

This invention relates to a switch device for an appliance for personal use, comprising an appliance switch for activating and deactivating a driving member capable of being electrically operated in a housing of the appliance, as well as a locking switch movable into the actuation path of the appliance switch.

An automatic safety device guarding against accidental operation of rechargeable electric shavers and toothbrushes is already known, comprising a tappet which is carried in the housing and movable against the action of a spring and whose inner end is displaceable into the actuation path of an On/Off switching member which is in the Off position. In this arrangement, the direction of displacement of the tappet is transverse to the direction of displacement of the On/Off switch so that a relatively large amount of space is required for the safety device (DE-A-33 15 643).

From DE-A-33 09 221 a dry shaving apparatus is known having an On/Off switch arranged on a printed circuit board and configured as push switch, and a locking switch slidable in a direction transverse to the actuating direction of the On/Off switch for locking or unlocking the On/Off switch.

From US-A-45 63 553 it is known to associate a two-position stepping switch of an electronic appliance with a stop switch movable transversely to the direction of movement of the stepping switch, in order to prevent the stepping switch from being switched through into a second switching position.

By contrast, it is an object of the present invention to provide a switch device of the type identified in the prior art referred to above, in which an appliance switch, when in the Off position, is reliably guarded against being brought into an On position. It is a further object herein to provide a switch device which is easy to manipulate, can be accommodated in a minimum amount of space, and requires a minimum number of components.

These requirements are satisfied in a switch device of the type initially referred to in that the locking switch and the appliance switch are each movable in a straight-line motion in the same direction when turned on or off, that the appliance switch and/or the locking switch include positive and/or frictional engagement means which are displaceable into one another or

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interengageable for securing the appliance switch by means of the locking switch in the Off position, and that both the appliance switch and the locking switch are mounted on a backing member of the appliance housing. This results in a very space-saving configuration of the switch device and a minimum overall height. The use of interengageable positive and frictional engagement means provided on the appliance switch and on the locking switch affords a simple method of wedging the appliance switch relative to the locking switch in the Off position of the appliance switch, thereby safely locking an appliance switch in the Off position so it cannot be actuated in any way, in particular not by accident.

The present invention admits of a variety of embodiments which afford the common advantage that all positive and/or frictional engagement means, in being suitably matched relative to one another, are formed on or molded into three structural elements of the appliance which are operatively associated with one another, these elements being the stationary partition wall of the housing or housing wall, the appliance switch, and the locking switch.

Preferably, the appliance switch includes at least one positive engagement means which is maintained in predetermined switch positions by means of at least one locking member provided on the backing member. For locking purposes, the locking switch includes latch members displaceable into notches provided on the backing member. In an embodiment of the present invention, the positive engagement means of the appliance switch is an L-shaped resilient latch member having a knob formed on its leg. In a further embodiment of the present invention, the positive engagement means of the appliance switch is a U-shaped latch member having a knob formed on each of its elastic legs. In an embodiment of the present invention, the positive engagement means of the appliance switch is a bolt formed on the appliance switch. In an embodiment of the present invention, the locking member is formed of a web member situated between two oblong openings provided in the backing member. In an embodiment of the present invention, the locking member is a bolt formed on the backing member. In an embodiment of the present invention, the locking member is a U-shaped latch member formed on the partition wall, with a knob being formed on each of its resilient legs. To prevent the positive engagement means of the appliance switch from sliding out of predetermined notches, the locking switch includes at least one frictional engagement means which is displaceable into the displacement path of the resilient positive engagement means of the appliance switch.

In another embodiment, the effect identified in the foregoing is accomplished in that the locking switch includes at least one frictional engagement means displaceable into the displacement path of the resilient legs of the locking member of the partition wall. The frictional engagement means is preferably an L-shaped latch member which, in the Off position of the appliance switch, is adapted to be slipped onto its positive engagement means. In a further embodiment, the frictional engagement means is a U-shaped latch member the legs of which are adapted to be slipped onto the legs of the positive engagement means of the appliance switch in the Off position of the appliance switch. In a still further embodiment, the frictional engagement means is a U-shaped latch member whose bar connecting the legs is slidable between the legs of the positive engagement means. The knobs provided on the latch members of the appliance switch and of the locking switch provide simple constructional means for accomplishing an operating sequence of both switches, including a latching function, in that for the knobs of both switches the notches are formed in at least one of the longitudinal sides of the backing member by means of projections formed thereon.

