

The invention concerns a safety door lock for doors of electrical appliances, in particular electric ovens, with the features indicated in the introductory part of patent claim 1. Such door locks serve, on the one hand, to keep the door securely in the closed position and to permit manual opening only when the electric appliance is in a safe operating state as far as the operator is concerned. For this purpose, the detent bolt actuates a switching element which, as the door is being closed, triggers the energization of the circuits in the appliance when a secure bolting of the door has been obtained. There is a general requirement that such door locks should be designed to be as reliable in manipulation, robust and reliable in operation as possible.

In a door lock known from the US 4 703 147, the door side is fitted with two pivoted detent levers which in the closed position each engage with their actuating ends behind a screening projection on the door lock casing and thereby actuate one switching slide each mounted for displacement in the lock casing, which only enable the circuits to be energized in the appliance when they have reached their sliding end position. In this known door lock, the screening projection only serves as a visual screen to ensure that the actuating ends of the two switching slides are not visible from the outside. However, this safeguard can be overcome in a simple manner in that the two switching slides are transferred into their "on" position, for example, by wires or the like bent into a hook shape and engaging behind the screening projections.

The invention is based on the problem of designing a safety door lock of the kind indicated at the outset in such a way that it reliably meets the most diverse safety functions in spite of a simple structure, and that it also largely withstands any manipulations that endanger safety. This problem is solved first of all by the characterizing features of claim 1.

The design in accordance with the invention operates with only one switching slide which can be only displaced linearly within the lock casing by the direct displacement by means of the detent bolt that is also only provided for linear displacement. Moreover, when the door lock is open, the switching slide is bolted in its "off" position from different sides by several detent latch carriers which must be moved apart from each other in different directions before the switching slide can be displaced against the pressure of a spring urging it towards its "off" position into its "on" position, which only then allows the electrical appliance to be energized. For this purpose, it is then necessary for a total of at least three pressure components to act in three different directions on three different door lock elements, which is practically impossible for an operator provided with only two hands.

By virtue of the teaching of claim 2, the latch carriers are mounted in a particularly simple and reliable manner inside the casing. Only small spring forces are required for automatically locking the switching slide on each occasion in its "off" position or door opening position. As follows from the further features indicated in the subclaims, the latch levers extend in their locking position approximately horizontally to the switching slide, so that because of the absence of lever arms, even strong forces acting from the outside on the switching slide in the switching-on direction with a view to manipulation, are absorbed or withstood by the latch levers.

When the electrical appliance is switched on, the detent bolt of the door lock is admittedly secured against inadvertent opening of the door by virtue of, as it were, a double action spring and ratchet mechanism. But it is nevertheless possible for the door to be opened normally by an operator, that is to say, when the operating state of the electrical appliance does not entail any danger for the operators.

However, special safety precautions are required with modern electric stoves with microwave or pyrolysis functions. In the latter case, there occurs, for example, a heating of the walls of the baking oven to approximately 500°C. In such operating conditions one must ensure that any opening of the door is reliably barred. It is only to be made possible when a certain degree of cooling has again been reached. The characteristic feature of claim 4 serves for this purpose. The activation, and after reestablishment of a non-hazardous operational state of the electric appliance, the deactivation of the blocking element are effected by the electrical program control of the appliance.

The feature of claim 5 permits a space-saving flat design of the door lock without making it less secure against manipulation. It would be necessary for both latch levers to be at first moved in different directions, that is to say, be moved by different manipulating devices into their releasing position and be held therein, before the switching slide can be displaced from the outside in a third direction, that is to say, the switching-on direction in order to supply current to the appliance.

The teaching of claim 6 is based on the fact, already referred to, that during the cooperation of the detent bolt on the door side with the detent latches, the longitudinal movement of the detent bolt is converted into a transverse movement of the latch carriers. Because of the design of these latch carriers as unilaterally pivotably mounted latch levers that operate in the manner of pincers, the pressure components acting on the detent latches in the switching-on direction are reliably absorbed and without wear. This is also promoted by the extremely slight angular movements at the bearing end of the latch levers during their pivoting between the engagement posi-

tion and releasing position, so that there does not occur any significant wear of the bearings. The feature of claim 8 ensures a particularly simple and effective repositioning of the latch levers with a favourable leverage. The features set out in claims 9 to 11 signify a solution for the coupling of the closing and opening process of the door with the control of the latch lever movement that is simple in design and can be easily implemented as far as manufacture is concerned. The control surfaces of the latch lever and the mating surfaces on the detent bolt or switching slide acting thereon, cooperate in the manner of a wedge drive, which again enhances the functional reliability.

The features of claims 12 and 13 allow the wedge surfaces to be designed with a large area, with a corresponding reduction of their specific areal loading, for example, when the door of the electrical appliance is heavily slammed shut. In this process, the cooperating conical surfaces on the detent latches ensure the centring of the detent bolt, and the bilaterally uniform pressure loading of the latch levers of the switching slide by the bolt latches also ensures in general that the bearing pressures exerted by the switching slide to be absorbed by the insulated casing are minimized. The feature of claim 14 enhances the security against manipulation, in that when the door is open, and hence the detent bolt has been moved away, the stub and the radial flanges of the switching slide fill in the space between the detent latches and also prevent thereby any extraneous body from being introduced into the door lock.

