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RELEASABLE ESCAPE DOOR DEVICE

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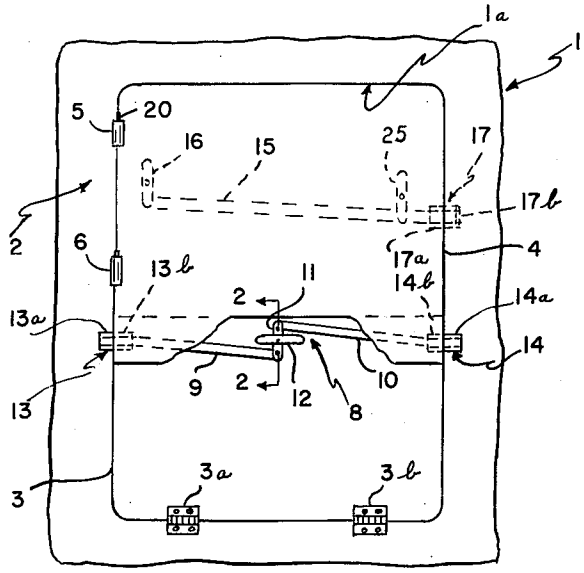


Fig-1

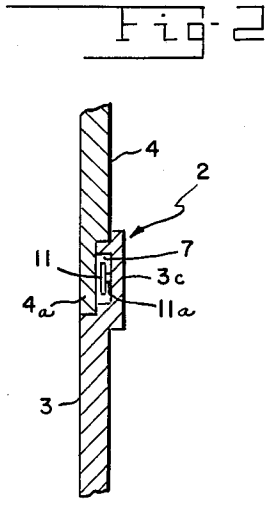


Fig-2

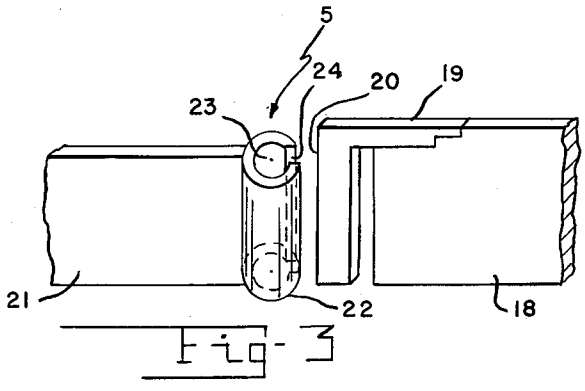


Fig-3

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RELEASABLE ESCAPE DOOR DEVICE

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The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royalty thereon.

This invention relates generally to an emergency escape door and, more particularly, to an escape door incorporating improved quick-release means facilitating its separation from a vehicle body. In the event of an accident involving a school bus or aircraft, or other vehicle, for example, an emergency escape door must be provided to permit rapid escape of passengers and/or crew therefrom. Such emergency escape doors have been used for many years; however, such doors were formerly attached to the vehicle body by means of the usual fixedly mounted hinges wherein the hinged portion affixed to the door was rigidly and unreleasably attached or interconnected with the hinged portion affixed to the door jamb. The main feature of the latter arrangement, especially when provided on an emergency door, resides in the frequent necessity for someone to hold the door in the open position in the event of an accident or other emergency, thus hampering rescue operations. In other words, the necessity for the would-be rescuer to maintain the emergency door open while, at the same time, attempting to extract trapped passengers from within the wrecked vehicle would, of course, greatly reduce the efficiency of the rescue operation and thereby probably substantially reduce the number of persons so rescued. To further improve the efficiency of the rescue operations where the fixed hinge door is involved, an additional rescuer would be required solely for the purpose of maintaining the emergency door open. Such a situation could not long be tolerated and some means of releasing the door was subsequently developed as will be hereinafter described in more detail.

The releasing means referred to above involved the use of a releasable hinge pin which could effect complete release of the escape door from its door jamb, for example. Here again, rescue operations were somewhat hampered due to the fact that said releasable hinge pin was made as an individual or completely separate element whereby it could be released only through manual removal from its seated position within the hinge to, in turn, release the door from its door jamb. With such a device, however, the removal of the separate hinge pin by hand is frequently quite difficult, if not impossible, as for example, when the pin has tended to become jammed within the hinge elements after being in position for some time. Of course, the aforesaid problem of a tendency towards jamming is further aggravated by the fact that only a comparatively small mass is available for the purpose of grasping with the hand and, sometimes, a tool is required before removal thereof can be effected. In any event, the use of an entirely separate hinge pin would frequently require an unreasonable length of time for removal in the event of an emergency. The device of the present invention eliminates or substantially alleviates any tendency of the hinge pin to jam in that it presents a quick-release means ensuring complete separation of the emergency door from its door jamb.