Further advantages and details of the present invention will become apparent from the subsequent description and the drawings illustrating some preferred embodiments. In the drawings,

FIG. 1 is an exploded perspective view of the individual parts of a switch device from above;

FIG. 2 is an exploded perspective view of the switch device of FIG. 1 from below;

FIG. 3a is a section through the switch device of FIGS. 1 and 2;

FIG. 3b is a section through the switch device of FIGS. 1 and 2, with an appliance switch shown in the Off position and a locking switch locking the appliance switch in place;

FIG. 3c is a section through the switch device of FIGS. 1 and 2, with an appliance switch shown in the On position and released by the locking switch;

FIG. 4a is a section through a switch device with U-shaped latch members formed on both the appliance switch and the locking switch;

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FIG. 4b is another section through the switch device of FIG. 4a;

FIG. 5a is a section through an appliance switch illustrating another embodiment thereof;

FIG. 5b is a top plan view, in section, of the switch of FIG. 5a, with the locking switch including knobbed legs in parallel arrangement which embrace a bolt in the Off position of the appliance switch;

FIG. 5c is a section through the switch of FIG. 5a and FIG. 5b in operating position;

FIG. 5d is a section showing details of the latching device of the locking switch;

FIG. 6a is a section through a switch device with U-shaped latch members, illustrating a further embodiment; and

FIG. 6b is a top plan view, in section, of the appliance switch of FIG. 6a.

Referring now to FIGS. 1 and 2, there are shown in perspective the individual parts of an embodiment of a switch device 10 for an appliance for personal use, for example, for an electric shaver or a toothbrush. In the subsequent FIGS. 3a to 3c, this embodiment is shown in section in assembled condition and will be explained in more detail in the following with reference to these figures.

The switch device 10 comprises an appliance switch 12 and a locking switch 14 which are slidably received in a backing member 16. The backing member 16 is part of a housing, not shown in the drawings, in which a driving member adapted to be operated electrically for operating the appliance is provided. The backing member 16 is comprised of a rectangular recess or cutout 24 provided in the housing wall of the appliance and serving to receive the appliance switch 12 and the locking switch 14, including a forward limit stop member 18 and a rearward limit stop member 20.

On the axis of symmetry of the backing member 16 is a rectangular opening 26 which serves to receive an L-shaped latch member 28 whose leg 32 extending parallel to the underside 30 of the backing member 16 has at its end a knob 34 abutting against a web member 36 of the backing member 16 in the operating position of the appliance switch 12. The web member 36 bounds the left-hand end of

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the opening 26 and the right-hand end of an oblong opening 38 serving to receive the knob 34 when the appliance switch 12 is shifted to the left as shown in FIG. 3c. In this position, the knob 34 provided on the leg 32 of the latch member 28 is engaged within the oblong opening 38. The L-shaped latch member 44 is formed on the locking switch 14 and extends through the oblong opening 38 bounded by the web member 36. Extending parallel to the oblong opening 38 are two further oblong openings 40 which are somewhat shorter than the oblong opening 38. The oblong openings 40 serve to receive two equally L-shaped latch members 46 having knobs 48 at their respective ends. Advantageously, the latch members 28 and 46 are resilient so that they bend slightly upwardly as they glide along the underside 30 of the backing member 16, until the knobs 34 and 48 lock into corresponding recesses.

To enable the latch member 44 of the locking switch 14 to be slipped onto the latch member 28 of the appliance switch 12 when the appliance switch 12 is in the Off position as shown in FIG. 3b, the appliance switch 12 is provided with a cutout 50 for sliding engagement by the forward end portion 52 of the locking switch 14 until the end 66 of the locking switch 14 is in abutment with the end 54 of the appliance switch 12.