By virtue of the design of the switching slide according to claims 16 to 18, when the door is open, the bolt latches secure the engagement of the switching slide 1 in its "off" position. On the other hand, the flanks of the bolt latches on their opening sides which act in the manner of wedge faces, serve to ensure that under the restoring resilient pressure permanently acting thereon, the switching slide automatically moves the latch levers apart and produces the bolted "off" position without the need of an electrical drive for this purpose. This facility is also of importance in the case where the mains voltage for the electrical appliance is for once cut off for a short time. The design according to claim 18 ensures that if an attempt is made to push the switching slide forcibly against its bolting in the switching-on direction, the specific areal loading of the abutment faces, and hence the risk that the bolt latches will be broken off, is minimized. The remaining features of the claim serve the design of the blocking device which is designed to be particularly space-saving. If an attempt is made to open the door forcibly while the detent bolt latch is blocked, the spreading forces exerted on the latch levers are easily taken up and absorbed by the tabs of the pivoting member, in which arrangement there only occurs a bending stress of the tabs. On the other hand, the bearing of the pivoting member remains practically unstressed, which has in turn a favourable effect on the service life and functional

reliability of the blocking device.

5 The measure according to claim 21 ensures that during an attempt at a forcible opening, the spreading pressures exerted on the latch lever are transmitted to the tabs of the pivoting member without any leverage effect.

10 The drive mechanism for the pivoting member explained in claims 23 and 24 has the advantage that the electromagnetic drive direction operates in only one direction and that there is no need for the driving tappet to be mounted with any articulation. Because of the features of claims 26 to 28, the position in which the door lock is inserted plays no significant part as far as the functional reliability of the blocking
15 device and its drive members are concerned. Because of the feature of claim 30, the electromagnetic drive need only be designed for short term operation.

20 The features of claims 32 et seq. facilitate the adjustment work to be carried out during the attachment of the appliance door to the appliance. This is because the door lock must be mounted on the appliance in such a way that in the closed position, it bears, to be sure, on the one hand flush against the appliance, but that the detent bolt nevertheless only
25 penetrates into the insulated casing 2 with a depth of penetration defined by the switching path of the switching slide. In this connection it should be borne in mind that after assembly of the appliance, the door lock is no longer situated in a place that is accessible from the outside. Any modifications
30 of the distance between the casing of the door lock and the appliance door required because of the manufacturing tolerances are no longer feasible. The spring ratchet mechanism in accordance with the invention acting on the detent bolt holds the detent bolt automatically at its desired depth of penetration on
35 the door lock casing, so that its subsequent mounting on the door of the appliance and adjustment can be effected quickly and in the correct position. Moreover, this double action spring ratchet mechanism constitutes a further gain in the locking force for the appliance door under normal operation of
40 the appliance.

45 The measure according to claim 37 ensures that the engagement of the detent rollers in the detent groove is effected within a narrowly defined displacement range of the detent bolt. The secure hold is thereby enhanced. The location of the engagement point during the adjustment work is facilitated, especially since with the door being almost closed, it can only be effected by means of the senses of touch and hearing.

50 The invention will be explained in greater detail with reference to an example of the embodiment represented in the Figures. There are shown in:

- Fig 1 an external view in perspective of the safety door lock,
- 5 Fig. 2 a top view of the door lock with the central part having been lifted off, in the "off" position of the switching slide 1 and in the position of the latch levers where they lock the switching slide,
- 10 Fig. 3 an exploded representation in perspective of the functional components that are important for the bolting of the door lock, with the central part of the casing having been lifted off from the base part,
- 15 Fig. 4 a detailed view of the switching slide in perspective and of the two detent latch levers cooperating therewith,
- 20 Fig. 5 a schematic representation of the spreading apart of the latch levers by the detent bolt that has been displaced into its locking position,
- 25 Fig. 6 a top view of the functional parts that are important for the bolting of the door lock, with the switching slide having been displaced into the "on" position,
- 30 Fig. 7 a top view of the blocking device accommodated in a side compartment of the casing made of an insulating material, with the blocking device being disposed in its inactive position,
- 35 Fig. 8 a section corresponding to line VIII-VIII in Figure 7,
- Fig. 9 a top view of the blocking device similar to Figure 7, but with the blocking device being disposed in its active or blocking position,
- Fig. 10 a section corresponding to line X-X in Figure 9,
- 40 Fig. 11 an exploded representation in perspective of the blocking device arranged between the central part and the cover shell,
- 45 Figs. 12 - 14 schematic detailed representations of the stepper pivoting drive for the blocking member of the blocking device,
- 50 Figs. 15 - 17 a modified mode of embodiment of the casing of the door lock and of the detent bolt for facilitating the adjustment of the door lock during assembly.

The door lock casing 2 made of an insulating material consists of a bottom shell 67 with formed-on mounting flanges 66, a central part 68 and a cover shell 69. The casing 2 has the

contour of a cuboid. At its end-sided opening or narrow side wall 70, provision is made for a casing opening 4 which is surrounded by an annular collar 71. Out of the front longitudinal side wall 72 there project along the separating line between the cover shell 69 and central part 68, as well as along the separating line between the bottom shell 67 and the central part 68, two rows of connecting tags 73 for electrical connections, which rows are parallel on top of one another. At the outer side of the casing, the two rows are screened from each other by a partition 74 and by two partitions 75, 76 towards the bottom and towards the narrow side wall 70. In the assembled position of the door lock, these sides are the ones that lie on the outside.

Let us at first describe with reference to Figures 2 - 6 the components of the closing and engagement device of the door lock that are arranged in the door lock casing between the central part 68 and the bottom shell 67. The central part of the said device is the switching slide 1 which extends with its median longitudinal axis 3 in the longitudinal direction of the bottom shell 67 that has a substantially rectangular outline. Within two guide means 77 formed respectively on the bottom shell 67 and central part 68, the switching slide 1 is linearly longitudinally displaceable in the direction of its median longitudinal axis 3. The switching slide 1 is pressed by a compression spring 78, that is disposed between its end face pointing in the switching-on direction 17 and the opposite casing wall and has two projections 53 arranged at its bottom and top respectively, against two stops 79 acting with the same action and being fixed to the casing on the bottom shell 67 and central part 68 respectively. In the position where these projections 53 bear on the stops 79, the "off" position of the switching slide 1 has been reached.

