Sept. 20, 1949. R. PRATT 2,482,206

LEVER OPERATED CONTROL SWITCH

Filed May 4, 1945

Fig. 1.

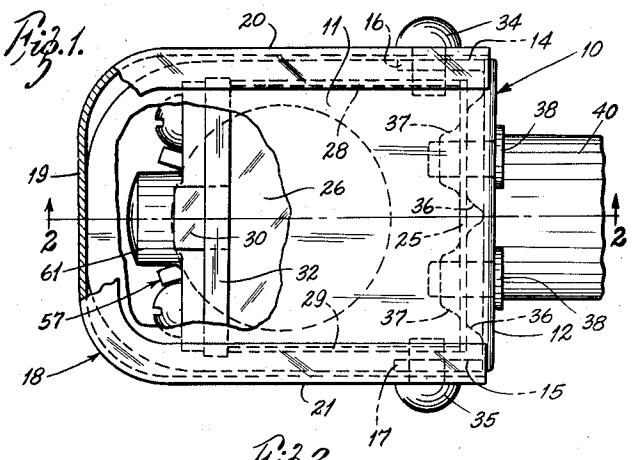


Fig. 4.

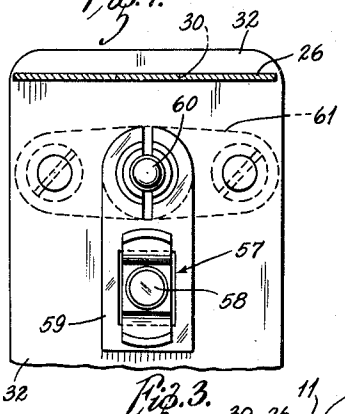


Fig. 3.

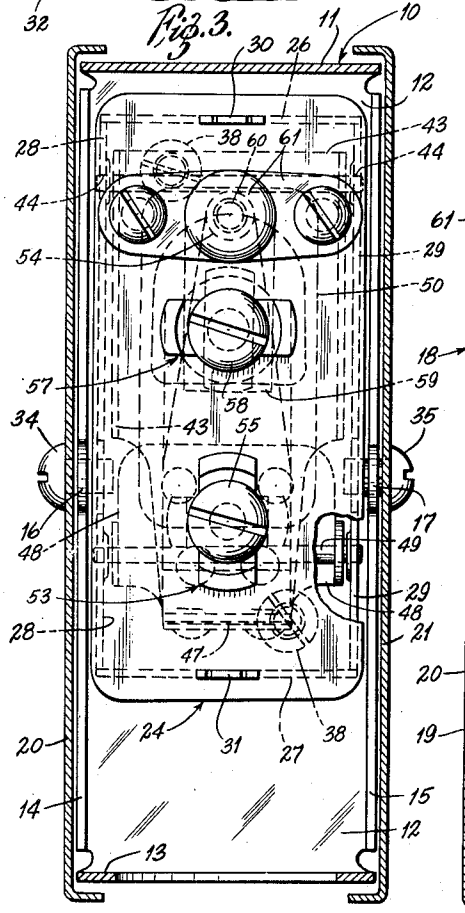


Fig. 2.

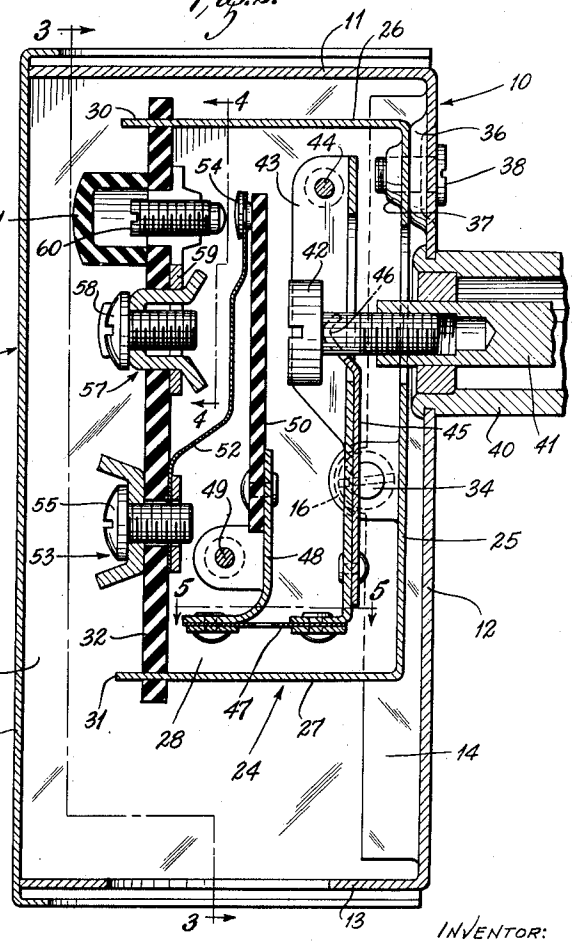
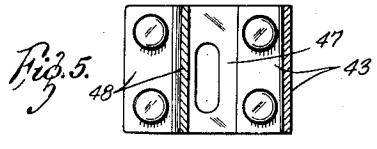