The latch member 28 of the appliance switch 12 has on either side thereof small hooks 56 which abut the underside 30 of the backing member 16 and are formed fast with the appliance switch 12. The hooks 56 extend likewise through the opening 26, thus securing the latch member 28 against slipping out of the opening 26. When it is desired to remove the appliance switch 12 with its latch member 28 from the opening 26, only the two opposed hook members 56 have to be slightly compressed, whereby the upper part of the hook member becomes disengaged from the underside 30 of the backing member 16. The appliance switch 12 is then readily removable from the opening 26. To secure the locking switch 14, the locking switch 14 equally includes two hooks 58 which, according to FIGS. 3a to 3c, secure the locking switch 14 to the backing member 16 while permitting an adjustment of the locking switch 14. With their knobs 48, the two parallel latch members 46 of the locking switch 14 lockingly engage into recesses or cutouts 60 when the locking switch has been shifted all the way to the right as shown in FIG. 3b.

In FIG. 3b, the appliance switch 12 is in its Off position and is secured against unintentional operation by means of the locking switch 14. In FIG. 3a, the locking switch 14 and the appliance switch 12 are in a mid-

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position in which the knobs 48 of the legs 46 of the locking switch 14 as well as the knob 34 of the leg 32 of the appliance switch resiliently engage the web member 36. For example, when the appliance switch 12 is shifted all the way to the right to an Off position as shown in FIG. 3b, the appliance switch 12 rests with its grip member against an edge 62 of the limit stop member 20 of the backing member 16, whereby further movement of the appliance switch 12 to the right is prevented. At the same time, the knob 34 is moved behind the web member 36, lockingly engaging into the opening 26 due to the resilient property of the latch member 28. This then enables the locking switch 14 to be shifted to the right, in which process the L-shaped latch member 44 glides over the L-shaped latch member 28, thus preventing the knob 34 from disengaging from the opening 26. This reliably prevents the appliance switch 12 from being moved from its Off position to the left into an operating position, because the knob 34, locked by the L-shaped latch member 44 of the locking switch 14, is only allowed to abut the edge 70 of the web member 36. In addition, slipping the latch member 44 on the latch member 28 causes the two latch members to become frictionally engaged, this being due to the friction occurring between the underside of the latch member 44 and the surface of the latch member 28. Further, the latch member 44 may be provided with a knob, not shown in the drawings, for locking engagement with recesses provided on the surface of the latch member 28. This produces an additional clamping or wedging effect between the latch member 44 and the latch member 28. Upon having assumed the position shown in FIG. 3b, the appliance switch 12 and the locking switch 14 are thus secured by positive engagement means and frictional engagement means. Because the appliance switch 12 and the locking switch 14 can be displaced and interengaged in a common plane, the overall height of construction of the switch device 10 is significantly reduced compared to conventional switch devices. Further, with the locking switch 14 assuming the position shown in FIG. 3b, the knobs 48 of the latch members 46 lock into the cutouts 60 of the backing member 16. This provides for positive engagement between the locking switch 14 and the backing member 16. When it is desired to shift the appliance switch 12 into an operating position again, first the locking switch 14 has to be shifted all the way to the left until it abuts the limit stop member 18, in which process the knobs 48 are disengaged from the cutouts 60 and moved into the oblong openings 40 via the web member 36. At the same time, the L-shaped latch member 44 releases the latch member 28 of the appliance switch 12. If the appliance switch 12 is then shifted to the left, the knob 34 will glide along the underside 30 of the

backing member 16 via the web member 36 into the oblong opening 38 until the end 54 of the appliance switch 12 abuts an end 66 of the locking switch 14. Due to the absence of a locking action by the L-shaped latch member 44, the appliance switch 12 can be returned from this operating position shown in FIG. 3c to the right into the Off position and then moved into the On position again at any time.

In FIG. 3b, the appliance switch 12 is shown in its Off position in which the knob 34 abuts an edge 70 of the web member 36 bounding the opening 26. In this position, the contact element 72 provided between the walls 61 is spaced from a further contact element 74 provided in the housing of the appliance, so that the circuit of the electric drive of the appliance is open. To secure the latch member 28 in position, an L-shaped latch member 44 is slipped over the forward end of the latch member 28, thus preventing the knob 34 from moving via the edge 70 and the web member 36 on the underside 30 of the backing member 16 or the housing. The latch member 44 thus prevents shifting of the appliance switch 12 into an operating position.

To shift the appliance switch 12 into an operating position as illustrated in FIG. 3c, only the locking switch 14 has to be moved to the left, thus enabling the knob 34 to be moved via the edge 70 of the web member 36 into the oblong opening 38 serving to receive the positive engagement means 28 of the appliance switch 14. In the process, the knob 34 resiliently engages into the oblong opening 38 via the web member 36 due to the resilience of the latch member 28. In this operating position, the electrical contact element 72 picked up by the appliance switch 12 engages the contact element 74, thereby closing the electric circuit, setting the electric drive of the appliance in operation.

