Jan. 3, 1956 C. D. VISOS 2,729,717

SWITCH CONSTRUCTION

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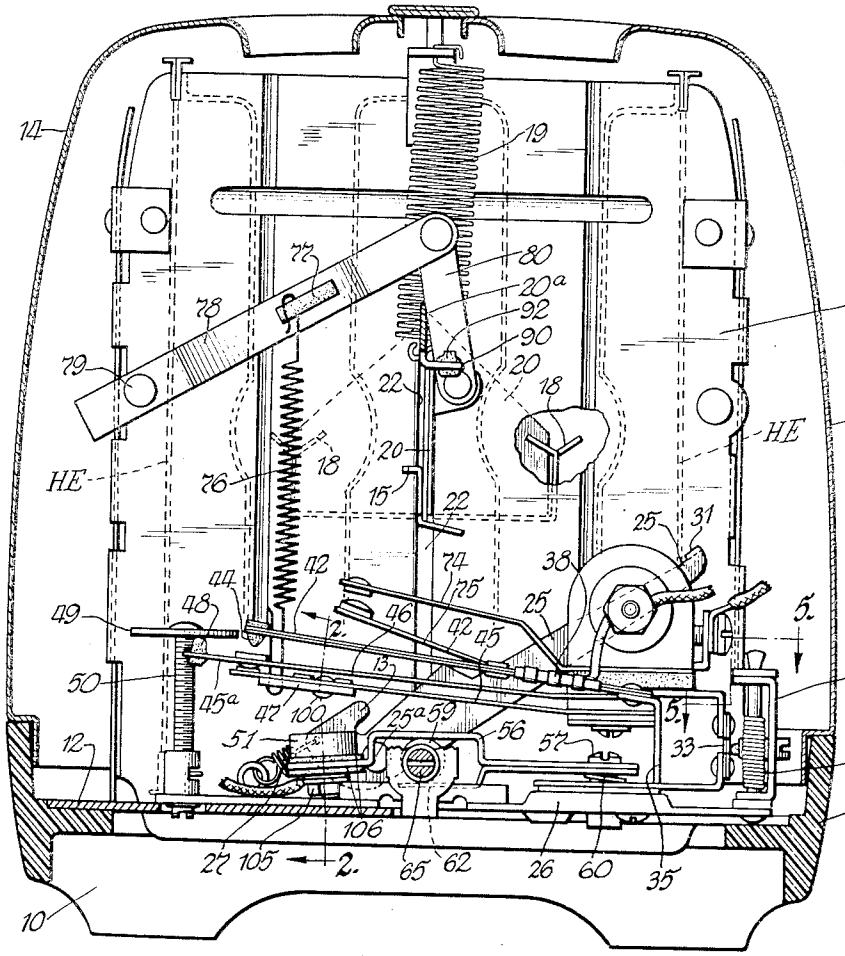


Fig. 1

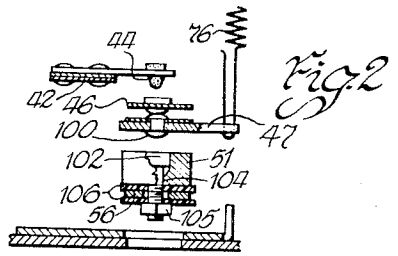


Fig. 2

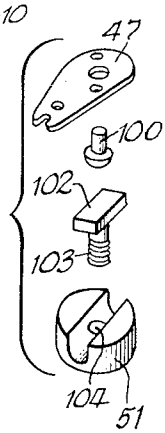


Fig. 3

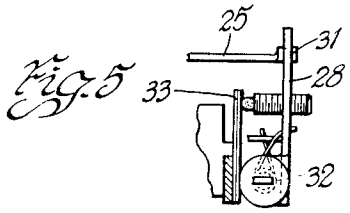


Fig. 5

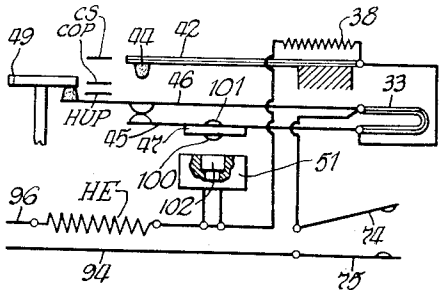


Fig. 4

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SWITCH CONSTRUCTION

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3 Claims. (Cl. 200—122)

This invention relates to a switch construction and particularly one for use in connection with a toaster of the type shown in the copending application of Huck and Visos, Serial No. 54,142, filed October 10, 1948, now Patent No. 2,614,481, granted October 21, 1952.

