Oct. 27, 1931. A. A. THOMAS 1,829,312

SAFETY DOOR

Filed Nov. 24, 1928

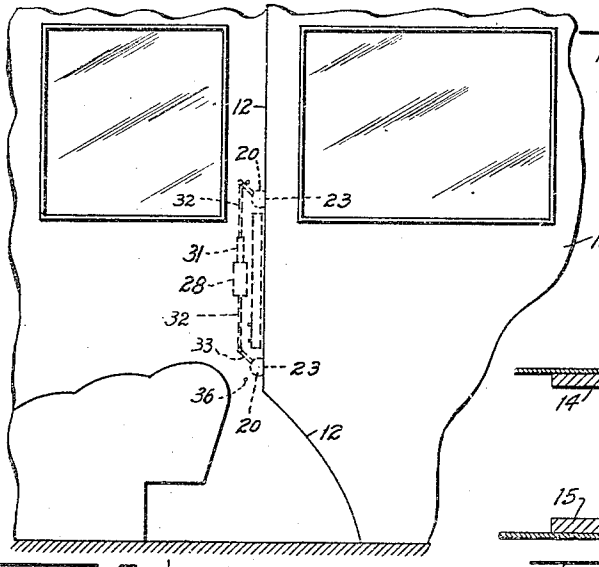


FIG. 1.

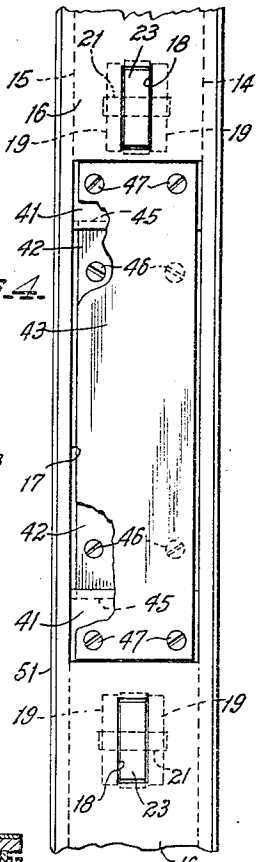


FIG. 4.

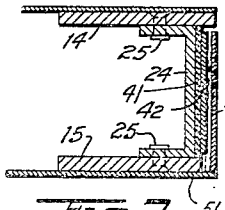


FIG. 7.

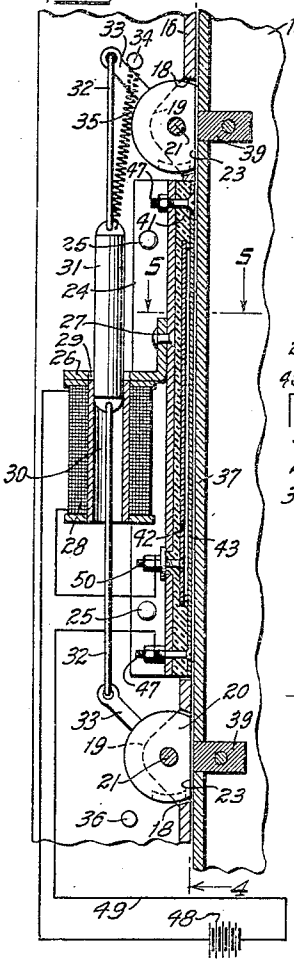


FIG. 2.

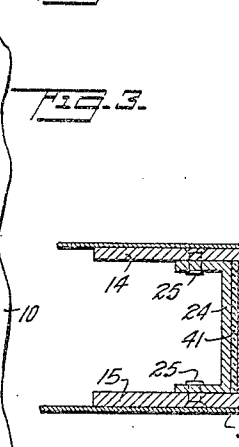


FIG. 5.

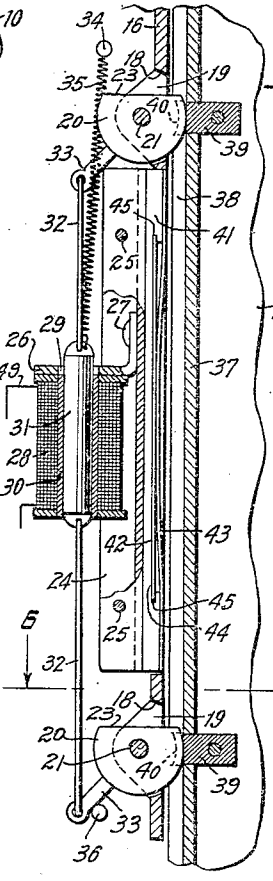


FIG. 3.

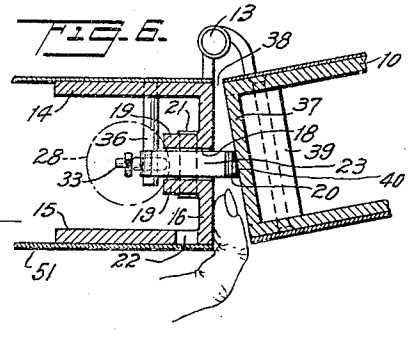


FIG. 6.

INVENTOR

Adolph A. Thomas

Patented Oct. 27, 1931

1,829,312

UNITED STATES PATENT OFFICE

ADOLPH A. THOMAS, OF NEW YORK, N. Y.

SAFETY DOOR

Application filed November 24, 1928. Serial No. 321,528.

My invention relates to doors and its object is to provide safety means for preventing the closing of a door when a person's fingers are in the door crack. To this end I mount finger-controlled stop mechanism in the door casing. This mechanism is normally inoperative and permits closing of the door in the usual way. When, however, a person's fingers are placed against the edge of the door casing, they press against a movable member which automatically projects one or more stops out of the casing edge, and those stops prevent the door from being closed on the fingers. As soon as the fingers are removed, the stops are automatically withdrawn and the door can be closed. In a preferred form of my invention, the stops are actuated by electric mechanism including a coil which is energized by the finger-pressed member closing an electric circuit. At the present time, my new safety device is particularly useful in automobiles, where people often get their fingers crushed in the door crack.

One embodiment of my invention is illustrated in the accompanying drawings, in which—

Fig. 1 shows an inside view of an automobile equipped with my safety door device, which is diagrammatically indicated in dotted outline;

Fig. 2 is a vertical cross-section of my device, the parts being in normal position;

Fig. 3, which is similar to Fig. 2, shows the parts in actuated position, with the stops projected to prevent closing of the door;

Fig. 4 is a face view (on line 4—4 of Fig. 2) of the door casing in which the safety device is mounted;

Fig. 5 represents a transverse section on line 5—5 of Fig. 2;

Fig. 6 is a transverse section on line 6—6 of Fig. 3, showing how the fingers are prevented from being crushed when the door encounters the projected stops in the casing; and

Fig. 7 shows a slightly modified construction, this view being a cross-section similar to Fig. 5.

The fragmentary view shown in Fig. 1 is supposed to represent the interior of any standard make of automobile in which a door 10 is hinged to the car body along the edge 12. One of the hinges is shown at 13 in Fig. 6. In this instance, the door casing is made of sheet metal and comprises an outer wall 14, an inner wall 15, and a transverse connecting wall 16 which forms the edge of the casing. The edge 16 has an elongated opening 17, and a pair of slots 18 arranged above and below the opening. The side walls of each slot 18 are formed by a pair of lugs 19, which may conveniently be formed as integral projections of the casing edge 16. A rotary stop 20 is mounted on a pin 21 carried by each pair of lugs 19. One of the casing walls 14 or 15 has a hole 22 in alignment with each pivot pin 21 to permit insertion of the latter between the supporting lugs 19. The rotary stops 20 are here shown in the form of disks of hard metal having a segment cut away to form a straight edge 23, which is normally flush with the edge 16 of the door casing to permit closing of the door 10, as will be clear from Fig. 2.

A base plate 24, which may be an ordinary channel bar, is mounted between the walls 14 and 15 of the door casing to which it is secured by rivets 25 or otherwise. A right-angled bracket 26, preferably of non-magnetic material, is mounted on channel bar 24 in any practical way, as by rivets 27, and a coil 28 is attached to the bottom of the bracket. The horizontal arm of bracket 26 has a hole 29 in axial alignment with a sleeve or tube 30 on which the coil is wound. A magnetic plunger 31 is connected at opposite ends by rods 32 with arms 33 projecting radially from the rotary stops 20. The upper arm 33 is normally held against a fixed stop 34 by a contracting coil spring 35. One end of spring 35 may be attached to the stop 34 and the other end to the plunger 31. The stop 34 may be a pin riveted to one of the casing walls 14 or 15, or it may be an integral lug struck up from the metal of the wall.

It is clear from Fig. 2 that, when the spring 35 holds the upper arm 33 against the fixed stop 34, the magnetic core or plunger 31 is above the coil and the edges 23 of stops 20

are substantially flush with the edge 16 of the door casing, so that the door can be closed in the usual way. If we now suppose the coil 28 to be energized by an electric current of sufficient strength, the magnetic plunger 31 is instantly pulled down into the position shown in Fig. 3. This downward movement is limited by a fixed stop 36 arranged in the path of the lower arm 33. The downward movement of the solenoid core 31 rotates the stops 20 through an angle of about ninety degrees into the locking position shown in Fig. 3. If an attempt should be made to close the door while the stops 20 are in actuated position, the edge 37 of the door would strike the projecting stops, so that the door could not be closed further than indicated in Figs. 3 and 6, thus leaving a safety gap 38 wide enough to prevent a person's fingers placed in the door crack from being injured. This will be clearly understood by looking at Fig. 6. If desired, the door edge 37 may have blocks 39 of hard metal inserted at points where they strike the stops 20. The contacting edge 40 of each stop disk 20 may be bevelled sufficiently to present a flat surface to the door edge 37 when the parts come into contact, as shown in Fig. 6.

I shall now describe how the coil 28 is automatically energized when a person in the car places his fingers against the edge 16 of the door casing, as happens so very frequently. The supporting bar 24 carries a strip 41 of insulating material, which may be a piece of molded bakelite, rubber, porcelain, and others along the same line. The insulating base 41 carries a pair of contact plates or strips 42 and 43 of good conducting metal. The arrangement of the contacts 42 and 43 is such that normally they are electrically separated to keep the circuit of coil 28 open. The contact 42 is a thin strip or bar mounted in a recess 44 of the insulating base 41. A simple way to fasten the strip 42 in place is to provide the ends of the recess 44 with undercut slots 45 into which the ends of the strip are inserted. If desired, screws 46 may also be used to fasten the contact strip 42 to the base 41. The outer contact 43 is connected to the insulating base 41 by bolts 47, which pass through the channel bar 24 and thus also serve as means for mounting the base on the channel bar, as clearly shown in Fig. 2. It is understood, of course, that the various parts referred to are mounted on the channel bar 24 before the latter is inserted in the door casing.

As seen in Fig. 4, the contact plate 43 practically covers the elongated opening 17 in the edge 16 of the door casing. The material of which the contact plate 43 is made imparts the right degree of flexibility or resilience, so that it is easily pushed inwardly against the door casing. The flexed position of contact plate 43 is shown in Fig. 3. The moment when the contacts 42 and 43 touch each other, the circuit of battery 48 is closed through the coil 28, which instantly pulls down the magnetic plunger 31 and moves the stops 20 into the door-stopping position shown in Figs. 3 and 6, thereby preventing injury to the fingers. One of the bolts 47 may be used as a binding post for the battery lead 49, which is therefore grounded to the metal of the car. The other binding post 50 is insulated from the channel bar 24 and is electrically connected to the insulated contact plate 42. Consequently, whenever the flexible contact plate 43 is pushed by the fingers against the fixed contact plate 42, the coil 28 is energized to move the stops 20 into safety position. It is immaterial, of course, which one of the contacts 42 and 43 is insulated or grounded; in fact, both may be insulated from the metal of the car, but that is a needless precaution. The length and position of the contact plate 43 are so chosen in each particular case as to cover that portion of the door casing where a person in the car would be liable to place his fingers. The drawings are therefore not to be taken as showing accurate dimensions applicable in all cases. Different makes and sizes of car will probably require different positioning of the safety device, particularly with respect to the flexible contact strip 43.

My new safety device can be installed in any make of car on the market. Except for the outer flexible contact 43, all parts of the mechanism are invisible, and even the contact plate 43 is hardly noticeable, because it is in effect merely a yieldable portion of the edge 16 of the door casing. It is supposed that the yieldable strip 43 will have the same color as the edge of the door casing, so that it is practically invisible even when the door is open. In some instances it may be desirable to extend the flexible strip 43 across the edge of the inner wall 15, as shown in Fig. 7, whereby the circuit of coil 28 is closed even when a person places his fingers against the corner of the casing edge without bending them in the manner illustrated in Fig. 6.

The flexible plate 43 need not itself be of metal, for it may be a tensioned strip of rubber or elastic fabric carrying a metallic contact on its inner side. The idea is to make the part 43 so easily movable that even the pressure of a baby's fingers will close the circuit through coil 28 and throw the stops 20 into safety position. It is apparent that only one stop need be used, but I think two are better. In the drawings I have shown the stops attached to that edge of the door casing where the door is hinged, but they may be attached to the opposite edge, depending on the way the door is hung. If the stops are opposite the hinged edge of the door, the free edge of the latter will strike the side of the stops and will thus be held ajar without hurting the fingers. The inside lining or covering 51,

usually of cloth or leather, extends to the edge of the door casing, and in the construction of Fig. 7 this lining yields along the edge when the plate 43 is pushed in by the fingers. As far as I know, I am the first to provide a door structure with stops which are automatically moved into door-stopping position when a person places his fingers in the door crack, and I claim this feature in a fundamental way, irrespective of the particular mechanism that operates the stop or stops.

Although I have shown and described a specific construction, I want it understood that my invention is not limited to any details set forth, unless they are included in the claims that define the scope of my invention. To prevent possible confusion, I will explain that when I speak of a door structure in the claims, I include not only the door itself but also the casing or frame on which the door is mounted.

I claim as my invention:

1. The combination of a door casing and a door hinged thereto, a stop normally in position to permit closing of the door, and mechanism controlled by the pressure of fingers placed against the edge of the casing to move said stop into the path of the door and thereby prevent closing thereof, said stop and actuating mechanism being mounted on said door casing.

2. The combination of a door casing and a door hinged thereto, a stop mounted in said casing normally in position to permit closing of the door by hand, and electric mechanism controlled by fingers placed in the door crack for automatically actuating said stop to prevent closing of the door, said stop when actuated always arresting the hinged door at the same predetermined angle from closed position.

3. A door casing provided with a movable stop which is normally inoperative and permits closing of a door hinged to said casing, a movable member mounted on said casing where a person would be liable to place his fingers when the door is open, and means for projecting said stop beyond the edge of the casing when said member is actuated by pressure of the fingers, said projecting stop preventing the door from being closed.

4. A door casing provided at one edge with an elongated opening, a movable plate normally closing said opening, said plate being adapted to be pushed inwardly by the fingers, a movable stop carried by said casing and normally held in a position to permit closing of the door hinged to the casing, and means operated by the inward movement of said plate to actuate said stop into a position to prevent closing of the door.

5. A door casing provided at one edge with a movable stop which is normally inoperative and permits closing of the door hinged to said casing, a yieldable member forming part of the casing edge where a person would be liable to place his fingers, and electric mechanism automatically energized when said member is moved by finger pressure to project said stop beyond the edge of the casing and thereby prevent closing of the door until the fingers are removed from said member.

6. A door casing comprising outer and inner walls, a pair of spaced flanges between said walls, a rotary stop pivoted to said flanges between the same and normally in a position to permit closing of a door hinged to said casing, a movable member arranged at an edge of said casing where a person would be liable to place his fingers, and connections mounted in said casing to rotate said stop into a position to prevent closing the door when said member is actuated by pressure of the fingers.

7. In a door structure, a casing having an edge provided with a movable electric contact, a second electric contact associated with said movable contact which is normally out of engagement with the second contact, said movable contact being adapted to be pushed against the second contact to close an electric circuit by the pressure of fingers held against the edge of the door casing, a stop carried by said casing and normally held in a position to permit closing of the door, and electric connections automatically operated when said contacts are brought together to project said stop out of the door casing and thereby prevent closing of the door until the fingers are removed.

8. A door casing provided at one edge with a pair of pivoted disks having each a segment cut away to form a straight edge which is normally flush with the adjacent edge of the casing, whereby a door hinged to said casing is normally free to be closed, a yieldable member forming part of the casing edge where a person would be liable to place his fingers, and electric mechanism automatically energized when said member is operated by the pressure of fingers to rotate said disks and project them beyond the edge of the casing, whereby said disks act as positive stops to prevent closing of the door until the fingers are removed from said yieldable member.

9. A door casing structure of sheet metal having outer and inner walls, a portion of one edge of said casing being cut away to provide an elongated opening, a base member mounted between said walls and secured thereto opposite said opening, movable stops carried by said casing walls above and below said opening and normally held in a position to permit closing of a door hinged to the casing structure, a movable plate carried by said base member to close said opening, said plate being adapted to be pushed inwardly by the fingers, electric mechanism mounted on said base member

and operatively connected to said stops to actuate the same into a position to prevent closing of the door, and circuit connections controlled by said movable plate to energize said mechanism.

10. A safety door structure comprising a door casing and a swinging door, and means carried by said casing for automatically stopping the closing door at a predetermined angle from closed position when a person's fingers are placed against the casing in the door crack.

11. A safety door structure comprising a door casing on which a door is movably supported, a movable stop mounted on a vertical portion of said casing and normally permitting the door to be closed, and means automatically controlled by the placing of a person's fingers against the door casing for projecting said stop to prevent closing of the door.

12. A safety door structure comprising a door casing on which a door is movably mounted, a movable stop normally in position to permit closing of the door, a yieldable member mounted on said door casing, and means automatically operated when pressure is applied to said yieldable member to actuate said stop and thereby prevent closing of the door.

13. A safety door structure comprising a door casing and a door movably mounted thereon, a movable stop normally in position to permit closing of the door, said door casing having a recess or chamber between its outer walls, and mechanism concealed in said recess and controlled by the pressure of fingers placed against the edge of the casing to move said stop into the path of the door and thereby prevent closing thereof.

14. A safety door structure comprising a door casing on which a door is movably supported, a pivoted disk mounted at one edge of the door casing, said disk having a segment cut away to form a straight edge which is normally flush with the adjacent edge of the casing, and means for actuating said disk to project the same beyond the edge of the casing and thereby prevent closing of the door.

15. A safety door structure provided with a normally inoperative stop mounted in the framework surrounding the door, and means carried by said framework for automatically projecting said stop to prevent closing of the door when a person's fingers are placed in the door crack, said stop always arresting the door at the same predetermined distance from closed position.

ADOLPH A. THOMAS.