In its central section, the switching slide 1 has two rectangular cutouts 80, 80'. Into them there is inserted one contact bridge 81, 81' each and a compression spring 82, 82' urging the contact bridges 81, 81' in the switching-on direction and pressing them against the narrow side walls of the cutouts 80, 80' of the switching slide. Each contact bridge 81, 81' coupled for movement with the switching slide 1 is assigned a pair of contact components 83, 84 and 83', 84' that are fixed to the casing. The contact components 83, 84 and 83', 84' flank and cross the switching slide 1 on both sides at right angles to its longitudinal axis 3, in which arrangement one contact component 83, 83' of one contact component pair is respectively arranged above, and its other contact component 84, 84' beneath the switching slide 1. As opposite contacts fixed to the casing to the contact bridges 81, 81' and coupled for movement with the switching slide 1, the contact components 83, 84; 83', 84' each carry fixed contacts 85.

The end 27 of the switching slide 1 pointing in the switching-off direction 16 has a head-shaped thickened portion. The head

contains a cone frustum 88 that tapers in the switching-off direction 16, at whose tapered end there is fitted a stub 30. At its end pointing in the switching-on direction 17, the head carries an annular, radially aligned peripheral engagement projection face that is sawtooth-shaped in cross-section. The engagement projection 36 formed thereby has for its operation an engagement abutment face 37 directed in the switching-on direction and extending at right angles to the median longitudinal axis 3 and a wedge face 38 directed in the switching-off direction 16. From the cone frustum 88, there moreover project two diametrically opposite radial flanges 31.

In the half of the bottom shell 67 adjoining the casing opening 4, there are moreover, mounted two latch levers 6 at diametrically opposite sides of the switching slide 1 and extending parallel to its median longitudinal axis 3. With their free ends 9, they can be swung out parallel to the surface of the bottom shell 67 in the direction that is facing away from the switching slide 1. In the swung-in rest position, they serve to bolt the switching slide 1 in its "off" position, for instance when the door is open. Moreover, when the door is closed, they serve to fix a detent bolt 5 on the door side that is introduced into the casing opening 4 as the door is bolted (Figures 5, 6). With their ends 8 pointing in the switching-on direction 17, the latch levers 6 are pivotably mounted by means of formed-on stubs 89 in casing eyes 90 of the bottom shell 67 and of the central part 68. The pivot axes 12 of the latch levers extend at right angles to the median longitudinal axis of the switching slide 1.

In the zone of their free ends 9, the latch levers 6 are each urged by a compression spring 23 into their engagement or rest position, that is to say, in the engagement direction 10. The compression springs 23 are inserted in blind holes 91 on the outer sides 14 of the latch levers 6 that are remote from the switching slide 1 and are supported on the casing 2. In the zone of their free ends 9, the latch levers 6 are designed as trough-shaped half-shells 92 whose inner sides 24 facing the switching slide 1 have a concave curvature, with the longitudinal direction of the trough being aligned parallel to the median longitudinal axis 3. They embrace the head zone (the end 27) of the switching slide 1.

The two half-shells 92 each have a detent latch 15 that is wedge-shaped in cross-section, on the one hand for controlling their operational movements, and on the other hand for latching the detent bolt 5 on the door side that is introduced through the casing opening 4. The detent latch 15 is disposed at the free end 9 of the latch levers 6. Between their free end 9 and their mounting end 8, the two latch levers 6 comprise a bolt latch 33 that is sawtooth-shaped in cross-section for fixing the switching slide in its "off" position. Both detent latches 15, 33 project radially from the trough-shaped concave inner sides 24 of the half-shells 92, towards the inside in the

engagement direction 10 and have in this arrangement the shape of semicircular-type bulges.

5 The detent latches 15 comprise a semiconical wedge face 18 pointing in the switching-off direction 16 and a wedge face 19 that is also semi-conical and points in the switching-on direction 17. With their half annular faces 25 lying therebetween, they embrace the stub 30 of the switching slide 1 in the manner of an annular diaphragm when the door is in its open position (Figure 2). The bolt latches 33 lie between the latches 15 and the pivot pins 89 of the latch levers 6. They have a planar abutment face 35 disposed at right angles to the median longitudinal axis 3 and in the switching-off direction 16, and a wedge face 34 disposed in the switching-on direction 17. The angles of inclination of the wedge faces 18, 19 of the latches 15 and of the wedge face 34 of the bolt latches 33 facing away from the casing opening 4 amount to approximately 45°.

20 As shown in Figure 5, the detent bolt 5 on the door side has a stub-type shape. At its end on the side of the casing, it tapers to a section 94 with a smaller diameter, at whose end to be introduced into the casing opening 4, a head-type peripheral annular projection 20 is formed for controlling the movement of the latch levers 6 and for engaging the detent bolt 5. The annular projection 20 has an outer conical surface 21 pointing in the switching-on direction 17 and cooperating with the wedge face 18 of the latch levers 6 and an inner conical surface 22 pointing in the switching-off direction 16 and cooperating with the wedge face 19 of the latch levers 6. At its end face, the detent bolt 5 is provided with a blind hole-shaped recess 39 for the insertion of the stub 30 of the switching slide 1. In this mutual insertion position, the switching slide 1 is transferred into its "on" position as the detent bolt 5 is closed (Figure 6).

40 The blocking device will be described in greater detail with reference to Figures 7 to 11. It serves to block the latch levers 6 in their engagement position. It is accommodated between the central part 68 and the cover shell 69 of the casing 2 made of an insulating material. Figure 7 provides at the same time a view into the inside of the blocking device when the cover shell 69 has been taken off. The core of the blocking device is formed by the blocking member designed as a pivoting member 44 which can, according to arrow 45, be pivoted between an inactive swung-out position releasing the latch levers 6 and an active swung-in or blocking position blocking the latch levers 6. The pivoting member 44 has tabs 46 formed at its side flanks by means of which it engages in its blocking position through cutouts 95 in the intermediate bottom 96 of the central part 68 and embraces the latch levers 6 in the manner of a clamp with a blocking action.