In the further embodiments illustrated in FIGS. 4a to 6b, locking switch and appliance switch are equipped with U-shaped latch members which, being interengageable, serve to secure the appliance switch.

As becomes apparent from FIGS. 4a and 4b, the appliance switch 12 is likewise slidably received in a backing member 16 or a housing and equipped with a U-shaped latch member 80 comprising two parallel resilient legs 82 and 84 having knobs 34 at their respective ends. When the appliance switch 12 is moved from an operating position into its Off position as shown in FIG. 4b, the two knobs 34 are moved past a bolt 37 provided on the backing member 16 until they abut the rear side of the

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bolt. To prevent the appliance switch 12 from being shifted further, the locking switch 14 is slipped with its U-shaped cutout 88 onto the legs 82 and 84 of the latch member 80, with the legs 83 and 85 providing a clamping effect on the legs 82 and 84. On a movement of the appliance switch 12 to the left, the two legs 82 and 84 can no longer be spread apart, so that an adjustment of the appliance switch 12 is prevented due to the legs 82 and 84 resting against the fixed bolt 37. An adjustment of the appliance switch 12 is not possible until after the locking switch 14 has been moved to the left, then enabling the knobs 34 to be moved past the bolt 37 again.

In the embodiment of FIGS. 5a and 5d, the partition wall 16 includes an opening 87 extending through the partition wall, as well as a recess 24 limiting the displacement travel of the appliance switch 12 and the locking switch 14. Within the opening 87, the partition wall 16 has formed thereon a U-shaped latch member 79 comprising two resilient legs 82 and 84 having knobs 35 at their respective ends. With the appliance switch 12 in the Off position as shown in FIGS. 5a and 5b, the legs 82 and 84 embrace with their knobs 35 the bolt 86 which is integrally formed with the appliance switch 12. The locking switch 14 is provided with a U-shaped latch member 81 extending into the opening 87, its legs 83 and 85 embracing the legs 82 and 84 to prevent straddling of the legs 82 and 84 which may be caused by the bolt 86 displaceable with the appliance switch 12. Transversely to the sliding direction of the locking switch 14, two locking means 90 and 92 are provided on the locking switch 14 which, in dependence on the switch position of the locking switch 14, engage into locking grooves 94, 96 or 97, 98 provided in the side walls 100 and 102 of the opening 87. The locking means 90 and 92 are preferably formed on two resilient hooks 58 which, for ease of assembly and holding of the locking switch 14 in the opening 87 of the partition wall 16 - as shown in FIG. 5d -, are provided on the locking switch 14 in a manner partly engaging the underside of the partition wall 16, with the locking means 90, 92 being dimensioned such that, by utilizing the resilient properties of the hooks 58, a displacement of the locking switch 14 can be performed while at the same time the locking switch 14 continues to be held by means of the hooks 58.

As shown in FIGS. 5a to 5c, resilient hooks 56 are also formed on the appliance switch 12 in the area of the side walls 100, 102 of the partition wall 16, the hooks partly engaging the underside of the partition wall 16 to guide and hold the appliance switch 12.

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In the representations of FIGS. 5a and 5b, the appliance switch 12 is in its Off position in which it is secured against inadvertent sliding movements by means of the locking switch 14. The locking means 90 and 92 of the locking switch are in engagement with corresponding locking grooves 94 and 96. The legs 83 and 85 of the U-shaped latch member of the locking switch 14 embrace the resilient legs 82 and 84 of the U-shaped latch member 79, thereby preventing straddling of these legs 82 and 84 which is necessary for a release or displacement of the appliance switch 12 whose bolt 86 situated between the legs 82 and 84 is secured against displacement by the legs 82 and 84 and the knobs 35 formed thereon.

