Oct. 4, 1966 J. P. BARTHELL 3,277,264

SWITCH ACTUATOR

Filed Dec. 11, 1961 2 Sheets-Sheet 1

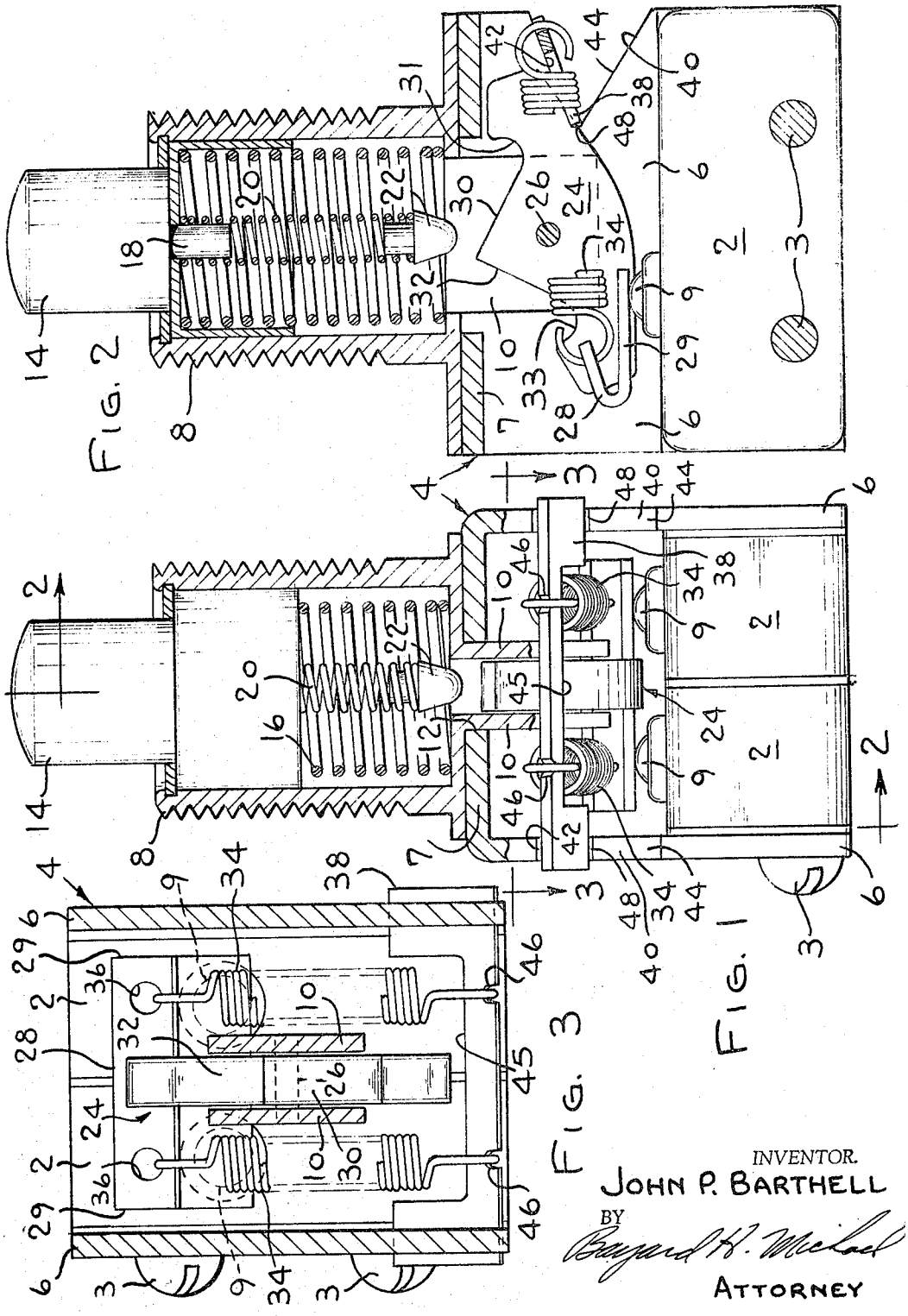


FIG. 2

FIG. 1

FIG. 3

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SWITCH ACTUATOR

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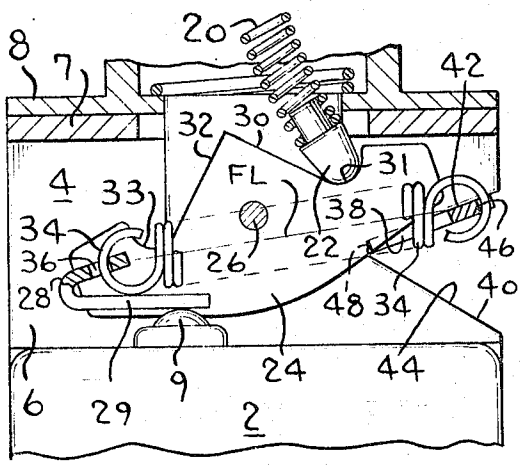


FIG. 4

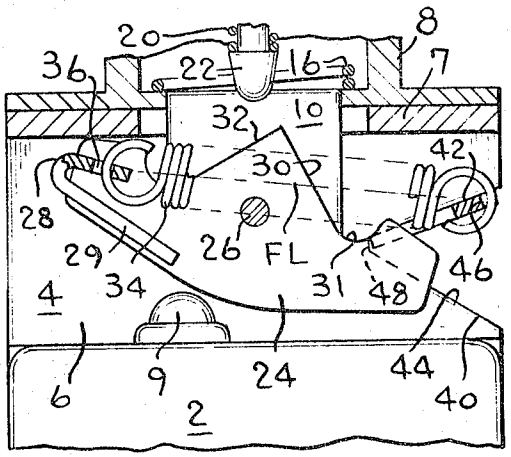


FIG. 5

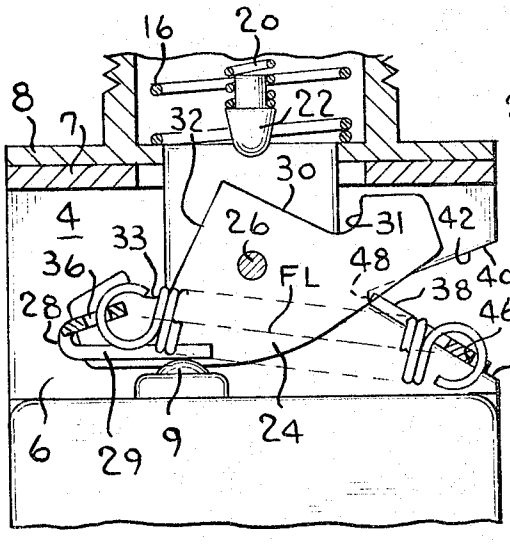


FIG. 6

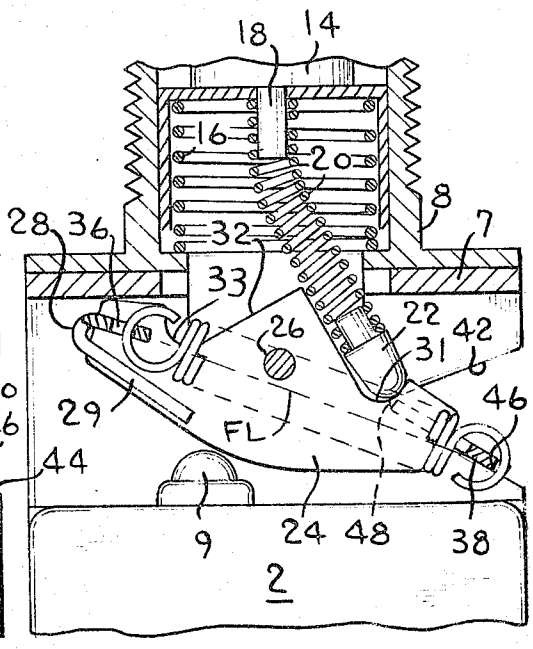


FIG. 7

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SWITCH ACTUATOR

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Filed Dec. 11, 1961, Ser. No. 158,309
10 Claims. (Cl. 200—159)

This invention relates to an electric switch actuator and, more particularly, to a switch actuator which will provide both alternate and momentary switch actuation.

An object of this invention is the provision of a single switch actuating mechanism which will selectively provide either alternate or momentary switch actuation.

