

United States Patent

Ellenberger

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[54] LOCKSWITCH

[72] Inventor: **Jakob Ellenberger**, Altdorf near Nuernberg, Germany

[73] Assignee: **Ellenberger & Poensgen GmbH**, Altdorf near Nuernberg, Germany

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[58] Field of Search60/23; 200/61.64, 67 D; 236/68 R; 310/4.1; 337/1, 77, 101, 102, 103, 104, 107, 112, 377; 219/511

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Primary Examiner—George Harris

Assistant Examiner—Dewitt M. Morgan

Attorney—Harness, Dickey & Pierce

[57] ABSTRACT

A lock switch for washing machine doors and the like having a locking plunger which is moved by a lever which is acted on by a bimetal strip. The strip may be caused to bend by a heating coil, and the bending movement is transmitted to the plunger by the lever.

9 Claims, 2 Drawing Figures

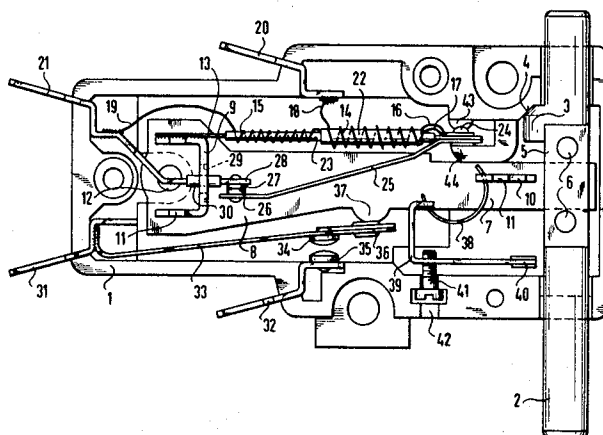


Fig. 1

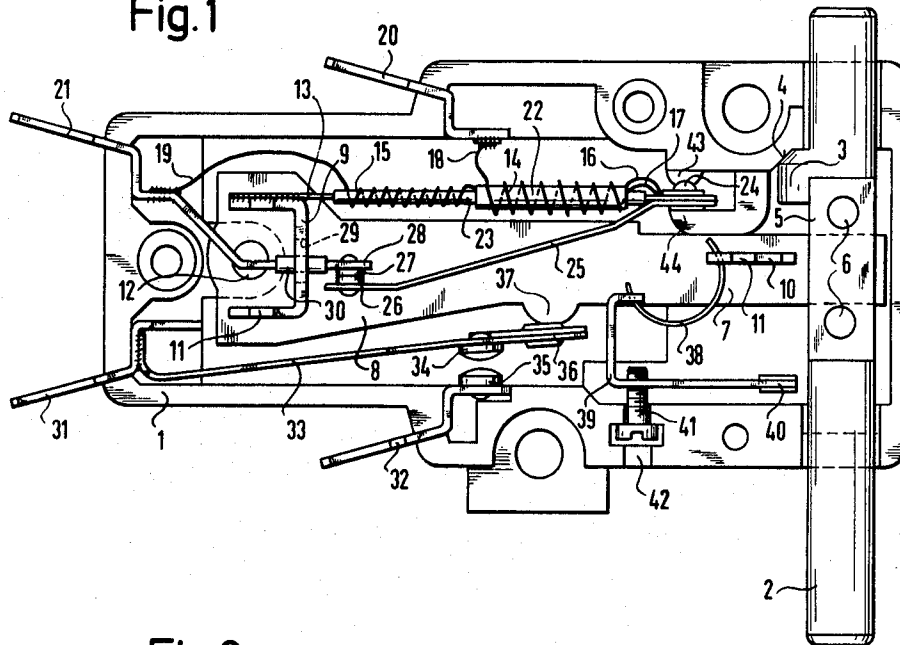
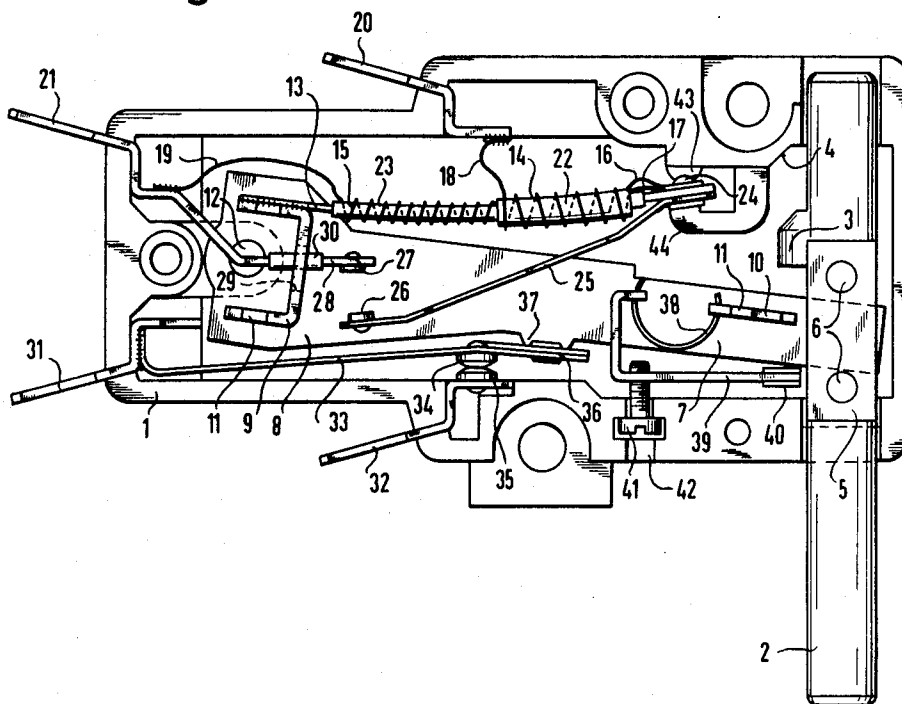