At its end 47 pointing in the switching-off direction 16 of the switching slide 1, the pivoting member 44 is pivotably mounted with a formed-on stub 97 in recesses 98 of the central part 68 and therewith adjoins the narrow side wall 70. The pivot axis 54 of the pivoting member 44 extends parallel to the pivoting plane 43 of the latch levers 6 and at right angles to the median longitudinal axis 3 of the switching slide 1. An electromagnetic stepper drive mechanism is arranged on the longitudinal side wall 72 lying opposite the longitudinal side wall 52 for providing the pivoting drive for the pivoting member 44. The said mechanism consists of a coil 48, an armature 49, a driving tappet 50 for acting on the pivoting member 44 and a restoring spring 51 for the driving tappet 50. The driving tappet 50 is selectively acting on two fillets 55, 56 of the pivoting member 44 as its abutment, in which arrangement the pivoting member 44 can be pivoted by action on its outer fillet 56 into its inactive swung-out position and by acting on its inner fillet 55 on the side of the switching slide 1 into its active blocking position. The fillets 55, 56 are separated from each other by a wedge-shaped web 57. Its wedge faces 58, 58' guide the driving tappet 50 designed as a tilting tappet alternately into the respective fillets 55, 56 to provide the pivoting drive for the pivoting member 44.

Adjoining the longitudinal side wall 72, there is arranged a bolting slide 59 for fixing the pivoting member 44 in its inactive swung-out position or its active blocking position. The displacement direction 60 of the bolting slide 59 extends at right angles to the pivot axis 54 of the pivoting member 44 and parallel to the pivoting plane 43 of the latch lever 6. A compression spring 61 is seated in a blind hole-shaped recess 99 of the end face of the bolting slide 59 remote from the pivoting member 44, which spring bears on the casing wall and urges the bolting slide 59 in the fixing direction 62. The end face of the bolting slide 59 facing the pivoting member 44 is designed to be wedge-shaped and to act in the fixing direction 62. It forms at the same time an outer steering edge 64 projecting in the direction towards the pivoting member 44 and a set back inner steering edge 65. The two steering edges 64, 65 alternately act on a wedge-shaped control cam 63 formed on the pivoting member 44.

Into its zone adjoining the compression spring 61, the bolting slide 59 has on its side facing the longitudinal side wall 72, an eye 93 into which there are inserted a ball 100 and a spring 101 loading it. The compression spring 101 presses the ball 100 against a switching rocker 102. The switching rocker 102 is mounted on a tilting member 103 fixed to the casing which is electrically conductively connected to one end of the coil 48. By means of the switching rocker 102, two contact components 104, 105 flanking the tilting member 103 can be alternately connected to the tilting member 103 and thereby to the coil 48.

A third contact component 106, arranged at a distance in the fixing direction 62 from the contact component 105, is connected in an electrically conductive mode to the other end of the coil 48. The part of the bolting slide 59 adjoining the pivoting member 44 has a rectangular cutout 107 into which there are inserted a contact bridge 109 that is coupled for movement with the bolting slide 59 and a spring 110 loading it in the fixing direction 62. The contact bridge 109 is assigned to contact components 111, 112 that are fixed to the casing, which each have a fixed contact 113 for making contact with the contact bridge 109. The contact components 104, 105, 106, 111, 112 fixed to the casing project with their connecting tags 73 at right angles from the longitudinal side wall 72 of the central part 68.

The adjustment-engagement device is represented in Figures 15-17. It comprises as catch engagement means two detent rollers 116 which are arranged on diametrically opposite sides of the casing opening 4 and project into the movement path of the detent bolt 5 on the door side. At the end faces of the detent rollers 116, there are formed journals 117 with a smaller diameter. When the door is closed, the detent rollers 116 which are spring-loaded in the engagement position engage in the detent groove 115 that is approximately V-shaped in cross-section on the detent element 5 on the door side. The detent groove 115 is dimensioned in such a way that it accommodates the detent rollers 116 approximately with half its cross-sectional surface. The detent rollers 116 are arranged parallel to each other and at right angles to the longitudinal axis of the switching slide 1 and are carried for movement in guide channels 119 extending on both sides from the casing opening towards the inside of the casing 2 made of an insulating material and ending therein in a dead end. The guide channels 119 are approximately rectangular in cross-section and each have two stops 121 in the issuing end 120 that faces the casing opening 4. The detent rollers 116 bear with their journals 117 on these stops 121 in such a way that the detent rollers 116 project with a part of their circumferential surface into the casing opening 4.

A compression spring 123 is inserted into each of the guide channels 119, which is supported on the dead end 122 of the guide channels 119. Between the compression spring 123 and the detent roller 116, there is inserted a substantially U-shaped bearing shackle 124. The latter is loaded by the compression spring 123 in the engagement direction 118 and bears with the end faces 125 of its two arms on the peripheral surface of the journals 117. An arresting stub 126 for the compression spring 123 is formed on the median part of the U-shaped bearing shackle 124 on the side facing towards the compression spring 123.

The operating and functional mode of the door lock will be described as follows:

Figure 2 shows the open door lock when the door of the appliance is open and when the appliance is in its "off" position. The switching slide 1 is pressed by the compression spring 78 with its projections 53 in the switching-off direction 16 against the stop 79 on the bottom shell 67 and on the central part 68. In this position, the contact bridges 81, 81' are not in contact with their opposite fixed contacts 85, so that the circuits in the appliance that are connected to the contact component pairs 83, 84 and 83', 84' are interrupted. Thus the electrical appliance cannot be switched on. The latch levers 6 loaded by the compression springs 23 are situated in their bolting or engagement position fixing the switching slide 1 in its "off" position. An attempt to displace the switching slide 1 by means of an object introduced into the casing opening 4 in the switching-on direction 17 would fail because its bolt projections 36 are arrested by the rearward engagement on the part of the bolt latches 33 with their abutment faces 35.