Another object of this invention is to provide a simplified, relatively inexpensive, efficient and reliable switch actuating mechanism adapted to provide either alternate or momentary switch actuation.

The novel features of this invention are set forth in the appended claims. The invention itself, together with additional objects and advantages thereof, will be more clearly understood from a reading of the following description in connection with the accompanying drawings wherein a switch assembly embodying this invention is illustrated and in which:

FIG. 1 is an end view;

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 1;

FIGS. 4 and 5 illustrate the actuating mechanism set for alternate action and in switch actuating and release positions respectively; and

FIGS. 6 and 7 illustrate the actuating mechanism set for momentary action and in switch actuating and release positions respectively.

With reference to the drawings, the switch assembly includes a pair of switches **2** mounted in a U-shaped frame **4** having depending side portions **6** and a web portion **7**. Switches **2** are connected in the assembly by screws **3** extending through suitable mounting holes in the frame and the switches. It will be understood that the number and type of switches **2** can be varied without departing from the scope of this invention. Preferably, switches **2** are of the snap action type actuated by depressing button **9**. Housing **8** is suitably attached to web **7** and includes a pair of relatively spaced arms **10** extending through an aperture **12** in the web. Push button **14** is supported for movement relative to housing **8** and compression spring **16** is suitably seated between housing **8** and button **14** to bias the button toward a normal position. Spring post **18** is connected to the underside of button **14** and has one end of the compression spring **20** attached thereto. Actuator tip **22** is attached to the other end of spring **20** so that a flexible connection is provided between actuator tip **22** and button **14**.

Cam **24** is pivotally mounted on a pin **26** supported between arms **10** of housing **8**. Cam **24**, as will be explained more fully hereinafter, is movable between a switch actuating and a switch release position and carries bracket **28** having ends **29** extending outwardly on either side of the cam to engage button **9** and actuate the switches. Cam **24** includes inclined faces **30** and **32** which terminate in pin receiving valleys **31** and **33** respectively. Depending on the position of the cam (FIG. 4 or 5), either inclined face **30** or **32** will be presented to actuator tip **22** to guide the tip into one of the valleys **31** or **33** as button **14** is depressed. In this manner the cam is pivoted to either its switch actuating or release position. Spring **20**, although flexible to allow the actuator

tip to follow the contour of the inclined faces of cam **24**, is relatively stiff so as to impart sufficient force to the cam to pivot it about its axis.

Tension spring **34** is disposed on either side of cam **24** with one end of each of the springs being connected to bracket **28** at a spring seat **36** and the opposite end of each spring being connected to a spring holder **38** mounted on bracket **4**. The spring holder includes a portion **45** of reduced cross section to receive springs **34** and a pair of notched seats **46** for the springs. As can be seen in FIGS. 4–7, springs **34** are thus seated with their force lines FL extending generally transversely of the pivotal axis of cam **24** provided by pin **26**.

Spring holder **38** is preferably positioned in a V-shaped notch **40** in bracket **4** and is selectively movable between a first position (FIGS. 4 and 5) in contact with an upper face **42** of the notch and a second position (FIGS. 6 and 7) in contact with a lower face **44** of the notch. During movement of cam **24**, the spring holder in both its first and second positions remains stationary relative to the pivotal axis of the cam and brackets **28** are movable with the cam and relative to the pivot axis of the cam. Therefore, each spring **34** has, relative to the pivot axis of the cam, a fixed seat and a movable seat.

The selection of either alternate or momentary switch actuation is preferably controlled by varying the position of spring seats **34** through selective positioning of spring holder **38**; and it will be noted that with the spring holder in both its first and second position, each seat **46** and pivot pin **26** lie in a plane extending transversely of, or generally normal to, the direction of movement of the cam, this plane being defined by the pivotal axis of the cam and seats **46**. With reference to FIGS. 4 and 5, alternate switch actuation is achieved by moving the spring holder to its first position in engagement with face **42**. In this position, movement of the cam is achieved with a toggle action. More particularly, with the cam in switch actuating position (FIG. 4), each spring seat **36** is disposed on one side of the pivotal axis of the cam so that force lines FL extend below the pivotal axis to hold the cam in switch actuating position. When the cam is pivoted to its switch release position (FIG. 5), each spring seat **36** is moved to the opposite side of the pivotal axis so that force lines FL now extend above the pivotal axis and hold the cam in its switch release position. In moving between the switch actuating and switch release positions of the cam, force lines FL are caused to move over-center with respect to cam axis so that the cam is alternately snapped into and then held in each position.

