July 1, 1969 J. MILLER 3,453,015

AUTOMOBILE DOOR EMERGENCY LOCK WITH INERTIA TRIGGERED DETENT LATCHING THE BOLT IN OPEN COCKED POSITION

Filed March 20, 1967 Sheet 1 of 2

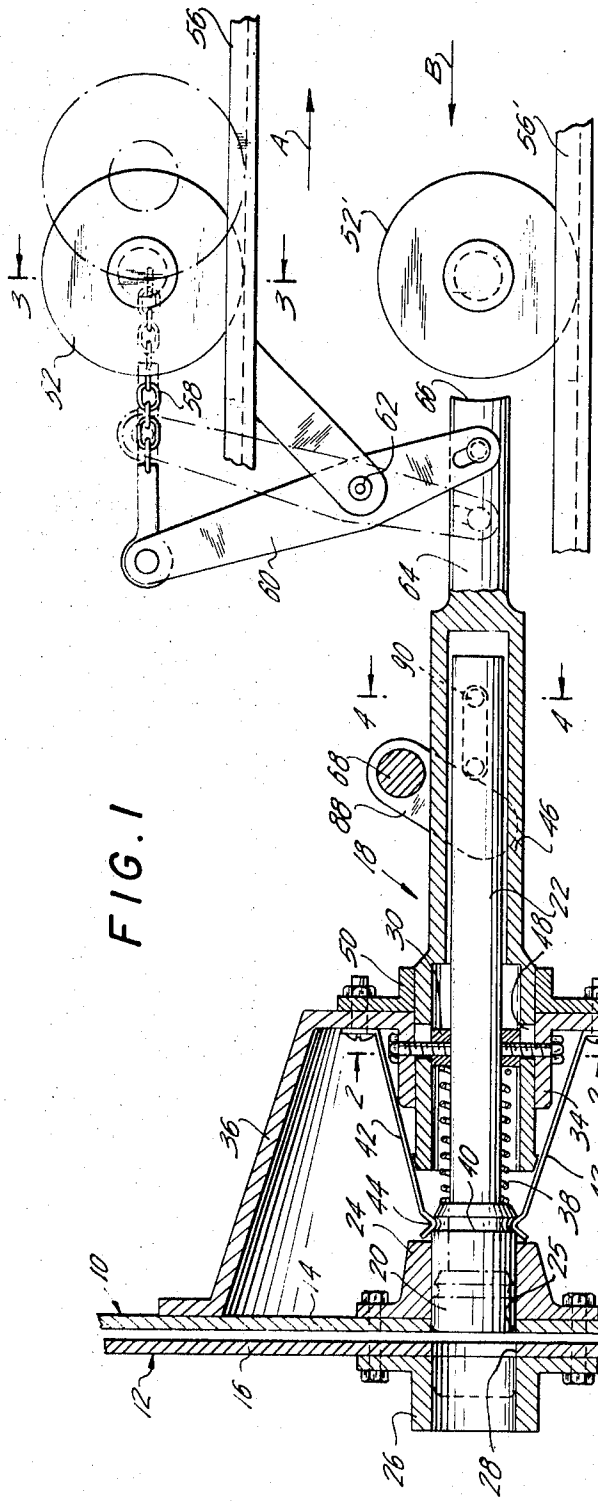


FIG. 1

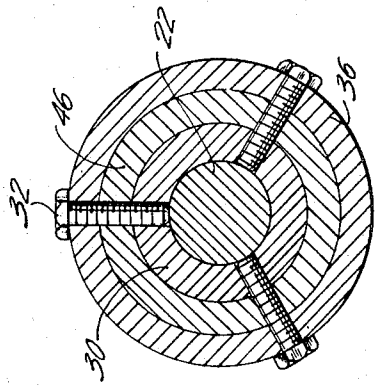


FIG. 2

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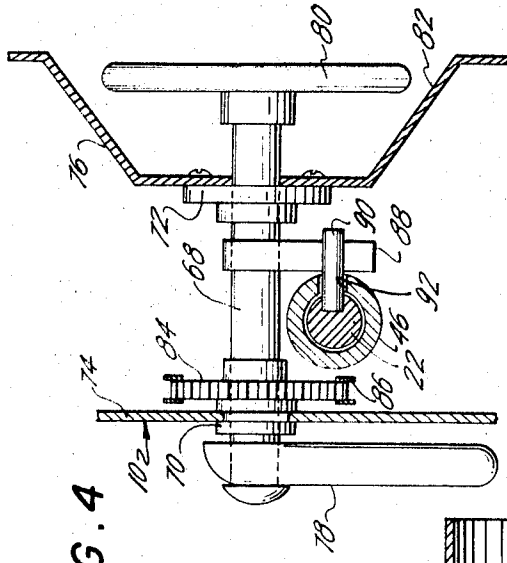


FIG. 4

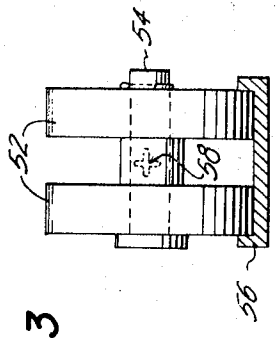


FIG. 3

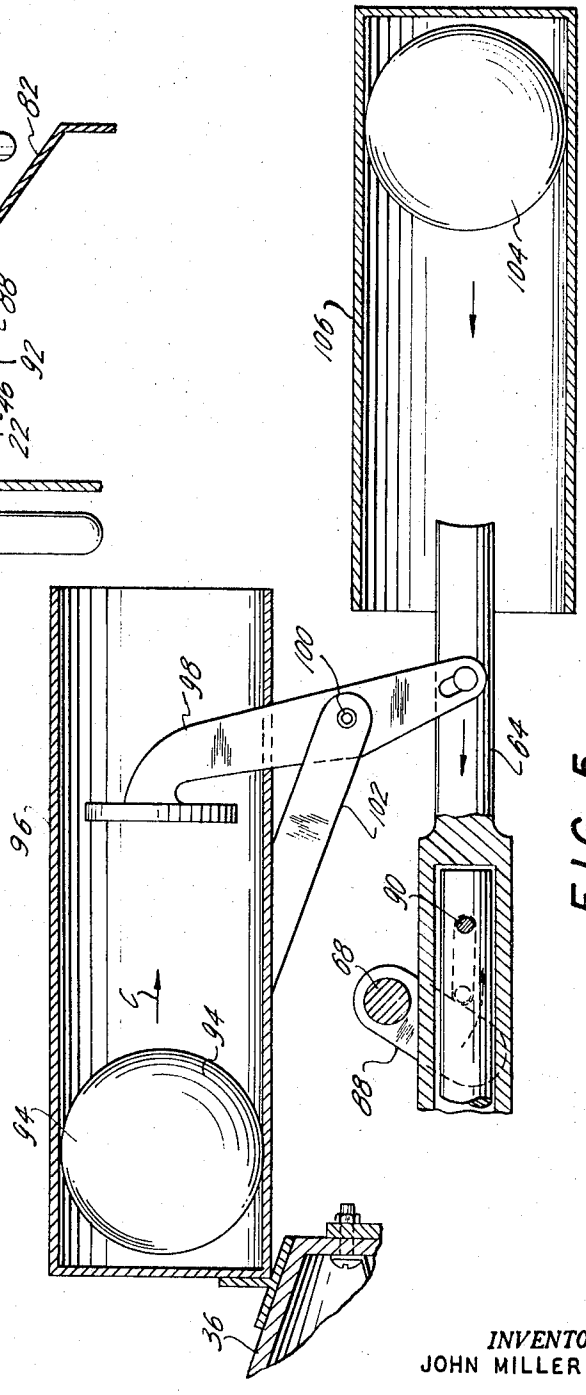


FIG. 5

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AUTOMOBILE DOOR EMERGENCY LOCK WITH INERTIA TRIGGERED DETENT LATCHING THE BOLT IN OPEN COCKED POSITION

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U.S. Cl. 292—186 9 Claims

ABSTRACT OF THE DISCLOSURE

An emergency lock for automobile doors. A detent normally holds a bolt cocked in retracted position against the force of a spring. An inertial mass responsive to sudden deceleration of the automobile triggers the detent so as to release the same and allow the spring to snap the bolt into a hole in a keeper plate.