The main object of the invention is to provide an improved magnet armature and contact construction for a switch of the general character shown therein.

More specifically, it is my object to provide switch contacts associated with a magnet and armature for securing snap action during the engagement and disengagement of circuit controlling contacts wherein the magnet and armature constitute contacts which are engaged and separated to perform control functions.

One of the difficulties experienced in the manufacture of toasters of the kind shown in the above mentioned patent is that during manufacture small slivers of steel and other magnetic particles are attracted to the magnet and in some instances cause failure of a control circuit to be established as it should as a result of the magnet and armature engaging each other, or arcing sometimes occurs through the foreign material which burns the magnet and armature and results in failure or at least reduction of current in the circuit. Where the contacts are provided to shunt out a bimetal heater they thereupon fail to do so and the control of the toaster expected to produce a certain color of toast is thereby upset or fails to completely function in which case the bread will be burned unless the toaster is turned off manually.

In order to eliminate the difficulties mentioned, my present invention contemplates the use of a contact between the poles of the magnet to cooperate with a contact carried by the armature, the contacts spacing the armature from the magnet in the closed position of the contacts, such space accommodating any small slivers of steel or other magnetic particles that might get between them.

A further object is to provide an assembly of this character that may be accurately controlled at the factory to provide a gap of predetermined dimensions by the use of a contact on the armature having a given head thickness and a contact between the poles of the magnet which may be, after installed and tightened in position, ground down to be substantially level with the face of the magnet so that when these operations are performed there will be assurance that the gap between the magnet and the armature will be properly maintained in the final assembly of the switch construction.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my switch construction, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical sectional view through a control switch compartment of a toaster such as shown in Figure 2 of the above mentioned patent.

Figure 2 is an enlarged vertical sectional view on the line 2—2 of Figure 1 to show the relationship of parts.

Figure 3 is an exploded perspective view of the magnet, armature and contacts.

Figure 4 is a wiring diagram of the control switch comparable to that shown in the patent; and

Figure 5 is a plan view of a bimetal latch with one part of the view in section on the line 5—5 of Figure 1.

On the accompanying drawing I have used the same reference numerals as shown in the patent wherein reference numeral **10** indicates a toaster base frame. A cover plate **12** is provided for the base and a housing for the toaster is shown at **14**. The toaster may include suitable framework including two end plates **16** (only one of which is shown) and heating elements which are shown diagrammatically at HE in Figure 4 and indicated by dotted lines in Figure 1.

The usual bread carrier comprising bread supporting bars **18** between the end plates **16** is illustrated and they are connected together by brackets **20** which have parts **20***a* vertically slidable in slots **22** of the end plates **16**. The bread carrier may be depressed against the action of a coil spring **19** which normally raises it. One of the brackets **20** is provided with a lug **15** with which a locking lug **13** of a bread carrier latch lever **25** is adapted to coact for the purpose of holding the bread carrier in the lowered or toasting position. The latch lever **25** is pivoted at **25***a* to a switch base plate **26** and is normally held in the position illustrated in Figure 1 by a spring **27**.

The latch lever **25** is adapted to be latched in position by a latch blade **28** for which a latch release element **33** is provided in the form of a U-shaped bimetal element adapted to warp when heated and release the latch blade as shown in the patent above mentioned. The mechanism for energizing the latch release bimetal **33** will now be described. A thermal element heater is provided consisting of a resistance ribbon **38** of Nichrome or the like wound on a thermally responsive element **42** in the form of a strip of bimetal anchored at one end to a bracket **35**. The opposite end of the bimetal is provided with a contact **44**.

Contact springs **45** and **46** are provided with suitable contacts and are normally engaged with each other and spaced from the contact **44** as shown in Figures 1 and 4. The contact springs **45** and **46** are anchored at their right-hand ends as illustrated and the spring **45** has an armature **47** secured thereto. The spring **46** has an extension **45***a* beyond its contact provided with an insulating button **48** which is normally engaged against a flange **49** of a cool-down adjusting screw **50**.

In the patent above referred to, the iron armature **47** and the two-pole permanent magnet **51** constitute contacts in a control circuit. The particular improvement in the present disclosure consists of providing contacts **100** and **102** (preferably silver) wherein the contact **100** has a head of predetermined thickness extending beyond the lower face of the armature **47**, the contact being extended through an opening in the armature and the switch blade **45** and riveted as at **101** (Figure 4) in the usual manner. The contact **102** is a substantially rectangular shape as shown in Figure 3 and has a shank **103** to be extended through an opening **104** in the magnet **51** and provided with a terminal nut **105** as shown in Figure 1, suitable insulation washers **106** being provided to prevent electrical contact between the elements **51**, **102** and **103** and a bracket **55** on which the magnet **51** is mounted.