The stub of the switching slide 1 lying between the latches 15 prevents both latch levers 6 from being simultaneously gripped and moved radially outwards into the releasing position by a wider, for example a stub-shaped article, which is centrally introduced into the casing opening 4. If, for example, a screwdriver is eccentrically introduced into the casing opening 4 or the parting plane 32 between the latch levers 6 so as to move the latch levers 6 apart from each other, this article will be opposed by the radial flanges 31 formed on the head end of the switching slide 1. Further penetration is thereby prevented.

The switching slide is only displaced into its releasing position by the closing of the door or the introduction of the detent bolt 5 into the door lock related thereto. In this action, the detent bolt 5 first strikes the wedge faces 18 of the latches 15 of the latch levers 6 pointing in the switching-off direction 16 with its conical surface 21, whereby the latch levers 6 are moved apart (releasing direction 11) and are moved into their releasing position. Figure 5 shows an intermediate position, wherein the detent bolt 5 holds the latch levers 6 in their releasing position, and with the bottom 114 of its blind recess 39 loads the stub 30 of the switching slide 1 for the displacement drive towards its "on" position.

Further closing of the appliance door, and the further introduction of the detent bolt 5 into the door lock related thereto, causes the switching slide 1 to be displaced against the pressure of the compression spring 78 into its "on" position, and driven by the inwardly directed compression springs 23, the latch levers 6 return into their rest position. The latch levers 6 now press with the wedge faces 19 of their latches 15 pointing in the switching-on direction 17 on the inner conical surface 22 of the annular projection 20 of the detent bolt 5 and act on the latter in the manner of catches of a spring ratchet mechanism, with a force component holding the appliance

door in its closed position. In the "on" position of the switching slide 1, the fixed contacts 85 are bridged by the contact bridges 81, 81' with the contact component pairs 83, 84, 83', 84'. The circuits connected to the contact component pairs 83, 84 and 83', 84' are now closed and the functions of the appliance can now operate as selected.

By opening the appliance door after the completion of the appliance functions, the latch levers 6 are moved radially outwards into their releasing position because the inner conical surface 22 of the detent bolt 5 runs up onto the wedge faces 19 of their latches 15 pointing in the switching-on direction. The switching slide 1 is released thereby and is automatically displaced into its switching-off direction 16 by the compression spring 78 without it being possible to impede this displacement movement.

If, by an adroit manipulation, it would nevertheless become possible to displace the switching slide 1 into its "on" position, the latter does not remain there but is mechanically and automatically displaced again by the compression spring 78 in its switching-off direction 16. In this process, the wedge face 38 of the engagement projection 36 of the switching slide 1 presses against the wedge faces 34 of the bolt latches 33 that point in the switching-on direction 17. Because of this, the latch levers 6 are moved apart and the switching slide 1 returns into its "off" position. In the latter, it is held by the rearward engagement of the bolt latches 33 with their bolt abutment faces 35 on the abutment faces 37 of the switching slide 1.

Figures 7 and 8 show the inactive state of the swung-out blocking device. In this inactive position, the pivoting member 44 is fixed by the spring-loaded bolting slide 59. For this purpose, the bolting slide 59 engages with its steering edge 64 beneath the control cam 63 and holds the pivoting member 44 in its inactive swung-out position.

The electrical switching process activating the blocking device is triggered with an appropriate programming of the appliance after the appliance door has been closed and for example, by switching on the pyrolysis process for the baking oven. In doing so, a voltage is applied to the contact component 104. The circuit of the coil 48 is closed via the rocker switch 102, the tilting member 103, the coil winding and the contact component 106. The driving tappet 50 which has so far been located in its rest position represented in Figure 12 is pressed with the energization of the coil 48 by the armature 49 against the inner wedge surface 58' of the web 57 and is guided with a tilting movement into the inner fillet 55 (Figure 13).

By acting on the fillet 55 on the side of the switching slide, the driving tappet 50 pivots the pivoting member 44 into its blocking position, wherein it engages with its tabs 46 through

the cutouts 95 of the intermediate bottom 96 and embraces the outer sides 14 of the latch levers 6 in their rest position fixing the detent bolt 5, in the manner of a clamp. The pivoting member 44 for its part is fixed in its blocking position by the bolting slide 59, in that its lower steering edge 65 acts on the control cam 63 in the swinging-in direction and blocks it. The bolting slide 59 is coupled for movement with the pivoting member 44 by means of its steering edges 64, 65 that cooperate with the control cam 63 and is, during the swinging-in movement of the pivoting member 44, automatically displaced by the compression spring 61 from its initial position into its blocking position, that is to say, in the fixing direction 62. Thereby the rocker switch is simultaneously moved over onto the contact component 105 to which no voltage is applied. Consequently, the circuit of the coil 48 is interrupted and the driving tappet 50 and the armature 49 are automatically mechanically pushed back by the restoring spring 51 into their initial position.

The blocking of the latch levers 6 can only be cancelled in that on the terminal 105 a voltage is applied by the program of the appliance. Because of this, the driving tappet 50 driven by the armature 4 advances again. The driving tappet 50 is guided into the outer fillet 56 by the outer wedge face 58 of the web 57. By the action on the outer fillet 56, the pivoting member 44 is pivoted into its inactive swung-out position and the state shown in Figures 7, 8 is reached again wherein the latch levers 6 of the door lock can be moved apart.