Background of the invention

Field of the invention.—The invention pertains to door locks for automobiles and particularly to door locks which are open in the normal use of the automobile, but which, in the event of an accident or any other occurrence which is accompanied by rapid forward deceleration of the automobile, will render the door lock effective to bolt the door and thereby prevent passengers from being ejected from the automobile.

Description of the prior art.—It long has been recognized that one of the causes of serious injury or death is the ejection of passengers from automobile doors which open by themselves upon and due to impact occurring when the vehicle collides, either with another vehicle or with a stationary object. It has been found that the doors or their frames spring or twist to such an extent, or the forces of inertia operate in such a fashion, as to disengage the usual door lock from its keeper plate with consequent swinging open of the door and sudden uncontrolled ejection of the passengers through the open door.

Various proposals have been made to overcome this drawback. For example, automobiles conventionally include manually manipulatable latches which, when actuated, maintain the door locked against inertial forces. This arrangement, however, is not satisfactory because people forget to set the latches or children tamper with the latches, or the doors or frames twist so extensively that the latches and locks are ineffective in case of accident.

It also has been proposed to provide an electrically operated latching system which is under the sole control of the driver or is automatic in action, being rendered effective upon starting of this automobile. However, such installations are quite expensive, so much so that their universal adoption has not been forthcoming and, moreover, these systems are subject to electrical failure and in the first mentioned rely upon the dependability of the driver who may in an unguarded moment forget to set the system into operation with consequent dire results.

It also has been proposed to provide an inertia operated bolt which is spring biased to open (retracted) position and which includes an inertial mass that, upon the occurrence of an accident, supposedly shifts the bolt against the action of the spring into an opening in a keeper plate. However, these locks likewise have not been acceptable. There is no assurance that the inertial force generated is sufficient to insert the bolt in the keeper plate opening. There is no assurance that the bolt will remain in the keeper plate opening for the duration of the accident, so that the bolt may only momentarily be

engaged and then disengaged so as to permit the door to open and passengers to be expelled from the automobile.

Summary of the invention

It is an object of my present invention to provide a novel emergency lock of the character described for automobile doors which overcomes the foregoing disadvantages.

It is another object of my invention to provide a door lock of the character described which is simple and inexpensive in construction, has but few parts and lends itself readily to incorporation in a conventional automobile.

It is another object of my invention to provide a door lock of the character described which is positive in its locking operation, that is to say, which does not rely upon inertia to close the bolt or to hold it closed, although inertia is the force which triggers the latch that holds the bolt cocked open.

It is another object of my invention to provide a door lock of the character described with a detent that can be accurately designed to release upon a given rate of deceleration, but yet with a bolt that when triggered locks positively, forcefully and surely.

It is another object of my invention to provide a door lock of the character described which when once locked can be relied upon to remain in locked position until deliberately unlocked.

It is another object of my invention to provide a door lock of the character described which, if accidentally actuated upon a sudden brake controlled stop or a mild collison, can be easily reset into a cocked mode, ready again to be tripped, i.e. triggered, into an actuated mode.

Other objects of my invention in part will be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combination of elements and arrangements of parts which will be exemplified in the locks hereinafter described and of which the scope of application will be indicated in the appended claims.

In general, I achieve the objects of my invention by providing on a door of the automobile to be guarded, and preferably on each door, an emergency bolt separate and apart from the conventional hand operated door lock. The emergency bolt is mounted on the door for movement in a direction perpendicular to an edge of the door, preferably perpendicular to that edge which is parallel to and remote from the door hinge, although not necessarily so. The bolt is mounted for movement between a position in which its tip is contained within the door and a position in which its tip extends from the door edge. Cooperating with the bolt is a keeper hole, this constituting a registered opening in the door frame opposite the door edge from which the tip of the bolt is adapted to protrude. For normal operation of the door the bolt is in retrograde (retracted) position with its tip concealed within the door.