Referring now to FIGS. 6 and 7, when the spring holder is moved into its second position in engagement with face **44** the switch assembly is set for momentary action. More particularly, with the cam in its switch actuating position (FIG. 6), each spring seat **36** lies on one side of the pivotal axis of the cam so that force lines FL of the spring extend below the pivotal axis and hold the cam in switch actuating position. When the cam is pivoted to its switch release position (FIG. 7) each spring seat **36** remains on the same side of the pivotal axis of the cam so that force lines FL remain on the same side of the pivotal axis of the cam and bias the cam toward its switch actuating position so that when the actuating force on the cam is removed the springs will pivot the cam back to switch actuating position. Therefore, with the spring holder in its second position in contact with face **44** force lines FL of springs **34** are never moved over-center with respect to the cam axis and continuously bias the cam toward a switch actuating position providing momentary switch actuation.

A simplified pivotal connection is provided between spring holder **38** and bracket **4** in that the spring holder

is loosely positioned in notch 40 and is maintained in position by springs 34. More particularly, as can be seen in FIGS. 4–7, pivot point 48 of the spring holder is so positioned relative to spring seats 36 and 46 that whether the spring holder is positioned for alternate or momentary switch actuation force lines FL remain on the same side of pivot pin 48 during movement of cam 24. With the spring holder in both of its positions and with cam 24 in either its switch actuating or release positions, spring 34 bias the spring holder inwardly toward pivot point 48 and upwardly or downwardly against respective ones of the faces of the notch. Hence, a simple pivotal connection is provided which is relatively inexpensive yet effective and reliable.

This invention is equally well suited to use in an assembly where the switches and actuators are gang mounted or where only the switches are gang mounted and are operated off a single actuator having a suitable extension or with slight modifications both ends of the actuator cam could be adapted to control a switching operation. These are merely examples of modifications which can be made without departing from the scope of this invention. Therefore, it should be understood that, the discussion of this invention with reference to a particular preferred embodiment thereof has been for illustrative purposes only and should not be taken by way of limitation, and that it is intended in the appended claims to cover all modifications and embodiments of this invention as fall within the true spirit and scope thereof.

What I claim is:

1. A switch actuator comprising, in combination, a cam, means for selectively moving said cam about a pivotal axis and between a switch actuating and a switch release position, a spring holder, means for connecting said spring holder for selective movement to a first and a second position relative to the pivotal axis of said cam, and at least one spring connected between said spring holder and said cam and defining a force line extending generally transversely of said pivotal axis, said spring holder in each of said first and second positions and relative to said pivotal axis defining a fixed seat for said spring and said connection between said spring and said cam defining a movable seat for said spring, when said spring holder is in said first position said movable seat being positioned on one side of said pivotal axis when said cam is in said switch actuating position and being positioned on the other side of said pivotal axis when said cam is in said switch release position so that said force line is moved over-center when said cam is moved between its switch actuating and release positions, when said spring holder is in said second position said movable seat being positioned on the same side of said pivotal axis when said cam is in both said switch actuating and switch release positions so that said force line does not move over-center and said cam is continuously biased towards one of its positions.

2. The combination of claim 1 which includes a frame having a notch, and wherein said spring holder is pivotally positioned in said notch for selective movement to its first and second positions.

3. The combination of claim 2 wherein when said spring holder is in both its first and second position, said force line of said spring remains on the same side of the pivot point of said spring holder on said frame when said cam is in both its switch actuating and switch release positions.