Fig. 5.



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Patented Sept. 20, 1949 2,482,206

UNITED STATES PATENT OFFICE

2,482,206

LEVER OPERATED CONTROL SWITCH

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Application May 4, 1945, Serial No. 591,986

5 Claims. (Cl. 200—153)

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The present invention relates to a control switch. More particularly, it relates to a switch construction having high multiplication, minimum lost motion, and rugged construction.

In the drawings:

Fig. 1 is a plan view of the device partly broken away;

Fig. 2 is a front-to-rear vertical section on the line 2—2 of Fig. 1;

Fig. 3 is a side-to-side vertical section on the line 3—3 of Fig. 2;

Fig. 4 is a vertical section on the line 4—4 at the upper middle part of Fig. 2; and

Fig. 5 is a horizontal section on the line 5—5 of Fig. 2.

The switch includes a more or less U-shaped main supporting base 10, having a top flange 11, a forward panel 12, and a bottom flange 13. It has also two short forward side flanges 14 and 15. The two side flanges have ears 16 and 17, respectively, thereon to receive screws for attachment purposes, as will appear.

A cover 18 provides a back panel 19 and two side panels 20 and 21. It has top and bottom flanges so that it may be slipped over the open end of the main supporting base 10. Its side panels 20 and 21 overlie the short flanges 14 and 15 on the main supporting base, and particularly lie alongside the two attachment ears 16 and 17 thereon.

Within the main supporting base 10 and secured adjacent the front thereof is an inner switch housing, generally indicated at 24, and comprising a front wall 25, a top wall 26, a bottom wall 27, and two side walls 28 and 29. Central projections of the bottom and top walls 26 and 27 are shown at 30 and 31, these being designed to penetrate a front panel 32 of insulating material and to be peened over to hold the front panel in place.

The side walls 28 and 29 lie within the two ears 16 and 17 on the main supporting base 10. Screws 34 and 35 pass through the side walls 20 and 21 of the cover member, then through the ears 16 and 17, and finally into the side walls 28 and 29 of the inner switch housing. These two screws thereby hold the several parts together. Additionally, the main supporting base 10 has raised portions 36 engageable against the forward surface of the front wall 25 of the switch housing member and registerable with similar raised portions 37 extending inwardly from that panel 25. A screw 38 passes through both raised portions and secures these parts together in cooperation with the two screws 34 and 35.

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The operating mechanism includes a thermal device in the form of an outer tube 40 and an inner connecting rod 41 adapted to be joined with an inner tube portion, all as shown in co-pending application Serial No. 588,554, filed April 16, 1945, for Heat-responsive element, by this inventor. The inner end of the rod 41 receives a headed screw 42 for threaded adjustment thereinto. It will be understood that upon being subjected to great changes in heat conditions within a stack or the like the tube 40 will expand to a greater extent than the inner member including the rod 41, and will draw the screw 42 to the right. Similarly, upon cooling, the screw 42 will be moved to the left.

A primary lever 43 is pivoted at 44 to the side walls 28 and 29 of the inner switch housing. The pivot 44 consists of a rod that extends all the way through the flanges on the primary lever 43 to the aforesaid side walls 28 and 29, as appears in the upper part of Fig. 3.