The free end of the bimetal element **42** deflects downwardly upon an increase of heat, such heat being radiated from the heater **38**. The deflection is from a cool start position shown at CS in Figure 4 and the bimetal passes through a cool-off point position COP with its termination of movement at a heat-up point position HUP. At the cool-off point the contact **44** engages the contact spring **46**. Adjacent the heat-up point, the bimetal element **42**

brings the armature 47 into close enough proximity to the magnet 51 that the magnet causes the contact of the spring 45 to leave the contact of the spring 46 and engage the contact 100 with the contact 102. The various contacts enumerated are in electrical circuits which will be described later.

The bracket 56 is pivoted at the right hand end in Figure 1 by a loose mounting thereof on a screw 57, play being taken up by a spring 60. This pivotal mounting permits the bracket 56 to pivot against an eccentric 59, the bracket being held in contact with the eccentric by a leaf spring 62. The eccentric 59 is secured to an adjusting shaft 65 which may be provided with a control knob for toast color in the usual manner such as shown in the Huck and Visos patent referred to.

The toaster heating elements HE are controlled as to energization by a main switch consisting of contact springs 74 and 75 which are normally disengaged due to their resiliency and the bracket 20 of the bread carrier is adapted to engage the spring 74 for closing the switch when the bread carrier is depressed. These contacts then remain closed while the bread carrier remains lowered for toasting the bread. The various elements of my switch construction are connected in electric circuits as shown diagrammatically in Figure 4.

Means is provided for separating the armature 47 from the magnet 51 when the bread carrier rises and comprises a light spring 76 extending to an insulator 77 carried by an equalizing lever 78 pivoted at 79 and connected by links 80 to the brackets 20.

Practical operation

In the operation of the toaster illustrated and my switch construction, the bread carriers 18 are depressed after being loaded with slices of bread. As the bracket 20 approaches the lower limit of its movement, the lug 15 thereon will engage the inclined upper edge of the latch lever 25 in Figure 1 and will swing the lever down for latching its cam end 31 under the latch blade 28. During the swinging of the latch lever, the lug 13 thereon swings to a position over the lug 15 so that the bread carrier is thereby retained in the lowered position during toasting as shown in the above mentioned patent.

The bracket 20 has an extension 90 which carries a ceramic insert 92. This insert engages the upper main switch blade 74 causing it to be lowered to engagement with the lower main switch blade 75 for establishing a circuit from a supply wire 94 in Figure 4 through the elements 75, 74, 46, 45, 38, and HE to a second supply wire 96. Thus the heating element HE of the toaster and the thermal heater 38 are in an established circuit and are the only elements of the control switch therein as the bimetal 33 for the latch 28 is shunted out of the circuit by the contacts on the switch blades 45 and 46.

As the heating element HE radiates heat to the bread slices for toasting them, the thermal heater 38 heats the control bimetal 42 to cause it to warp from the cold start position CS toward the heat-up point HUP. After a control period during such warping, the bimetal element 42 reaches the cool-off point COP which causes the contact 44 to close against the contact of the blade 46 without in any way affecting the circuit. The bimetal 42 accordingly warps farther and finally reaches the heat-up point HUP at which time the armature 47 on the blade 45 is sufficiently within the field of the permanent magnet 51 to result in the magnet attracting the armature. This results in the contact 100 engaging the contact 102 which shunts the thermal heater 38 out of the circuit so that it commences to cool off. The cooling action, of course, removes the source of heat that warped the bimetal element 42 downwardly and accordingly it commences to warp upwardly as it cools but the armature 47 remains adjacent the magnet 51 and the contact 100 remains engaged with the contact 102.

When the ceramic insert 48 engages the flange 49 of the adjusting screw 50 further upward warping of the bimetal element 42 will separate the contact 44 from the contact of the spring 46. This particular position, prior to such separation, leaves the armature 47 still adjacent the magnet 51 and the separation of the contact 44 from the switch blade 46 results in energization of the bimetal element 33 because 45 and 46 are separated from each other due to the fact that the contact 100 is still in engagement with the contact 102. The blades 45 and 46 shunt the bimetal 33 but it can also be said the contact 44 and the blade 46 shunt this bimetal element which later condition is a result of the contact 100 remaining in contact with 102. It is therefore obvious that separation of 44 from 46 will result in energization of 33. Within a few seconds unlatching of the blade 28 from the cam 31 of the latch lever 25 occurs by reason of 33 warping toward the right in Figure 4 against the bias of the spring 32. The spring 19 then raises the lever 25 through 15 engaged with 13 and swings the lug 13 off the lug 15 to permit the bread carrier to rise and in rising the ceramic insert 92 disengages from the main switch blade 74 so that its contact is separated from the contact of the blade 75 thereby entirely cutting off the circuit to the toaster and all parts of the control mechanism.