The contact bridge 109 coupled for movement with the bolting slide 59 is lifted off from the fixed contacts 113 of the contact components 111, 112 as a result of the bearing of the projecting outer steering edge 64 of the bolting slide 59 on the control cam 63 of the pivoting member 44 of the door lock in the inactive swung-out position of the pivoting member 44. On the other hand, in the active swung-in or blocking position of the pivoting member 44, the bolting slide 59 bears with its set back inner steering edge 65 on the control cam 63 of the pivoting member 44. Because of this, the bolting slide 59 projects further in the fixing direction 62 and the contact bridge 109 coupled for movement therewith bridges the fixed contacts 113 and consequently connects the contact components 111, 112 to each other. Thereby a further circuit can be actuated for monitoring the blocking position of the pivoting member 44.

The adjustment-engagement device according to Figures 15-17 serves to facilitate the adjustment work during the assembly of the door of the appliance. This adjustment work is necessary, because the detent bolt 5 on the side of the door is only intended to penetrate with a defined depth of penetration into the insulated casing 2 and to move the switching slide 1 into a defined "on" position, and since moreover manufacturing tolerances have to be compensated. For this reason, the detent

bolt 5 on the side of the door is generally not rigidly mounted on the appliance door but by means of an adjustment mechanism which makes it possible to modify the position of the detent bolt 5 on the door of the appliance.

5

During assembly, the appliance door is first mounted so that it is applied flush with the appliance. In a second step, the distance position of the detent bolt 5 relative to the appliance door is adjusted by means of the adjustment mechanism in such a way that the depth of penetration of the detent bolt 5 in the casing 2 of the door lock defined by the switching path of the switching slide 1 is ensured and not exceeded. The correct depth of penetration is reached when the detent rollers 116 engage in the detent grooves 115 of the detent bolt 5.

10

15

This engagement takes place in a sharply defined movement range of the engagement element on the door side. It can be perceived by the fitter by his sense of touch or hearing. This is because, in contrast to the adjustment-engagement device, the fixing of the detent bolt 5 on the door side inside the insulated casing 2 is not effected abruptly by means of the latch levers 6 but by virtue of the cooperating wedge faces within a relatively large movement range of the detent bolt 5 on the side of the door, and therefore can only be perceived with difficulty from the outside.

20

25

LIST OF REFERENCE NUMERALS

5	1	switching slide	51	restoring spring
	2	door lock casing	52	longitudinal side wall
	3	median longitudinal axis	53	projection
	4	casing opening	54	pivot axis
	5	detent bolt	55	inner fillet
10	6	latch lever	56	outer fillet
	7		57	web
	8	mounting end	58, 58'	wedge face
	9	free end	59	bolting slide
	10	engagement direction	60	displacement direction
15	11	releasing direction	61	compression spring
	12	pivot axis	62	fixing direction
	13		63	control cam
	14	outer side	64	outer steering edge
	15	detent latch	65	inner steering edge
20	16	switching-off direction	66	mounting flange
	17	switching-on direction	67	bottom shell
	18	wedge face	68	central part
	19	wedge face	69	cover shell
	20	annular projection	70	narrow side wall
25	21	outer conical surface	71	annular collar
	22	inner conical surface	72	longitudinal side wall
	23	compression spring	73	connecting tags
	24	inner sides	74	partition
	25	half-ring faces	75	partition
30	26		76	partition
	27	end	77	guide means
	28		78	compression spring
	29		79	stop
	30	stub	80, 80'	cutout
35	31	radial flange	81	contact bridge 81, 81'
	32	separating space	82, 82'	compression spring
	33	bolt latch	83, 83'	contact component
	34	wedge face	84, 84'	contact component
	35	abutment face	85	fixed contact
40	36	bolt projection	86	
	37	abutment face	87	
	38	wedge face	88	cone frustum
	39	recess	89	pivot pin
	40	bolt recess	90	casing eye
45	41		91	blind hole
	42		92	half-shell
	43	pivoting plane	93	eye
	44	pivoting member	94	engagement recess
	45	pivoting direction	95	cutout
50	46	tabs	96	intermediate bottom
	47	end	97	stub
	48	coil	98	recess
	49	armature	99	recess
	50	driving tappet	100	ball

	101	compression spring	114	bottom
	102	rocker switch	115	detent groove
	103	tilting member	116	detent roller
	104	contact component	117	journal
5	105	contact component	118	engagement direction
	106	contact component	119	guide channel
	107	cutout	120	end
	108		121	stop
	109	contact bridge	122	blind end
10	110	compression spring	123	compression spring
	111	contact component	124	bearing shackle
	112	contact component	125	end face
	113	fixed contact	126	arresting stub



PATENT CLAIMS

1. A safety door lock for doors of electrical appliances, in particular electric ovens,

- with a detent bolt (5), which
- is mounted for longitudinal displacement on the appliance door by actuating the latter and
- 5 -- is insertable for bolting the door into a casing opening (4) of the door lock casing (2), and
- with a switching slide (1) mounted in the door lock casing (2) for longitudinal displacement,
- which slide can be transferred against the restoring pressure of a compression spring (78) urging it into its "off" position (Figure 2) into an "on" position (Figure 6) by the bolting displacement of the detent bolt (5), in which position the functions of the electric appliance are released, and
- 10 --
- 15 - with a latching means
- for latching the detent bolt (5) in the bolted position of the door (Figure 6) and
- for bolting the switching slide (1) in its "off" position (Figure 2) when the detent bolt (5) is
- 20 unlatched,

characterized in that

a) the detent bolt (5) and the switching slide (1) lie on a median longitudinal axis (3) which extends substantially in the switching-on and switching-off direction (17, 18) in such a way that as the detent bolt (5) is transferred into the door bolting position, it pushes the switching slide (1) into its "on" position (Figure 6),

b) that the latching means consists of at least two latch carriers which in the "on" position (Figure 6) flank the substantially abutting ends of the detent bolt (5) and of the switching slide (1) approximately in the manner of the clamping jaws of a jaw chuck