Shifting the locking switch 14 to the left into the locking position shown in FIG. 5c in which the locking means 90 and 92 are in engagement with the locking grooves 97 and 98 releases the locking action of the legs 83 and 85 on the legs 82 and 84. This then enables the appliance switch 12 to be also moved to the left into an operating position, with the bolt 86 acting on the knobs 35 and causing straddling of the legs 82 and 84 while use is made of the resilient properties of these legs, the bolt 86 thus slipping through between the knobs 35 to assume the position shown in FIG. 5c which corresponds to the operating position of the appliance switch 12, in which position the electric circuit of an electric drive is closed by a contact element provided on the appliance switch 12 yet not shown in FIGS. 5a to 5c.

Through the bolt 86, the appliance switch 12 is held in both the operating position and the Off position by the resilient legs 82, 84 and the knobs 35 formed thereon, and it is movable from one switch position into the other switch position by utilizing the resilient properties of the legs 82, 84. In the Off position, the appliance switch 12 can be secured against any sliding motion acting on the appliance switch 12 by means of slipping the legs 83 and 85 of the U-shaped latch member 81 of the locking switch 14 onto the legs 82 and 84 of the partition wall 16.

In the embodiment of FIGS. 6a and 6b, the partition wall 16 includes a recess 24 receiving the appliance switch 12 and the locking switch 14 in a slidable relationship thereto. The appliance switch 12 is slidably mounted by means of four hooks 56 which extend through corresponding oblong openings 104 provided in the partition wall 16 and engage the partition wall 16 from below. To slidably mount the locking switch 14 on the partition wall 16, two further oblong openings 106 are

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provided in the partition wall 16 through which corresponding hooks 58 formed on the locking switch 14 extend and engage the partition wall 16 from below.

On the appliance switch 12, a U-shaped latch member 80 is provided whose resilient legs 82 and 84 with the knobs 34 formed thereon rest against the two longitudinal side walls 108 and 110 of the recess 24. The locking switch 14 is comprised of a U-shaped member 81 which is engageable between the legs 82 and 84 and has resilient legs 83 and 85 provided with knobs 35 resting against the longitudinal side walls 108 and 110, and of an actuation member 114 arranged to extend through an opening 112 provided in the appliance switch 12, with the opening 112 being fashioned such as to ensure an unhindered displacement of the locking switch 14 via the actuation member 114.

Formed in the longitudinal side walls 108 and 110 by means of projections 115, 116, 118 are notches 121, 122, 119 and 120 in which the knobs 34, 35 of the legs 82, 84, 83 and 85 extending in the same direction engage in order to maintain both the appliance switch 12 and the locking switch 14 in switch positions determined by the respective notch.

In FIG. 6b, the appliance switch 12 is in its Off position in which it is secured in place by the locking switch 14 engaged between the legs 82 and 84. By displacing the locking switch 14 to the left whereby the resilient legs 83 and 85 spring with their knobs 35 over projections 116 provided in the side walls 108 and 110, the locking switch 14 is moved from the locking position shown to a release position in which the knobs 35 are in engagement with the notches 120. The appliance switch 12 which is accordingly unlocked can then be moved, on account of the resilient legs 82 and 84, from the Off position shown to the operating position which is attained after the knobs 34 provided on the legs 82 and 84 have overcome the projections 118. The appliance switch 12 is provided with a contact element, not shown, which in the operating position of the appliance switch closes the electric circuit of an electric drive.

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10	Switch Device	66	End of Locking Switch 14
12	Appliance Switch	56	Hook
14	Locking Switch	58	Hook
16	Backing Member = Housing of an Appliance	60	Two Recesses or Cutouts
18	Forward Limit Stop Member	61	Two Walls
20	Rearward Limit Stop Member	62	Edge
24	Recess or Cutout	70	Edge
26	Rectangular Oblong Opening	72	Contact Element
28	L-shaped Latch Member = Positive Engagement Means	74	Contact Element
30	Underside of Backing Member 16	79	U-shaped Latch Member = Locking Member
32	Leg		
34	Knob	80	U-shaped Latch Member = Positive Engagement Means
35	Knob		
36	Web Member = Locking Member	81	U-shaped Latch Member = Frictional Engagement Means
37	Bolt = Locking Member		
38	Oblong Opening	82	Leg
40	Two Oblong Openings = Notches	83	Leg = Latch Member
44	L-shaped Latch Member = Frictional Engagement Means	84	Leg
		85	Leg = Latch Member
46	Two L-shaped Latch Members	86	Bolt = Positive Engagement Means
48	Knob for 46	87	Opening in Partition Wall 16
50	Cutout		
52	Forward End Portion of 14		
54	End of Appliance Switch 12		
88	U-shaped Cutout		
90	Locking Means on Latch Member		
92	Locking Means on Latch Member		
94	Locking Groove = Notch		
96	Locking Groove = Notch		
97	Locking Groove = Notch		
98	Locking Groove = Notch		