Fig. 2



INVENTOR:

Jakob Ellenberger

BY

Harness Dickey & Piere
ATTORNEYS.

LOCKSWITCH

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a lock switch which is suitable for locking washing machine doors or the doors of similar machines.

According to the present invention a lock switch is provided including a plunger having a locking position and a retracted position, a pivoted lever having a free end of which engaging the plunger, and a bimetal strip fixed to the lever adjacent the pivot thereof and also secured to a housing for the switch, wherein bending of the bimetal strip causes rotation of the lever and consequent movement of the plunger to the locking position from the retracted position.

Advantageously, according to the invention, there is provided a locking spring adapted to restrain the lever in positions wherein the plunger is in the locking position, and the retracted position. This spring may be supported on a resilient support adjustable by means of a screw in the housing. The bimetal strip may be substantially parallel to the lever.

A pair of electrical contacts are provided which may be connected to two lugs outside the housing and can be closed by the lever on bending of the bimetal strip to close a circuit outside the switch. The switch may operate an electric motor which is only intended to operate when the plunger is in its locking position.

In order to bend the bimetal strip, the strip may be provided with a first heating coil for rapid heating of the strip. A second heating coil can be provided to operate in series with the first coil when the strip is bent, the coils together maintaining the elevated temperature of the strip without increasing it. The second coil, if provided, is short circuited when the strip is cold, but bending of the strip opens contacts arranged to bring the second coil into series with the first, and much reduce the current flow through the first, thus reducing the total heating effect. A resistor may be provided in place of the second coil.

The lever may be pivoted on pins integral with the housing, which may be in two halves, a pin being provided on each.

A U-shaped metal member on the lever may be used to support the bimetal strip, and this member can be fixed between two parallel parts of the lever, which may be of insulating material. The two parts can be fixed at another end to a metal member supporting one end of the locking spring.

In order that the invention may be more clearly understood the following description is given, merely by way of example, with reference to the accompanying.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of one form of lock switch according to the invention, the switch being in the cold state of the bimetal strip, with the plunger in the retracted position; and

FIG. 2 shows the switch of FIG. 1 in alternative state with the plunger in its locking position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The lock switch shown in FIGS. 1 and 2 has a housing consisting of two housing halves of which only one housing half 1 is shown. A plunger 2 is mounted for displacement in corresponding recesses formed in the housing halves and has a projection 3 which, in its retracted position shown in FIG. 1, bears against a stop 4 on the housing. The central portion 5 of the plunger is flat and has two pins 6, projecting out on both sides, and engaging between them a lever 7 consisting of two spaced insulating plates 8 (only one of which is shown), which are maintained apart by and fixed to a metal plate 10, which has projections 11 engaging in apertures in the plates 8. The insulating plates 8 are pivotally mounted on pins 12 on the housing halves at their ends remote from the plunger 2, and at their ends adjacent the pins the halves are held apart by a U-shaped metal member 9 to which they are fixed.

Welded to the metal member 9 is a bimetal strip 13 having two heating coils 14 and 15, which are both electrically con-

nected at their right-hand ends 16 and 17, to the right-hand end of the bimetal strip 13. The left-hand ends 18 and 19 of the two heating coils 14 and 15 are connected to lugs 20 and 21 outside the housing. The heating coil 14 is wound on an insulating sleeve 22 and the heating coil 15 on an insulating sleeve 23. A contact spring 25 is riveted at 24 to the right-hand end of the bimetal strip 13 and is electrically connected with it and with the heating coils 14 and 15. At its free end, the contact spring 25 carries a contact 26 bearing against a fixed contact 27 which is mounted on an extension 28 of the connecting lug 21. The extension 28 passes through a large aperture 29 in the central portion of the U-shaped member 9, and between the pivot pins 12. The extension 28 has an insulating sleeve 30 in the region of the member 9.

Two further connecting lugs 31 and 32 are provided, connected respectively to a contact spring 33 having at its right-hand end a contact 34 and a fixed contact 35 with which contact 34 can make contact. A projection 37 on one insulating plate 8 abuts the contact spring 33 at its outer end 36.

A semi-circular working spring 38 is supported between the metal plate 10 and a lever 39 secured at its end 40 to the housing. The lever 39 is resilient and is adjustable by a screw 41 the head of which is in a recess formed in the housing halves and accessible through an aperture 42. The spring 38 as shown in FIG. 1, urges rivet 24 in the bimetal strip against a projection 43, while a projection 44 also holds the rivet 24 against this projection 43.

When current is supplied to the lugs 20 and 21 which, for instance, may occur when a washing machine door is closed, or at a stage in a machine program, the current passes through coil 14, but not coil 15 and quickly heats the bimetal strip. During this time the heating coil 15 is short circuited because contacts 26 and 27 provide a path for current flow from coil 14 to lug 21. On heating, the bimetal strip bends, sagging downwards at its center, to attain the position of FIG. 2. During bending, the lever 7 is pivoted and the plunger 2 moved outwards to its locking position. The locking spring 38 makes this movement of the plunger and lever a rapid one. Pivoting of the lever 7 causes contacts 34 and 35 to close, so that current may be passed, for example, to a motor. Bending of the bimetal strip 13 moves the spring arm 25 so that the contacts 26, 27 are broken. When this occurs, current flows through both coils 14 and 15 which are then connected in series via their right hand ends. Because the coils are now in series, the current is much reduced, and is just sufficient to retain the bimetal strip 13 in the curved position of FIG. 2. The bimetal strip 13 is thus protected against overheating or strain. A cooling time may be established for the bimetal strip 13 which is less than 90 seconds. A resistance could be used in place of the second coil 15, to be switched into the circuit of coil 14 on bending of the bimetal strip. When current to lugs 20 and 21 is switched off, the bimetal strip quickly unbends, and the plunger is retracted.

One of the advantages of switches according to this invention is that the bimetal strip does not act directly on the plunger, but has its bending movement multiplied by the lever so that quicker action of the switch is obtained. Only a slight bending of the bimetal strip is required to move the plungers to the working position. In addition, the switches of this invention are small, compact and robust. The provision of a locking spring reduces the effects of shocks on the switch, since the lever is held by the spring in one of two positions.

While it will be apparent that the teachings herein are well calculated to teach one skilled in the art the method of making the preferred embodiment of this invention, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or meaning of the subjoined claims.

What is claimed is:

1. A lock switch for locking washing machine doors or the like comprising:
 - a housing;
 - a locking plunger mounted on said housing for movement between a retracted position and a locking position;

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a lever mounted on said housing by a pivot and operably connected adjacent its outer end to said plunger; and a bimetal actuator secured at one end to said housing and fixed at the other end to said lever adjacent said pivot and remote from said outer end of the lever, said actuator being operable by application of heat thereto to rock said lever about said pivot and thereby slide said plunger to move the latter between said retracted position and said locking position.

2. A lock switch as claimed in claim 1 further comprising a locking spring attached to said lever and said housing for restraining said lever in positions wherein said plunger is in its locking position and its retracted position.

3. A lock switch as claimed in claim 1 wherein said bimetal strip is substantially parallel to said lever.

4. A lock switch as claimed in claim 1 further comprising a pair of contacts supported by said housing, each of these contacts being electrically connected with a separate lug, one of said contacts being actuated by said lever upon its pivoting to engage the other contact.

5. A lock switch as claimed in claim 1 further comprising a heating coil associated with said bimetal strip and connected to the line voltage for rapid heating thereof, an electrical resistance also associated with said bimetal strip and a pair of electrical contacts, an arm attached to said bimetal strip and supporting one of said contacts, means supported by said housing separate from said bimetal strip supporting said other contact, said contacts being closed when said bimetal strip is

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cold so as to short circuit said resistance, and said contacts being open when said bimetal strip is bent so as to connect said resistance in series with said heating coil.

6. A lock switch as claimed in claim 5 wherein said resistance comprises a second heating coil to said bimetal strip.

7. A lock switch as claimed in claim 5 further comprising a U-shaped member attached to said lever and surrounding said pivot, means defining an aperture in said U-shaped member, said bimetal strip being connected at its other end to said U-shaped member, and a projection from said housing through said aperture carrying the other of said contacts.

8. A lock switch comprising:

a housing;

a locking plunger mounted on said housing for movement between a retracted position and a locking position;

a lever mounted on said housing by a pivot and operably connected to said plunger;

a bimetal actuator secured to at one end said housing; and a U-shaped member attached to said lever and surrounding said pivot, said bimetal strip being connected at its outer end to said U-shaped member and operable by application of heat thereto to actuate said lever and said plunger to move the latter between said retracted position and said locking position.

9. A lock switch as claimed in claim 8 wherein said lever comprises two insulating plates held apart by said U-shaped member.

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