A spring is provided in association with the emergency bolt in such a fashion that it urges the bolt to its tip-extended position. However, a detent is included which normally latches the bolt cocked in retracted position.

Furthermore, I including an inertial mass which is mounted for movement along the line of forward travel of the automobile. A suitable kinematic train is provided which, when the deceleration of the automobile is sufficiently great, enables the inertial mass to generate a force sufficient to trigger the detent which holds the bolt in cocked retracted position. Hence, upon the occurrence of such a degree of deceleration, the detent will open and the spring will snap the bolt into the keeper opening, thereby automatically locking the door in the event of stop or collision of sufficient violence to possibly eject the automobile occupants from the car.

Brief description of the drawings

In the accompanying drawings in which are shown various possible embodiments of my invention:

FIG. 1 is a fragmentary, sectional view through a door lock constructed in accordance with my invention, the same being shown with the bolt in cocked retracted position and the inertial mass and bolt shown in solid lines in their unactuated position, and in dot and dash lines in their deceleratively actuated position. Two inertial masses are illustrated, the complete one for a front hinged door and the fragmentary one for a rear hinged door;

FIGS. 2, 3 and 4 are enlarged sectional views taken substantially along the lines **2—2**, **3—3** and **4—4**, respectively, of FIG. 1; and

FIG. 5 is a view similar to FIG. 1, showing a modified form of my invention.

Description of the preferred embodiments

The reference numeral **10** denotes an automobile door and the reference numeral **12** an automobile door frame. The door and door frame are conventional, the door including a standard hand operated lock, and the door frame a keeper plate which is adapted to cooperate with such lock. The door also includes the usual handle and a manually operable latch for rendering the door lock immobile. All of these elements are so standard and widely used that their details and even their general outline are unnecessary to disclose in the present case which is solely concerned with the emergency door lock.

The door **10** includes an edge **14** remote from and parallel to the hinge. Said edge faces a corresponding edge **16** of the door frame when the door is closed. As is customary in automobiles, the door **10** is hollow, containing within its interior the usual window regulator, the usual door lock and latch mechanisms, and, now, the emergency lock of my instant invention.

The reference numeral **18** denotes this new emergency lock for automobile doors. Said lock includes a bolt **20** comprising the head of a shaft **22** which may be functionally unitary with the bolt. The bolt is longitudinally slidable in a front-to-back direction (with the door closed) in a bearing **24** mounted on the inner surface of the door edge **14**. The bearing is aligned with a bolt opening **25** in the door edge. In registry with the bolt **20** is a keeper bushing **26** that is mounted on the interior surface of the door frame edge **16**. The keeper bushing is provided with an aperture which is slightly larger than the diameter of the bolt and is aligned therewith, so that it can receive the bolt when the bolt is moved from its retracted position, shown in solid lines in FIG. 1, to its protruding position, shown in dot and dash lines in the same figure. The bore of the keeper bushing is in line with a keeper aperture **28** of the same size, formed in the door frame edge **16**.

A second bolt bearing **30**, in the form of a ring, is in line with the bearing **24**. The second bearing engages the bolt shaft **22** and with the bearing **24** mounts the bolt for axial reciprocation from the cocked retracted (idle) position shown in solid lines in FIG. 1 to the extended (actuated) position shown in dot and dash lines in the same figure. The second bearing **30** is mounted on the ends of machine bolts **32** which are supported on a tubular flange **34** forming part of a shroud casing **36** that is attached to and supported by the inner surface of the door edge **14**.

As indicated previously, means is included to urge the bolt **20** to its extended position in which it is engaged in the keeper bushing **26**. Said means constitutes a helical coil spring **38** which encircles the bolt shaft **22** and is maintained under compression between the front face of the bearing **30** and the back edge of the bolt **20**. Said spring is always under compression, but the compression is increased when the bolt is withdrawn to its concealed (retracted) position, inasmuch as the bearing **30** is stationary, i.e., stationary with respect to the door **10** and said bolt.

Means also is included to maintain the bolt **20** latched in its cocked position in which its tip is withdrawn so as not to protrude from the door edge **14**, and in which the compression of the spring **38** is increased so that there is sufficient energy stored therein to snap the bolt to its protruding position shown in dot and dash lines in FIG. 1 when the bolt is unlatched. Said means effectively constitutes a detent which can be triggered to cancel its holding function. The detent is shown in latched position in FIG. 1. The detent is in two parts. One constitutes a part carried by the bolt and the other a part carried by a stationary part of the lock, such, for instance, as the shroud casing, More specifically, the detent constitutes an annular groove **40** around and near the rear end of the bolt **20**. The other part constitutes a bolt retainer in the form of one or more, as shown two, cantilever leaf springs **42**. The rear ends or bases of these springs are affixed, as by machine bolts, to the inner end of the shroud casing. The springs extend forwardly and at a converging angle to the bolt shaft toward the bolt **20**, terminating in nibs **44** that engage the annular groove **40** in cocked position of the bolt. The springs **42** are sufficiently strong so that when their nibs engage the groove **40** with the bolt **20** in cocked position, they will maintain the bolt in such position against the force exerted by the compressed spring **38**.

Furthermore, as pointed out above, means is provided to trigger, that is to say, to release, the detent, in this case the springs **42**, upon sudden deceleration of the automobile such as accompanies the occurrence of an accident.

For convenience of description, the trigger will be subdivided into two sections, to wit, an activator which is sensitive to deceleration accompanying an accident, and an operator which, under the influence of the activator, constitutes the section of the trigger that releases the detent and allows the spring **38** to snap the bolt **20** into the keeper bushing **26**. The operator will be first described.

The trigger operator is in the form of a tube **46** which slidably accommodates the rear half of the bolt shaft **22** within the bore of the tube. The front half of the tube is enlarged and is slidably received within the tubular flange **34**. The tube is formed with longitudinal slots **48** to pass the fixed bolts **32** and permit longitudinal movement of the tube when the trigger functions to release the detent and allow the cocked bolts to snap forward. Desirably, the inner surface of the enlarged forward half of the tube **46** slides on the outside of the second bearing **30** which thereby aids in guiding movement of the tube **46**. A further bearing **50** for the tube is secured, as by machine bolts, to the rear surface of the shroud casing **36**.

The front end of the tube **46** is adjacent the inner forward surface of the cantilever leaf springs **42** and may lightly bear against the same. However, in the rearmost position of the trigger operator said front end of the tube does not prevent latching coupling of the nibs **44** with the groove **40**. To facilitate unlatching operation of the operator, the forward end of the tube is in the form of a flange of frusto-conical forwardly tapering peripheral configuration, the angle of the cone approximately matching the sloping angle of the springs **42**.

The rear end of the bolt **20** is formed with a rearwardly tapering chamfered surface the angle of which approximately matches that of the outwardly flaring tips of the springs **42**.

The trigger activator constitutes an inertial mass or masses, such, for instance, as heavy discs **52** mounted for movement in the direction A of the automobile. As shown in FIG. 3, two such discs are provided which are rotatable on an axle **54**. The discs travel in a track **56** that, like the remainder of the latch, is concealed within the hollow door **10**.

The inertial masses are arranged to activate the trigger operator upon sudden deceleration of the automobile. For this purpose a flexible kinematic element, such, for instance, as a chain **58**, has one end connected to the

axle **54** and the other end connected to the upper end of a reversing link **60**. The link is pivoted, as at **62**, on a stationary bracket which, for convenience, may be supported from the track **56**. The lower end of the reversing link is pivotally connected, as by a slot and pin connection, to a rod **64** constituting an integral extension of the inner end of the tube **46**. The reversing lever is shown in solid lines in the cocked position of the detent and in dot and dash lines in the releasing position of the detent.

To understand the operation of my novel lock, let it be assumed that the bolt is cocked (the steps and parts for cocking the bolt will be described later), and that the lock is in a front hinged door, that is to say, a door in which the hinge is at the front end of the door and the bolt and keeper are at the rear edge of the door. Let it also be assumed that the doors closed and that the automobile is moving forwardly in the direction A. Now, if the automobile strikes another automobile or an inanimate object, causing sudden deceleration to take place, the intertial mass or masses continue forwardly causing the tube **46** to move rearwardly toward the edge **14** of the door. If the inertial deceleration is sufficiently great, and this is determined by the weight of the masses and the design of the springs **42**, the tube **46** will be urged rearwardly with sufficient force to lift the nibs **44** out of the groove **40**. The moment this occurs the spring **38** will snap the bolt rearwardly, automatically locking the door, regardless of whether the deceleration was barely enough to trigger, i.e., trip the detent, or was more violent. In any event, the bolt immediately and securely locks the door in closed position and will keep it in closed position until such time as it is manually released by operation of a cocking means which will be described subsequently.

If the door is a rear hinged door, the reversing lever **60** is not necessary and in this event the inertial mass, e.g., weight discs, **52**, riding in a track **56**, are arranged so that when the automobile moves forwardly in the direction B and sudden deceleration takes place, the axle between the discs will strike the free end **66** of the rod **64**, causing the tube **26** to trip the detent and release the bolt.

Means further is included to set, that is to say, to cock, the emergency bolt **20** by compressing the spring **38** and locating the nibs **44** in the groove **40**. Said means preferably includes handles or other suitable members, such as knobs, located on the interior and exterior sides of the door and serving solely for the purpose of cocking the emergency bolt, and, optionally, said means additionally includes an arrangement coupling the cocking means to the conventional door handle which is manipulated to open the door, so that the emergency bolt **20** can be cocked either as a separate operation or automatically and coincidentally with opening the door. The cocking of the emergency bolt obviously is necessary for the door to be opened. It would be adverse to good usage of my invention to prevent a door from being opened by the ordinary handle means because the emergency bolt had been triggered, as, for instance, because of a sudden braking deceleration of the automobile which might have been enough to trigger the detent, but did not involve an accident.

The setting and cocking means includes a shaft **68** extending transversely of the door (see FIG. 4) and journalled in bearings **70**, **72** respectively secured to the outer and inner panels **74**, **76** of the door. The ends of the shaft extend through openings provided in these panels. A setting and cocking handle **78** is attached to the outer end of the shaft and a similar handle **80** is attached to the inner end of the shaft. Optionally, the inner handle may be located in a recessed pocket **82**. Thus, the shaft **68** can be manipulated (cocked) by moving either the exterior handles **78** or the interior handle **80**. Furthermore, the shaft is provided with means kinematically connecting it to the conventional door handle (not shown). This is accomplished by fixing a sprocket **84** on the shaft between the panels **74**, **76**. A chain **86** is trained about the sprocket and is also trained about a similar sprocket (not shown) which is actuated upon manipulation of the standard door handle to release the conventional door lock upon opening a door. The shaft **68** extends across the top of the tube **46**.

A radial arm **88** is affixed to the shaft **68** between the panels **74**, **76** in a position adjacent the tube **46**, so that the arm extends alongside of the tube. The arm is pendant, that is to say, is roughly vertical, and is disposed at an angle which is transverse to the longitudinal axis of the tube **46** (see, for example, FIGS. 1 and 4).

The shaft **22** carries a laterally extending pin **90** which protrudes horizontally outwardly through a slot **92** in the tube **46**, thereby permitting longitudinal movement of the bolt shaft **22** with respect to said tube which is necessary either to cock the bolt or to allow the bolt to snap to its locking position. When the bolt is in its locked position, the pin **90** is adjacent the forward end of the slot **92**, as shown in the left-hand dotted position in FIG. 1.

After the detent has been tirggered and it is desired to reset and cock the bolt, the shaft **68** is rocked in such a direction that the radial arm **88** will engage the pin and move it toward the back of the slot **92**, thereby shifting the bolt shaft against the force of the spring **38** and thus compressing the spring **38**. This will move the bolt retrogradely so as to fully receive it in the bearing **24**, as shown in solid lines in FIG. 1. As this movement of the shaft **22** and bolt **20** take place, the chamfered rear edge of the bolt will cam against the flaring ends of the tips of the springs **42** so as to force them apart and permit the groove **40** to line up with the nibs **44**, whereupon the nibs will snap into the groove and latch therewith. Preferably, a light torsion spring (not shown) maintains the arm **88** in idle position as shown in FIG. 1.

It will be apparent from the foregoing that the cocking and setting of the bolt can be achieved by manipulating either the regular door handle, the exterior emergency lock handle **78**, or the interior emergency lock handle **80**.

An alternative form of my invention is shown in FIG. 5, the only difference between this form and the form first described residing in the trigger activator which in this figure is illustrated as an inertial mass in the form of a ball rather than in the form of discs, inasmuch as a ball is simpler to directionally control than a disc. All parts of the lock shown in FIG. 5 are the same as those shown in FIG. 1, except for the activator, and hence will not be redescribed.

The activator for a forwardly hinged door comprises a heavy ball **94** contained in a guide tube **96**. The arrow C indicates the forward direction of movement of the automobile with the door closed. When the automobile suddenly decelerates, the ball will move in the direction of the arrow C and will strike the upper end of a reversing lever **98** which is pivoted intermediate its ends, as at **100**, on a stationary bracket **102** supported, for example, from the tube **96** which in turn is supported on the shroud casing **36**. The lower end of the reversing lever is engaged to the rod **64** by a pin and slot connection, so that when the ball hits the upper end of the lever located in the tube, the lower end of the lever will shift the rod **64** forwardly so as to trigger, i.e., release the detent. As in the case of the first described form of the invention, the force of engagement between the springs **42** and the groove **40** is sufficient to prevent disengagement except when a minimum designed deceleration is reached. For rearwardly hinged doors a ball **104** in a tube **106** is provided to hit the free end of the rod **64** without the interposition of the reversing lever.

It thus will be seen that I have provided locks which achieve the several objects of my invention and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein described or shown in the accom-

panying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. An emergency lock for an automobile door hinged to a door frame, said lock comprising a keeper opening in the door frame, a bolt, means to mount the bolt on the door for movement into and out of the keeper opening, a spring biasing the bolt into coupling engagement with the keeper opening, a detent to hold the bolt cocked against the action of the spring in ineffective position out of the keeper opening, inertial means, means to guide said inertial means for movement in a front to back direction between a forward position and a rearward position, said inertial means shifting to such forward position upon a sudden deceleration of the automobile and means rendered operative by said inertial means as it moves to said forward position to trigger the detent and thereby permit the spring to snap the bolt into the keeper opening.

2. An emergency lock as set forth in claim 1 wherein manually manipulatable means is included on the exterior of the door to cock the bolt.

3. An emergency lock as set forth in claim 2 wherein said manually manipulatable means is located on both the exterior and interior of the door.

4. An emergency lock as set forth in claim 2 wherein the manually manipulatable means constitutes the handle for opening the door.

5. An emergency lock as set forth in claim 1 wherein means is included to bias the detent to a bolt holding position and wherein the inertial means overrides the biasing means upon sudden deceleration of the automobile.

6. An emergency lock as set forth in claim 1 wherein the inertial means includes a rolling disk located within the door and means to guide the rolling disk in a front-to-back direction relative to the automobile when the door is closed.

7. An emergency lock as set forth in claim 1 wherein the inertial means includes a rolling ball located within the door and means to guide the rolling ball in a front-to-back direction relative to the automobile when the door is closed.

8. An emergency lock as set forth in claim 1 wherein there is provided a shaft attached to the bolt, the spring being helical and encircling the shaft, the bolt having a diameter larger than the shaft, the spring under compression between the back of the bolt and a stationary part functionally integral with the door, said shaft having an element movable therewith and protruding transversely therefrom, a member engageable with said element and arranged to force the bolt against the spring so as to compress the same and cock the bolt, and manually manipulatable means to shift said member to a cocking position so as to ready the bolt for operation by the inertial means.

9. An emergency lock as set forth in claim 8 wherein the bolt has a transverse groove and the detent includes a second spring biased into the groove when the groove and detent are transversely registered and wherein the inertial means includes a member mounted for movement parallel to the shaft and engaging the second spring upon operation of the inertial means so as to lift the detent out of the groove whereby to release the bolt for operation by the helical spring.

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U.S. Cl. X.R.

180—82, 113