The primary lever is cut away in its middle portion and surrounds the screw 42. At points beginning slightly above the two screws 34 and 35, the primary lever is cut inwardly to a narrow lower part. Riveted to this narrow lower part is an additional member 45 that projects back into the opening, whereby the primary lever straddles the screw 42. This member 45 has backwardly struck forked ends 46 that engage the forward side of the head of the screw 42. As a consequence, it will be seen that, when the head of the screw is moved to the right in Fig. 2, it will pivot the primary lever 43 counterclockwise about the pivot 44. The member 45 is resilient, to absorb any overtravel of the heat-responsive element.

The lower end of the primary lever 43 is turned backwardly to receive one end of a bronze pivot spring 47, the other end of which is attached to the turned back end of a secondary lever member 48. The secondary lever is mounted pivotally on a pivot rod 49 that passes through ears outstruck from the sides of the secondary lever 48 and passing through the flanges 28 and 29 of the switch housing. It may thus be seen that the secondary lever is caused to pivot clockwise about its pivot 49 upon clockwise pivoting of the primary lever 43 about its pivot 44.

The secondary lever 48 has an arm of insulating material 50 extending upwardly therefrom. The upwardly extending secondary lever thereby lies alongside the primary lever 43. Owing to the differences in the leverages of the two levers, it may be seen that the upper end of the secondary lever 50 will have a highly multiplied movement,

A spring blade **52** is secured rigidly to a terminal **53** that extends through the panel **32** of the switch housing. This spring blade **52** is bent in the manner shown in Fig. 2, and normally exerts a force to the right in Fig. 2. At its upper end, it contains a switch contact element **54**, the back of which is urged against the upper end of the secondary lever **50** by the inherent resiliency of the spring blade **52**. This force exerted against the secondary lever tends to pivot that lever clockwise about its pivot **49**.

The terminal **53** includes a screw **55** by which a proper electrical lead may be brought thereto and may be put into contact with the switch blade **52**. It will be seen that this blade is otherwise insulated because of the insulated character of the panel **32** of the switch housing.

Upwardly on the switch housing from the terminal **53** is another terminal **57** which has a screw **58** for attachment of an electrical wire. The terminal **57** projects through a terminal plate **59** within the switch housing and secures the terminal plate against the inner face of the housing. This plate **59** has an upper head portion projecting through the front panel **32** of the switch housing, and this head portion receives an adjustable contact member **60**. This contact member is disposed opposite the contact member **54** on the spring blade **52** and is adjustable toward and from this contact. A protective cap **61** is secured to the switch housing panel **32** to prevent accidental displacement of the contact **60** after it is once adjusted. It will further be observed that accidental displacement is prevented by the fact that the plate **59** is slit at its upper end (as shown in Figs. 2 and 4) so that it is normally urged inwardly, the two bifurcations being spread by the presence of the screw **60**.

Operation

When the stack unit **40** is cold, the screw **42** will be displaced to the left, permitting maximum clockwise movement of the primary lever **43** about its pivot **44**. This maximum movement is effected by the action of the spring switch blade **52** against the upper end **50** of the secondary lever **48**, pivoting that lever the maximum distance clockwise about its pivot **49**. When it so moves, it acts through the bronze spring **47** to draw the lower end of the primary lever **43** leftward as far as is permitted. The distance of such movement is determined by the engagement of the prongs **46** against the lower end of the head of the screw **42**.

When the screw **52** moves to the right under the influence of a heated stack member, it acts against the prongs **46** and moves them to the right in Fig. 2, thereby pivoting the primary lever **43** counterclockwise about the pivot **44**. This movement is transmitted to the secondary lever through the bronze spring **47**, drawing the end of the secondary lever below the pivot **49** to the right, and thereby pivoting the upper end **50** to the left, against the influence of the spring blade switch **52**. When this movement proceeds to a desired point, the contact member **54** on the spring switch blade will engage electrically with the fixed contact **60**, thereby completing the circuit. The particular temperature conditions of the stack unit required to effect closure of the two contacts may be adjusted by adjusting the screw **60** toward or from the contact **54**.

It will be seen that the switch hereinbefore described provides a mechanism that is relatively simple in construction which provides a large multiplication of forces with a minimum number of parts, all assembled in a highly compact arrangement. (Note that the member **45** will permit overtravel of the screw head **42** to the right.)

