on said rigid structure and a second electrical contact mounted on said blade to engage said first contact when the free end of the blade is moved in said other direction.
9. In combination, a snap-action type electrical switch having a pair of spaced apart stationary contacts, a co-operating movable contact selectively actuatable into switching engagement with said stationary contacts, and means operative for causing snap-action actuation of said movable contact into latched engagement with the selected one of said stationary contacts; first actuator means operable from an unactuated condition to an actuated condition for initiating operation of said snap-action means for latched engagement of said movable contact with one of said stationary contacts while preventing said latched engagement until said first actuator means is released for return to its said unactuated condition, and second actuator means operative from an unactuated condition to an actuated condition for initiating operation of said snap-action means causing snap-actuation of said movable contact into latched engagement with the other of said stationary contacts.
10. The combination of claim 9 wherein said second actuator means when in its actuated condition prevents said first actuator means initiation.

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