- on different sides and
- are movably mounted in the door lock casing (2) substantially radially to the median longitudinal axis (3),

c) that the latch carriers are urged by spring pressure (compression spring 23) in the radial bolting direction towards the median longitudinal axis (3),

d) that latches (15, 33) are arranged on the latch carriers in such a way that under the spring pressure there engage with a locking action:

- in the "on" position (Figure 6), a detent latch (15) facing the casing opening (4), in the manner of a locking pawl of a spring ratchet mechanism in an engagement recess (94) on the detent bolt (5) and
- 50 - in the "off" position (Figure 2), a bolt latch (33) re-



mote from the casing opening (4) in a bolt recess 40) on the switching slide (1) blocking its scope for longitudinal displacement and

- 5 e) that when being longitudinally displaced into, or from its bolted position, the detent bolt (5) lifts the latch carriers out of their engagement or bolted position.

- 10 2. A door lock according to claim 1,
characterized in that
the latch carriers are latch levers (6) which are pivotably mounted on the casing (2) at their ends remote from the casing opening (4) in the manner of gripping jaws of pliers.

15

3. A door lock according to claim 1 or 2,
characterized in that
20 the detent latch (15), as a locking latch on the side of the casing opening, and the engagement recess (94) as a keyway flank on the detent bolt (5) with at least its flank adjoining the free end of the detent bolt (5), cooperate in the manner of a ratchet mechanism.

25

4. A door lock according to claim 3,
characterized by
an electrically controllable blocking member which can be moved between an inactive position and a blocking position and which maintains the locking action of the locking latch in the blocking position by blocking the movement of the latch carriers.

30

5. A door lock according to one or more of the preceding claims,
characterized by
two latch levers (6) on diametrically opposite sides of the switching slide (1) and of the detent bolt (5).

40

6. A door lock according to one or more of the preceding claims,
characterized in that
45 the latch levers (6) extend parallel to the median longitudinal axis (3) and are, at their end (8) remote from the casing opening pointing in the switching-on direction (17), pivotable round a pivot axis (12) that extends at right angles to the median longitudinal axis (3).

50

7. A door lock according to one or more of the preceding claims,
characterized in that



the latch levers (6) are spring-loaded in the engagement direction (10).

8. A door lock according to claim 7,
characterized in that
in the zone of their free ends (9), the latch levers (6) are
each loaded by one compression spring (23) that is held be-
tween the outer side (14) of one latch lever (6), which is
remote from the switching slide (1), and the casing (2).

9. A door lock according to one or more of the preceding claims,
15 characterized in that
the flank of the detent latch (15) facing the casing opening
(4) is formed as a wedge face (18) in such a way that in its
bolting movement in the switching-on direction (17), the
20 detent bolt (5) moves the latch levers (6) away from each
other, whereby their bolt latches (33) which have been lifted
out of their bolting position, release the movement of the
switching slide in the switching-on direction (17).

25 10. A door lock according to claim 9,
characterized in that
the detent latches (15) are wedge-shaped in cross-section and
have one wedge face (18) pointing towards the switching-off
direction (16) and one wedge face (19) pointing in the
30 switching-on direction (17).

11. A door lock according to claim 9 or 10,
characterized in that
35 at its end that can be inserted into the casing opening (4),
the detent bolt (5) has a radial projection which cooperates
with the detent latches (15) of the latch levers (6).

12. A door lock according to claim 11,
characterized in that
the radial projection is formed as a circumferential annular
projection (2) which has a conical surface (21) pointing in
the switching-on direction (17), and that its guide surface
(22) pointing in the switching-off direction (16) is also
formed as a conical surface.

13. A door lock according to one or more of the preceding
50 claims,
characterized in that
the radially inward pointing inner sides (24) of the latch
levers (6) are hollowed out in the manner of grooves in the
zone of their free ends (9) containing the latches (15, 33).



with the direction of the groove extending in the direction of the median longitudinal axis (3), and that the latches (15, 33) project in the manner of semicircular beads beyond the inner sides (24), with the median longitudinal axis (3) approximately forming the ring axis.

14. A door lock according to one or more of the preceding claims,

characterized in that the end of the switching slide (1) pointing in the switching-off direction (16) is formed as a stub which, in the open position and the engaged position of the latch levers (6) is surrounded by the detent latches (15), and that from the outer surface of the stub, there project two diametrically opposite radial flanges (31) which, in the engaged position of the latch levers (6) project into the separating space (32) remaining free between their free ends (9).

15. A door lock according to one or more of the preceding claims,

characterized in that the detent bolt (5) has on its end face a blind recess (39) for receiving a stub (30) of the switching slide (1).

16. A door lock according to one or more of the preceding claims,

characterized in that the bolt latches (33) are arranged approximately centrally between the ends (8, 9) of the latch levers.

17. A door lock according to claim 16,

characterized in that the bolt latch (33) is saw tooth-shaped in cross-section, that its flank on the side of the casing opening is formed as an abutment face (35) which is substantially radially orientated and that its flank pointing in the switching-on direction (17) is formed as a wedge face (34).

18. A door lock according to claim 16 or 17,

characterized in that the switching slide (1) has a bolt projection (36) which is saw tooth-shaped in cross-section and cooperates with the bolt latches (33) of the latch levers (6) whose flank pointing in the switching-on direction (17) extends as an abutment face (37) approximately parallel to the abutment face (35) of the bolt latches (33) of the switching slide, and whose flank pointing in the switching-off direction (16) is a wedge face (38) acting as a lift-off slope relative to the bolt latches (33).



19. A door lock according to claim 4,
characterized in that
the blocking member is movably mounted in a side chamber of
the insulating casing (2) substantially at right angles to the
pivoting plane (43) of the latch levers (6) between an active
position reaching into the pivoting plane of the latch levers
(6) and an inactive position wherein it is moved out of the
pivoting plane of the latch levers (6).

20. A door lock according to claim 19,
characterized in that
the blocking member is a pivoting member (44) with two tabs
(46) formed on two sides facing away from each other, pro-
jecting in the manner of fork tines in the pivoting direction
(45) of the pivoting member (44), in which arrangement, the
tabs (46) grip in the blocking position round the latch levers
(6) at their outer sides (14) in the manner of a clamp.

21. A door lock according to claim 20,
characterized in that
in the blocking position, the tabs (46) lie near the free ends
(9) of the latch levers (6).

22. A door lock according to claim 20 or 21,
characterized in that
the pivoting member (44) is mounted on the casing (2) at its
end pointing in the switching-off direction (16).

23. A door lock according to one or more of the preceding
claims,
characterized by
an electromagnetic drive device operating in the manner of a
stepper mechanism for driving the pivoting member (44) in a
pivoting mode into its blocking position and into its swung
out position, with a coil (48), an armature (49), and a
driving tappet (50) mounted for displacement parallel to the
median longitudinal axis (3), for driving the pivoting member
(44) and with a restoring spring (51) acting parallel to the
switching-on direction (17), for the driving tappet (50).

24. A door lock according to one or more of the preceding
claims,
characterized in that
the pivoting member (44) has abutment faces on both sides of
its pivot axis (54) for being alternately acted on by the
driving tappet (50).

25. A door lock according to claim 24,



characterized in that
the abutment faces are formed as fillets (55, 56) and are
separated from each other by a wedge-shaped web (57) whose
wedge faces (58, 58') guide the driving tappet (50) designed
as a tipping tappet, into the appropriate fillet (55, 56)
depending on the pivoted position of the pivoting member (44).

26. A door lock according to one or more of the preceding
claims,

characterized by
a bolting slide (59) mounted for longitudinal displacement
parallel to the switching-off direction (16) under the
pressure of a spring element (62), abutting against the
pivoting member (44) and mechanically fixing the latter
thereby in its two functional pivoting positions.

27. A door lock according to claim 26,
characterized in that
the displacement direction of the bolting slide (59) extends
at right angles to the pivot axis (54) of the pivoting member
(44) and parallel to the pivoting plane (43) of the latch
levers (6).

28. A door lock according to one or more of the preceding
claims,

characterized in that
the bolting slide (59) bears under the pressure of a com-
pression spring (61) on a control cam (63) of the pivoting
member (44).

29. A door lock according to claim 28,
characterized in that
the end face of the bolting slide (59) pointing in the fixing
direction (62) and cooperating with the control cam (63)
projects in a wedge shape and forms an outer projecting
steering edge (64) and a far retracted inner steering edge
(65), in which arrangement, the pivoting member (44)

- controls on the one hand the displacement of the bolting
slide (59) by means of these steering edges (64, 65)
because of their positional offset that is effective in
the displacement direction (60) and
- on the other hand, the pivoting member (44) is fixed in
its two pivoting positions, in that the steering edges
(64, 65) alternately act on the control cam (63)
respectively on one of its sides with a pressure
component acting in the direction of the respective end
position.



30. A door lock according to one or more of the preceding claims,

characterized in that
the bolting slide (59) carries a switching device which
switches off the electromagnetic drive device for the driving
tappet (50) as soon as the pivoting member (44) assumes its
pivoting blocking position.

31. A door lock according to one or more of the preceding claims,

characterized in that
the bolting slide (59) is, for its part, designed as a
switching slide for controlling at least one circuit.

32. A door lock according to one or more of the preceding claims,

characterized by
a spring-loaded catch arranged in the casing opening (4) and a
detent groove (115) on the detent bolt (5) cooperating with
the catch in the manner of a ratchet mechanism, the detent
groove (115) being arranged in such a way that the catch
engages therein if the maximum penetration depth of the detent
bolt (5) into the insulated casing (2) corresponds to the
switching path required for moving the switching slide (1)
into its "on" position.

33. A door lock according to claim 32,

characterized in that
as catches, two detent rollers (116) with journals (117) with
a smaller diameter and formed at their end faces

- are arranged at opposite sides of the casing opening (4),
- extend parallel to each other and at right angles to the
median longitudinal axis of the switching slide (1),
- are movable with respect to the median longitudinal axis
(3) and
- are spring-loaded in the engagement direction (118).

34. A door lock according to claim 33,

characterized in that
the detent rollers (116) are guided in guide channels (119) of
the insulated casing (2) extending at right angles to the
median longitudinal axis (3), on the side walls of which chan-
nels they bear with their circumference and the end faces of
their journals (117), in which arrangement,

- one end (120) of the guide channels (119) leads into the
casing opening (4) and has a stop (121) for the journals
(117) and
- the other end is a blind end (122).



35. A door lock according to one of claims 32 to 34,
characterized by
a compression spring (123) bearing on the blind end (122) of
the guide channel (119) and a supporting component for the
detent rollers (116), which is arranged between the com-
pression spring (123) and the detent roller (116).

36. A door lock according to claim 35,
characterized in that
the supporting component is a substantially U-shaped bearing
shackle (124) carried in the guide channel (119), which
shackle, because of the compression spring (123), bears with
the end faces (125) of its arms on the circumferential faces
of the journals (117), and which presses the detent rollers
(116) with their journals (117) against the stops (121) at the
end (120) of the guide channels (119) which leads into the
casing opening (4).

37. A door lock according to claim 36,
characterized in that
the detent groove (115) has a V-shaped cross-section and is
dimensioned in such a way that the detent rollers engage
therein with approximately half of their cross-sectional area.

KA4