I have herein disclosed an improvement over the Huck and Visos patent consisting of the addition of the contacts 100 and 102 to overcome certain difficulties that were experienced when the armature and magnet were silver plated and used as contacts. During manufacture, small slivers of steel and other magnetic particles attracted to the magnet would cause minute separation between the magnet and the armature when they were attracted and this resulted in arcing through the magnetic foreign material, a condition which would be accompanied by failure of the magnet and armature to properly shunt out the thermal heater 38. Since the bimetal 42 acts on the heat-up cool-off temperature principle, the bimetal would not properly terminate its heat-up portion of the cycle and as a result the length of the toasting cycle would be extended sufficiently to cause burnt toast.

I found that the problem could be solved by adding separately mounted contacts such as shown at 100 and 102 and in order to properly calibrate the exact spacing between the armature and magnet when they were adjacent each other, one of the contacts was mounted between the poles of the magnet and the other located on the armature so as to engage the first contact at the center of the magnet. By grinding any excess height off the contact 102 to make its upper face substantially flush with the ends of the magnet, the thickness of the head of the contact 100 could be used as a means for predetermining the spacing. In actual practice, the desirable spacing between armature and magnet is .012" to .016" and therefore the thickness of the contact 100 is kept within these limits. By placing the axis of contact between the poles of the magnet, slight variations in angle of armature relative to magnet is equalized so that as distinguished from placing the contacts at one side of the magnet, accurate control of the spacing is maintained.

Some changes may be made in the construction and arrangement of the parts of my switch construction without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In a toaster control switch, a thermal element having an electric heater therefor, a pair of switch blades, support means for supporting said thermal element and switch blades in spaced relation, stop means for predetermining the initial position of said switch blades, a release mechanism including a bimetal element to actuate the same, electrical circuit means having a current supply, said bimetal element being shunted by said switch blades,

said thermal element when heated by said heater moving to engage said switch blades and move them in one direction, a magnet supported on said support means, one of said switch blades being movable toward said magnet when the blades are moved in said one direction, an armature carried by one of said switch blades and having a face adapted to be attracted by said magnet, a contact carried by said armature and having only the thickness of its head projecting from said face, a second contact between the poles of said magnet and adapted to be engaged by said first contact when said armature face is thus attracted, said second contact being substantially flush with the pole faces of said magnet.

2. In a toaster control switch construction, frame means supporting a pair of switch blades each having an electrical contact, stop means supported on said frame for predetermining an initial closed contact position of said switch blades, a release mechanism including a bimetal element to actuate the same, electrical circuit means operative to energize said bimetal, said switch blade contacts being connected in said circuit and being operative to shunt the bimetal element of said release mechanism when said switch blades are in closed contact position, a two-pole magnet supported on said frame and positioned adjacent one of said switch blades and having an electrical contact mounted between the poles thereof, said magnet contact being connected in said circuit, an armature carried by said one of said switch blades and having a contact mounted thereon, a second bimetal element connected in said circuit and operating when heated to engage said switch blades and move them away from said stop means toward said magnet wherein said armature contact and said magnet contact are engaged and said switch blade contacts are disengaged, said contact between the poles of said magnet being substantially flush with the pole faces thereof whereby the thickness of said armature mounted contact predetermines the spacing between said magnet and said armature when said magnet and armature contacts are engaged, a heater for said second bimetal element connected in said circuit and energized thereby, said magnet and armature contacts being operative to shunt said heater and de-energize the same when said contacts are closed, thereby permitting said second bimetal element to cool and separate from said switch blades when they return to said initial closed position.

3. In a toaster control switch, a thermal element having an electric heater therefor, a pair of switch blades, support means for supporting said thermal element and switch blades in spaced relation, stop means for predetermining the initial position of said switch blades, a release mechanism including a bimetal element to actuate the same, electrical circuit means having a current supply, said bimetal element being shunted by said switch blades, said thermal element when heated by said heater moving to engage said switch blades and move them in one direction, a magnet supported on said support means, one of said switch blades being movable toward said magnet when the blades are moved in said one direction, an armature carried by one of said switch blades and having a face adapted to be attracted by said magnet, a contact carried by said armature and having a head projecting from said armature face, a second contact between the poles of said magnet having a contact face substantially flush with said faces of the poles to provide a gap between the magnet and the armature when said contacts are engaged, the spacing of which is predetermined by the thickness of said head.

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