4. A switch actuator comprising, in combination, a cam connected for pivotal movement between a first and a second position, means for moving said cam between said first and second position, at least one spring seated at one end on and movable with said cam, means for adjustably seating the other end of said spring in a plurality of positions removed from said cam so that the force line

of said spring extends generally transversely of the pivotal connection of said cam, said adjustable seat in each of said positions being fixed relative to said pivotal connection, when said fixed seat is in one of its positions said movable seat being positioned on one side of said pivotal connection when said cam is in said first position and being positioned on the opposite side of said pivotal connection when said cam is in said second position so that said force line is moved over-center when said cam is moved between its first and second positions, when said fixed seat is in another of its positions said movable seat being positioned on the same side of said pivotal connection when said cam is in both its first and second positions so that said force line does not move over-center and said cam is continuously biased towards one of its positions.

5. A switch actuator comprising, in combination, a cam, means for moving said cam about an axis and between a first and second position, a resilient member having a first seat on said cam and a second seat removed from said cam so that said resilient member defines a force line extending generally transversely of the pivotal connection of said cam, and means for adjustably connecting one of said seats in a plurality of positions so that when in one of its positions said first seat is positioned on one side of said axis when said cam is in its first position and is positioned on the opposite side of said axis when said cam is in its second position and so that when in another of its positions said first seat is positioned on the same side of said axis when said cam is in both said first and second positions.

6. In combination, a switch actuator connected for selective pivotal movement between a first and second position, and means for moving said cam between said first and second position, biasing means acting on and defining a force line relative to said actuator for selectively biasing said actuator toward said first and second positions, and means for adjusting said biasing means to either a first position wherein said force line is moved over-center with respect to said pivotal connection as said actuator is moved between said first and second positions to alternately bias and hold said actuator in both said positions or to a second position wherein said force line does not move over-center as said actuator is moved between said first and second positions and said actuator is continuously biased toward one of its positions.

7. In combination, a switch actuator, means for moving said actuator between a first and second position, a resilient member acting on said actuator, and means for adjusting said resilient member relative to said actuator, said adjusting means operative selectively to either position said resilient member relative to said actuator so that when said actuator is in said first and second positions said resilient member respectively biases said actuator toward said first and second positions or to position said resilient member so that when said actuator is in both said and second positions said actuator is biased toward one of its positions.

8. In combination, an actuator, means for moving said actuator between a first and second position, biasing means acting on said actuator with the effective force acting along a force line, and means for adjusting said biasing means relative to said actuator so that said force line is selectively positioned to either bias said actuator alternately toward both first and second positions with a toggle action or to bias said actuator toward only one of said positions.

9. A switch assembly comprising, in combination, a frame including switch mounting apertures, at least one switch supported in said frame at said aperture, operating mechanism connected in said frame and movable relative to and controlling actuation of said switch, a cam intermediate said switch and said operating mechanism, said cam engageable with said switch and mounted for pivotal movement by said operating mechanism between

a switch actuating and a switch release position, a spring holder, means for adjustably connecting said spring holder in a first and a second position relative to the pivotal connection of said cam, at least one spring connected between said cam and said spring holder and defining a force line extending generally transversely of said pivotal connection, said spring holder in each of its positions defining a fixed seat for said spring relative to said pivotal connection and said connection between said spring and said cam defining a movable seat for said spring relative to said pivotal connection, when said spring holder is in said first position said movable seat being positioned on one side of said pivotal connection when said cam is in its switch actuating position and being positioned on the opposite side of said pivotal connection when said cam is in said switch release position so that said force line is moved over-center when said cam is moved between its switch actuating and release positions, when said spring holder is in said second position said movable seat being positioned on the same side of said pivotal connection so that said force line is not moved over-center and said cam is continuously biased towards one of its positions.

10. A switch assembly comprising, in combination, a frame, at least one switch mounted in said frame, operating mechanism connected in said frame and movable

relative to and controlling actuation of said switch, cam means mounted in said frame for pivotal movement by said operating mechanism about an axis and between a switch actuating and a switch release position, a spring member having one end seated on said cam and its other end seated on said frame to define a force line extending generally transversely of said axis, and means for varying the position of one of said seats relative to said axis so that in one position said force line is moved over-center as said cam is moved between said switch actuation and release positions and in another position said force line does not move over-center as said cam is moved between said switch actuating and release positions whereby said cam is continuously biased toward one of its positions.

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S. SIMON, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,277,264 October 4, 1966

John P. Barthell

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 57, after "said", first occurrence, insert -- first --.

Signed and sealed this 22nd day of August 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents