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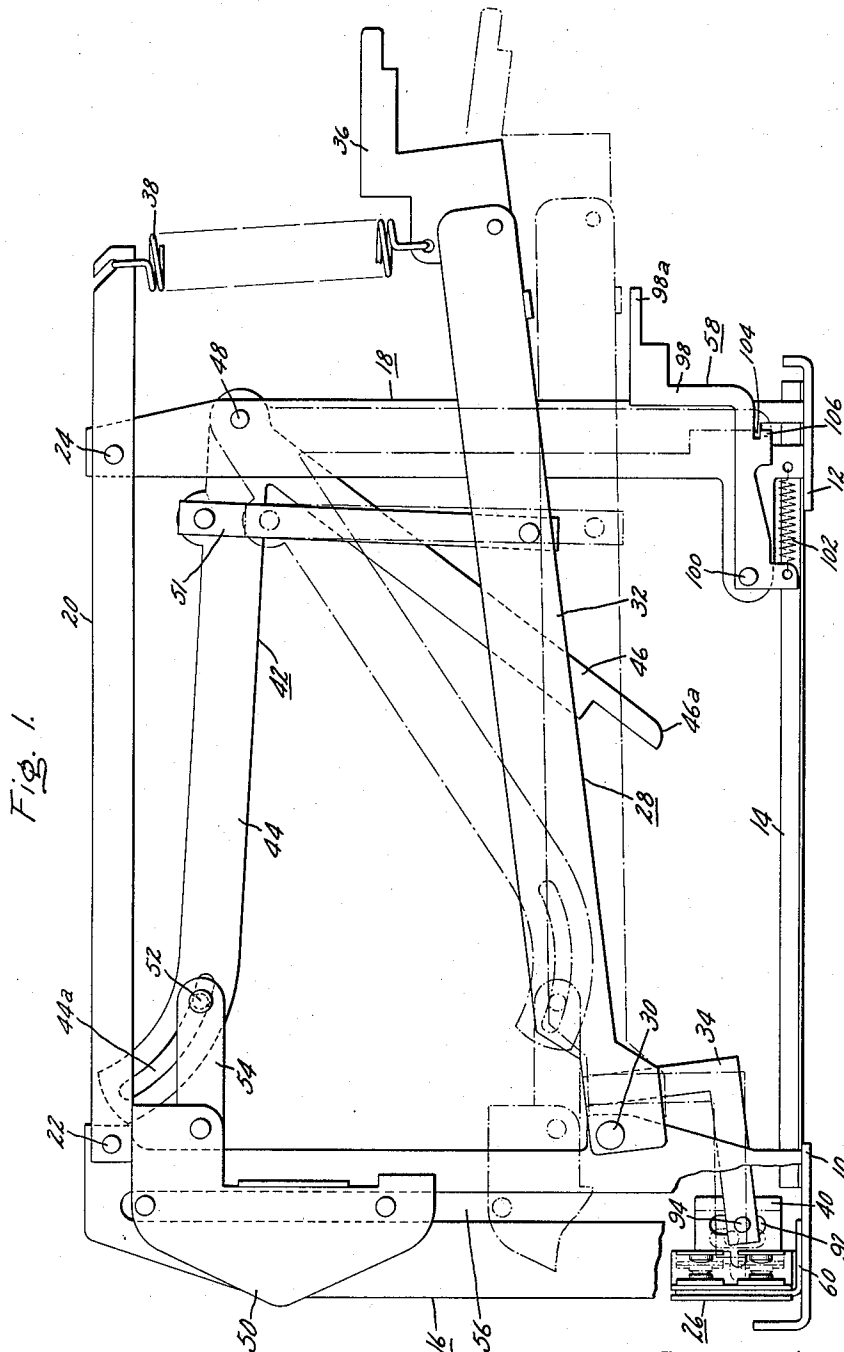
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ELECTRICAL SWITCH MECHANISM FOR TOASTER OR THE LIKE

Filed Feb. 18, 1959

2 Sheets-Sheet 1



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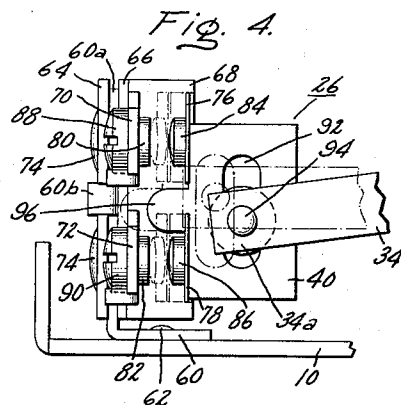
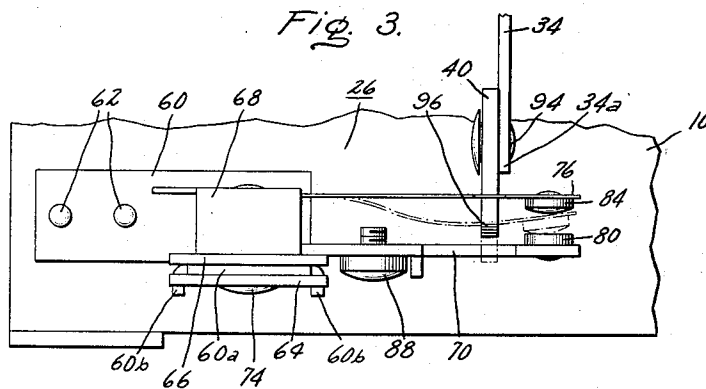
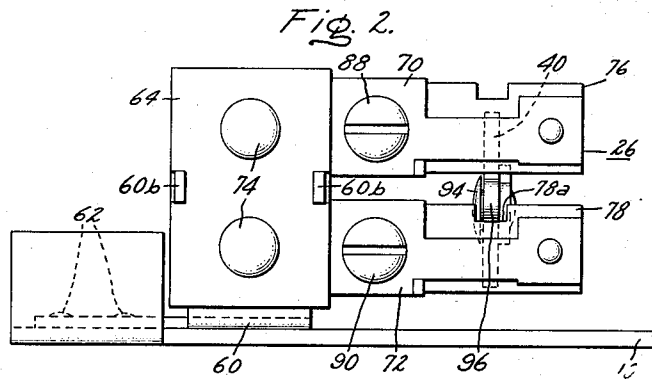
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2 Sheets-Sheet 2



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ELECTRICAL SWITCH MECHANISM FOR TOASTER OR THE LIKE

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2 Claims. (Cl. 200-164)

This invention relates to electrical circuit control means for automatic toasters and the like. More particularly, it relates to a lever-operated double pole switch providing the features of equalized contact pressure, reliability and simplicity of construction. The switch and its associated operating linkages are adapted to fit within a conventional electric toaster and operate in conjunction with other coacting elements of the toaster mechanism.

Double pole switches are highly desirable in the operation of electrical appliances, inasmuch as they provide complete isolation from the line when the appliances are not in operation. They are even more desirable in units such as toasters where the electrical heating elements are exposed and may be contacted by people inserting fingers or other objects into the spaces adapted to receive bread slices. In such case, there is a distinct shock hazard unless both sides of the line are disconnected, and such complete isolation is, of course, not supplied by single pole switches.

However, prior to the present invention practical double pole switches were unavailable for such applications. These switches must carry currents upwards of 10 amperes, and accordingly, switch contact resistance must be kept at a minimum. This is a serious problem in an easily actuated switch of small size and low cost, since reasonably high contact pressures must be maintained on both poles to minimize contact resistance. Prior constructions have failed in this regard because they do not properly align the switch contacts for simultaneous closure of both poles. A practical life requirement of at least 10,000 operating cycles has been another serious drawback.

Accordingly, it is a principal object of the present invention to provide an improved double pole switch mechanism adapted for use in electric toasters and the like. A more specific object of the invention is to provide a switch of the above character adapted to carry the high current required for such appliances and having substantially equal contact pressures on its two poles. Yet another object of the invention is to provide a switch of the above character which is reliable in operation over a large number of operating cycles and which has "fail-safe" features desirable in applications of this type. A still further object of the invention is to provide a switch of the above character which is easily operated by conventional toaster operating forces, e.g., hand operation to close the switch and timer or temperature responsive transducer operation to open it. Another object of the invention is a switch of the above character provided with automatic and effective wiping of the contacts upon closure thereof thereby further to lessen contact resistance. A final stated object of the invention is to provide a switch of the above character which is simple in design and easily fabricated by mass production methods. Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of

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construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is an elevation of a switch made according to my invention, together with certain associated parts of a toaster in which the switch may be incorporated;

Fig. 2 is a side elevation of the contact assembly of Fig. 1;

Fig. 3 is a top plan view of the contact assembly; and

Fig. 4 is an end elevation of the contact assembly, showing the action of the toggle member and associated operating lever in opening and closing the switch contacts.

In general, a switch made according to my invention has a pair of fixed contacts which cooperate with a pair of movable contacts mounted on cantilever or leaf spring contact arms. A pivoted operating lever carries a toggle member in engagement with the springs, and rotation of the lever thereby bends the latter to bring the movable contacts into engagement with the fixed contacts and thereby close the switch. An important feature of the invention is provided by the slidable and pivotal mounting of the toggle member on the operating lever. In a manner to be described, this permits the toggle member to apply substantially equal contact closure forces to the two poles of the switch. It also provides for contact wiping by bowing the cantilever springs after contact engagement, thereby imparting a translatory motion to the movable contacts. As will be shown below, the switch mechanism to be described is characterized by ease of operation permitting closure and opening of the switch by conventional toaster operating forces, and further by other important features to be described.

Referring now to Fig. 1, the switch mechanism is mounted on a pair of base members 10 and 12 positioned relative to each other by a bar 14 welded thereto. A pair of upstanding columns generally indicated at 16 and 18 are suitably secured to base members 10 and 12, respectively, and a beam 20 extending along the tops of columns 16 and 18 is fastened thereto by rivets 22 and 24. A contact assembly generally indicated at 26 is mounted on member 10 and is operated, in a manner to be described, by an operating lever generally indicated at 28. Lever 28, which is pivotally connected to column 16 as indicated at 30, comprises a main arm 32, an angle piece 34 and a handle bracket 36. The lever is held in the upper solid line position by a spring 38 extending between bracket 36 and beam 20 and is adapted to move against spring 38 into the dash-dot position of Fig. 1, thereby urging a toggle member 40 against the assembly 26 to close the switch contacts therein.

Still referring to Fig. 1, a second lever generally indicated at 42 is provided with a connecting arm 44 and a latching arm 46 preferably integral with each other. Lever 42 is pivoted on column 18, as indicated at 48. A link arm 51, extending between and pivoted to levers 28 and 42, causes counterclockwise rotation of lever 42 when bracket 36 is depressed to rotate lever 28 clockwise about pivot 30. When lever 42 is thus rotated, connecting arm 44 depresses a traveler 50 to its lower dash-dot position as shown in Fig. 1.

More particularly, arm 44 is provided with a slotted portion 44a accommodating a pin 52. Pin 52 is fixed to an arm 54 in turn secured to traveler 50. The traveler is suitably arranged for reciprocation in a slot 56 in column 16. Traveler 50 may carry supports (not shown) adapted to hold slices of bread in the toaster, and when

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handle bracket 36 is depressed, the traveler descends to lower the bread slices into a position of toasting relationship with the heating elements (also not shown). After the bread slices are toasted, the operating lever 28 is rotated counterclockwise about pin 30, back to the full line position, in a manner to be subsequently described, and the switch contacts of assembly 26 are opened and the traveler ascends to the upper position to raise the toasted bread slices in a well known manner.

The counterclockwise rotation of lever 42 when the switch contacts are closed also brings the latching arm 46 into contact with a locking mechanism generally indicated at 58 where it is held in a manner to be described until completion of the toasting operation. Then the arm 46 is released to permit spring 33 to retract and rotate lever 28 to open the switch and raise the traveler 50 in the manner described.

Referring now to Figs. 2, 3 and 4, the contact assembly 26 is supported by an angle bracket 60 mounted on the base member 10 as by rivets 62. Bracket 60 has an upstanding arm 60a (Figs. 3 and 4) sandwiched between a pair of insulating plates 64 and 66. An insulating spacer block 68, disposed directly behind plate 66, is notched to accommodate rigid arms 70 and 72 which carry the fixed contacts of the switch mechanism. A pair of rivets 74 passing through plate 64, arm 60a, plate 66, arms 70 and 72 and block 68 secure them together, the rivets clearing arm 60a and the contact arms 70 and 72 in order to prevent electrical contact with these latter parts. A pair of tabs 60b formed on arm 60a serve to position the various pieces mounted thereon.

The rivets 74 also serve to fasten a pair of movable contact arms 76 and 78 of suitable spring material to the back of block 68. The rigid arms 70 and 72 carry fixed contacts 80 and 82, and the movable arms 76 and 78 carry movable contacts 84 and 86 disposed opposite the fixed contacts. Connections to the fixed contacts may be made by means of terminal screws 88 and 90 threaded into the arms 70 and 72, while connections to the movable contacts are preferably made by means of bus bars (not shown) secured to the movable arms 76 and 78 by the rivets 74.

Accordingly, with one set of the switch contacts connected to the line and the other to the heating elements of the toaster, the toaster may be energized by bending the movable arms 76 and 78 to bring the contacts 84 and 86 into engagement with the fixed contacts 80 and 82. Upon their release, movable arms 76 and 78 spring back to the full line positions (Figs. 3 and 4) to break electrical contact. More particularly, the toggle member 40 urges the movable contacts against the fixed contacts upon clockwise rotation of the operating lever 28 about pivot 30 in the manner described above. When the latching arm 46 is released by the locking mechanism 58, and the operating lever returns to its upper full line position (Fig. 1), the toggle member 40 is retracted, thereby permitting disengagement of the switch in response to the spring forces exerted by arms 76 and 78.

As best seen in Fig. 4, the toggle member 40 has a vertical slot 92 accommodating the shank of a rivet 94 which loosely secures it to the angle piece 34 on lever 28 (Fig. 1). This arrangement permits relative rotation and vertical translation of the toggle member with respect to lever 28 and thereby provides equal contact pressures between the respective movable and fixed contacts as well as a contact wiping action, both highly desirable in a switch of this type.

As the operating lever 28 is rotated to close the switch, the end 34a of angle piece 34 carrying the toggle member 40 moves to the left (Figs. 1 and 4) carrying member 40 with it. The toggle member exerts leftward or closure forces on the arms 76 and 78 until the movable contacts engage the fixed contacts. No problem is presented if both pairs of contacts engage at the same time. However, in many cases, one pole of the switch

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will make contact before the other, and in prior constructions this would result in application of substantially the entire closure force to this pole with little or no force being applied to the other pair of contacts. A high resistance or completely open connection between the second pair of contacts would result. In the assembly 26, on the other hand, closure of one pair of contacts, say contacts 80 and 84, prior to closure of the other pair, will cause a reaction force to be exerted against the member 40, thereby rotating the member clockwise (Fig. 4) about rivet 94. This increases the force applied to the movable arm 78, thereby displacing the contact 86 towards contact 82. Such action continues until the latter two contacts are also in engagement. At this point, further leftward forces exerted by the toggle member 40 serve to increase the contact pressures in both poles of the switch, and by substantially equal amounts.

The leftward movement of the end 34a of angle piece 34 continues after closure of the switch contacts, thereby increasing the contact forces and also providing the aforementioned wiping action. As best seen in Fig. 3, such continued movement of end 34a and toggle member 40 will bow the movable contact arms 76 and 78 as seen in the dotted line positions of the various parts. Such bowing draws the movable contacts 84 and 86 to the left (Fig. 3) and thereby wipes them over the fixed contacts. The cantilever spring arms 76 and 78 thus serve a threefold function in that they (1) cause disengagement of the switch when the switch operating forces exerted by rotation of lever 28 are removed, (2) permit increased contact pressure through continued movement of the toggle member after contact closure, and (3) provide the highly desirable wiping action caused by bowing of the arms 76 and 78 upon such further movement of member 40.

The location of the point of contact between the member 40 and the contact arms 76 and 78 depends on several factors, viz. the maximum reaction force to be transmitted back through member 40 to lever 28, the amount of travel of the member 40 and thus the degree of rotation of lever 28 required to close the switch, and the degree of bowing required for a desirable amount of contact wiping. In this connection, it should be noted that, as the end 34a of angle piece 34 approaches the end of its travel after switch closure, its motion is largely upward (Figs. 1 and 4) lengthwise of the slot 92. Thus, there is wedging type action which increases further the mechanical advantage of the lever 28 in moving the toggle member 40 to the left. This increase in mechanical advantage is desirable because of the increased forces encountered by the toggle member in bowing the contact arms 76 and 78.

The toggle member 40, the insulating plates 64 and 66, and the block 68 should be of a material which retains its electrical insulating characteristics as well as its physical stability at the relatively high temperatures to be found inside a toaster or other like appliances. Continuous glass filaments impregnated with any available suitable plastic material may be used for this application.

The member 40 is preferably provided with a guide tip 96 extending between the movable contact members and resting in a notch 78a in the arm 78 (Fig. 2). The guide tip prevents disorientation of the toggle member when the latter is retracted to disengage the switch contacts. The toggle member 40 provides completely "fail-safe" operation inasmuch as failure of this member will cause the spring-like movable contact arms 76 and 78 to move away from the fixed arm and thereby open the switch.

Returning to Fig. 1, the locking mechanism 58 incorporates a lever 98 pivoted at 100 on the column 18. A spring 102 urges lever 98 in the counterclockwise direction against a stop 104 on column 18. When the handle bracket 36 is depressed to close the contacts in assembly 26 and swing the latching arm 46 downwardly into the

dotted line position (Fig. 1), a camming surface 46a on the latching arm engages a detent 106 and forces clockwise rotation of the lever 98. As the arm 46 passes the detent 106, the spring 102 moves lever 98 back into position thereby preventing leftward movement of the arm 46 and maintaining engagement of the switch contacts. Depression of a projection 98a on lever 98 will disengage the detent 106 from the latching arm 46 to permit opening of the switch in the manner described above. The force required to operate lever 98 is minimal and may be supplied by a conventional timer, temperature responsive element or other device that is used to time the toasting period of the heating elements.

Thus, I have described an improved double pole switch mechanism adapted for use in a toaster or like appliance. The switch makes use of a pivotally mounted toggle member to move a pair of movable contacts into engagement with fixed contacts, and rotation of the toggle member about its pivot ensures equal contact forces on both poles of the switch. My novel design also provides an efficient contact wiping action through bowing of the cantilever spring arms carrying the movable contacts, the bowing action being provided by continued movement of the toggle member after closure of the switch contacts. The toggle member is moved by rotation of an operating lever which lends a considerable mechanical advantage to the switch closure system, and a further advantage is provided, as pointed out above, by the camming action of the lever against the toggle member during the latter stages of its travel. The switch assembly has a long operating life, is easily fabricated by mass production techniques and is readily incorporated into conventional toaster operating mechanisms.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims

are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An improved double pole switch mechanism comprising in combination a pair of fixed contacts, a pair of movable contacts, a pair of cantilever spring contact supports each of which has a fixed end and a free end, means mounting said movable contacts on said free ends of said supports opposite said fixed contacts, a toggle member and an operating lever, a cooperating first pivot and slot arrangement mounting said toggle member on said lever, said pivot oriented lengthwise of said contact supports and said slot extending perpendicular to the direction of travel of said movable contacts, and a second pivot adapted for rotation of said operating lever thereabout, whereby initial rotation of said lever about said second pivot forces said toggle member against said contact supports to bend them and bring said movable contacts into engagement with said fixed contacts, rotation of said toggle member about said first pivot providing substantial equalization of contact pressures, said toggle member engaging said contact supports between said fixed ends and said movable contacts, whereby further rotation of said lever causes said toggle member to bow said supports and wipe said movable contacts over said fixed contacts.

2. The combination defined in claim 1 in which the portion of said lever secured to said toggle member moves substantially in the direction of said contact motion during said initial rotation of said lever and substantially perpendicular to said direction during said further rotation.

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