100 Side Wall of Opening 87
102 Side Wall of Opening 87
104 Oblong Opening for Appliance Switch
106 Oblong Opening for Locking Switch
108 Longitudinal Side Walls
110 Longitudinal Side Walls
112 Opening
114 Actuation Member
115 Projections
116 Projections = Locking Member
118 Projections = Locking Member
119 Cutout = Notch
120 Cutout = Notch
121 Cutout
122 Cutout
123 Bar

Patent Claims

1. A switch device for an appliance for personal use, comprising an appliance switch (12) for activating and deactivating a driving member capable of being electrically operated in a housing of the appliance, as well as a locking switch (14) movable into the actuation path of the appliance switch (12), characterized in that the locking switch (14) and the appliance switch (12) are each movable in a straight-line motion in the same direction when turned on or off, that the appliance switch (12) and/or the locking switch (14) include positive and/or frictional engagement means which are displaceable into one another or interengageable for securing the appliance switch (12) by means of the locking switch (14) in the Off position, and that both the appliance switch (12) and the locking switch (14) are mounted on a backing member (16) of the appliance housing.

2. A switch device as claimed in claim 1, characterized in that the appliance switch (12) includes at least one positive engagement means (28, 80, 86) which is maintained in predetermined switch positions by means of at least one locking member (36, 37, 79, 118) provided on the backing member (16).

3. A switch device as claimed in claim 1, characterized in that the locking switch (14) includes latch members (46, 83, 85, 90, 92) displaceable into notches (40, 60, 94, 96, 97, 98, 119, 120) provided on the backing member (16).

4. A switch device as claimed in claim 2, characterized in that the positive engagement means (28) of the appliance switch (12) is an L-shaped resilient latch member having a knob (34) formed on its leg (32).

5. A switch device as claimed in claim 2, characterized in that the positive engagement means (80) of the appliance switch (12) is a U-shaped latch member having a knob (34) formed on each of its elastic legs (82, 84).

6. A switch device as claimed in claim 2, characterized in that the positive engagement means (86) of the appliance switch (12) is a bolt formed on the appliance switch (12).

7. A switch device as claimed in claim 2, characterized in that the locking member (36) is formed of a web member situated between two oblong openings (26, 38) provided in the backing member (16).

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8. A switch device as claimed in claim 2, characterized in that the locking member (37) is a bolt formed on the backing member (16).

9. A switch device as claimed in claim 2, characterized in that the locking member (79) is a U-shaped latch member formed on the partition wall (16), with a knob (35) being formed on each of its resilient legs (82, 84).

10. A switch device as claimed in any one of the preceding claims 4, 5 and 9, characterized in that the locking switch (14) includes at least one frictional engagement means (44, 81) which is displaceable into the displacement path of the resilient positive engagement means (28, 80) of the appliance switch (12).

11. A switch device as claimed in claim 9 or claim 10, characterized in that the locking switch (14) includes at least one frictional engagement means (81) which is displaceable into the displacement path of the resilient legs (82, 84) of the locking member (79) of the partition wall (16).

12. A switch device as claimed in claim 10, characterized in that the frictional engagement means (44) is an L-shaped latch member which, in the Off position of the appliance switch (12), is adapted to be slipped onto its positive engagement means (28).

13. A switch device as claimed in claim 10, characterized in that the frictional engagement means (81) is a U-shaped latch member the legs (83, 85) of which are adapted to be slipped onto the legs (82, 84) of the positive engagement means (80) of the appliance switch (12) in the Off position of the appliance switch (12).

14. A switch device as claimed in claim 10, characterized in that the frictional engagement means (81) is a U-shaped latch member whose bar (123) connecting the legs (83 and 85) is slidable between the legs (82, 84) of the positive engagement means (80).

15. A switch device as claimed in any one of the preceding claims, characterized in that the notches (121, 122, 119, 120) are formed in at least one of the longitudinal sides (110, 108) of the backing member (16) by means of projections (118, 115, 116) formed thereon.