What is claimed is:

1. In a switch mechanism, a housing, a first lever pivoted on the housing, a force element adapted to apply force to move the first lever in one direction, said first lever having resilient prong means adapted to be abutted by the force element for transmission of the movement from the force element to the first lever, the resiliency of said prong means permitting overtravel of said force element without further movement of said first lever after a predetermined maximum movement of said first lever, a second lever lying alongside the first lever and connected therewith for movement thereby, said second lever being pivoted to the housing adjacent its connection aforesaid, and extending beyond the pivot, a spring switch contact blade secured to the housing and extending adjacent the extending end of the second lever, said blade normally engaging the second lever and urging it oppositely to the direction applied by the force element and the second lever, and a second contact engageable by the contact blade.

2. In a switch mechanism, a housing, a first lever pivoted on the housing, a force element adapted to apply force to move the first lever in one direction, said first lever having resilient prong means adapted to be abutted by the force element for transmission of the movement from the force element to the first lever, the resiliency of said prong means permitting overtravel of said force element without further movement of said first lever after a predetermined maximum movement of said first lever, a second lever lying alongside the first lever and connected therewith for movement thereby, said second lever being pivoted to the housing adjacent its connection aforesaid, and extending beyond the pivot, a spring switch contact blade secured to the housing and extending adjacent the extending end of the second lever, said blade normally engaging the second lever and urging it oppositely to the direction applied by the force element and the second lever, and a second contact engageable by the contact blade, said blade being fixed at its end opposite the second contact to the housing and having an electrical terminal.

3. In a switch mechanism, a housing, a first lever pivoted on the housing, a force element adapted to apply force to move the first lever in one direction, said first lever having resilient prong means adapted to be abutted by the force element for transmission of the movement from the force element to the first lever, the resiliency of said prong means permitting overtravel of said force element without further movement of said first lever after a predetermined maximum movement of said first lever, a second lever lying alongside the first lever and a spring blade pivot by which it is connected therewith for movement thereby, said second lever being pivoted to the housing adjacent its connection aforesaid, and having an electrically insulative portion extending beyond the pivot, a spring switch contact blade secured to the housing and extending adjacent the extending end of the second lever, said blade normally engaging the second lever and urging it oppositely to the direction applied by the force element and the second lever, and a second contact engageable by the contact blade.

4. In a switch mechanism, a housing, an op-

positely movable power driven element on the housing, a first lever pivoted at its first end to the housing, the end being at one side of the power element, the lever extending across the power element to dispose its second end on the other side thereof, a resilient member secured to said first lever and in contact with said power element for transmission of movement of said power element to said first lever, said resilient member permitting overtravel of said element without further movement of or damage to said first lever after said first lever has pivoted a predetermined maximum degree, a second lever alongside the first, the second lever being connected to the second end of the first lever to be moved thereby, pivoted to the housing, and having a free end extending beyond said pivot, a spring switch blade having a first contact thereon, the blade being mounted on the housing, extending along the free end of the second lever, the blade being engageable with the said free end and applying a force thereto that acts through the second lever to urge the first lever into contact with the power element, and a second contact on the housing engageable by the first contact when the power element displaces the levers and the spring blade against the force of the spring blade, the power driven element including a reciprocatable member and a headed member adjustably secured thereto, the headed member passing across the first lever and resilient member, and the head being hookable over the said resilient member to move it and said first lever in one direction against the force of the spring blade.

5. In a switch mechanism, a housing, a power moved element extending into the housing, a first lever pivotally mounted in said housing including a resilient member contacting said element for transmission of movement of said element to said first lever, said resilient member permitting overtravel of said element without further movement of or damage to said first lever after said first lever has pivoted a predetermined maximum degree, a second lever pivotally mounted in said housing and having a free end, said first lever being connected to said second lever close to the pivot point of the latter for pull-pivoting thereof upon pivotal movement of said first lever, movement of the free end of said second lever being thereby multiplied a predetermined number of times the movement of said element, a resilient switch blade having a free end engaging the free end of said second lever and biasing it against movement by said first lever, a contact on said blade, and a second contact, said blade contact being movable into engagement with said second contact through pivotal movement of said second lever.

RYDER PRATT.

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