The primary object of the present invention, therefore, is to provide an emergency release device for an escape door incorporating improved means for facilitating quick-release thereof in an accident.

A further object of the invention utilizes a unique and novel releasable hinge device providing quick and automatic release of an emergency escape door from its door jamb despite tendency thereof to jam.

A still further object of the invention involves an emergency escape door incorporating improved hinge means permitting movement thereof to a partially opened, limited entrance and exit position and further movable to a completely open, completely separable position.

An additional object of the invention utilizes a unique and improved combined door device having separable hinge means and further incorporating novel and improved means insuring against premature or accidental complete opening of the entire emergency doorway.

Other objects and advantages of the invention will become apparent from the following description, taken in connection with the accompanying drawings, in which like reference characters refer to like parts in the several figures.

FIG. 1 is an outside rear end view, fragmentary in form, of a vehicle incorporating the emergency escape door of the invention.

FIG. 2 is a vertical sectional view taken on the line 2—2 of FIG. 1, illustrating additional details of the emergency release mechanism and combined door of the invention.

FIG. 3 is an enlarged somewhat perspective view, partially broken-away, of the hinge mechanism utilized with the invention of FIGS. 1 and 2.

Referring to the drawings and particularly to FIG. 1, the interior of the rear end portion of the vehicle utilized with the invention is generally indicated in fragmentary form by the reference numeral **1**. It is to be understood that said vehicle may constitute an aircraft, school bus or other similar type vehicle for transporting a number of passengers. Incorporated within vehicle rear end portion **1** is the relatively enlarged rear end door opening **1***a* in which opening **1***a* is mounted in closed position the combined emergency escape door of the invention as indicated generally at **2**.

The latter includes a lower door section **3** mounted for pivotal movement about a horizontally disposed hinge axis extending through the usual pair of hinges illustrated at **3***a* and **3***b*, and an upper door section **4** positioned in overlapping relation to lower door section **3** for movement between closed and open positions about a vertically disposed hinge axis through a pair of hinges illustrated generally at **5** and **6** in FIG. 1 and in more detail in FIG. 3 of the drawings. The aforesaid hinges **5**, **6** form a key feature of the invention especially when taken in consideration with the combined feature of the emergency escape door **2** as will hereinafter be described in detail.

The overlapping relation between lower and upper door sections **3**, **4** is illustrated in more detail in FIG. 2 of the drawings wherein, on the one hand, it is clearly seen that lower door section **3** incorporates an upper portion **3***c* which is offset to the front relative to the remainder of said door section **3** to provide an emergency door release mechanism-receiving recessed portion **7** for the accommodation of the emergency door release mechanism indicated generally at **8** in FIG. 1 as mounted on the outside thereof. On the other hand, upper door section **4** incorporates a lower depending and lower door-overlapping portion **4***a* (note FIG. 2) which overlapping portion **4***a* seals-off the recessed portion **7** of lower door section **3** and the emergency door release mechanism **8** mounted therewithin when said upper door section **4** is in its closed position as illustrated in FIG. 1 of the drawings. This latter arrangement provides definite assurance

against any premature or accidental release-operation of the aforesaid emergency door release mechanism **8**. The latter mechanism **8** consists of a toggle system including a pair of latch arms **9** and **10** extending or projecting outwardly to the left and right, respectively, as viewed in FIG. 1 of the drawings, from pivotal connection at the inner ends thereof to the lower and upper ends, respectively, of a relatively short, main toggle arm **11** which toggle arm **11** is pivotally positioned on the aforesaid lower door section **3** within the aforesaid recessed portion **7** thereof as indicated generally at **11***a* in FIG. 2. An emergency door-release handle **12** is rigidly attached at the mid-point to said toggle arm **11** for operation of the latter and the pair of latch arms **9**, **10** pivoted thereto. Said latch arms **9**, **10** are relatively elongated and each terminates in an outer end slidably positioned within a pair of keeper elements indicated respectively at **13** and **14** therefor. Each of the aforesaid pair of keeper elements **13**, **14** includes a first keeper element portion, as indicated respectively at **13***a* and **14***a*, affixed to the respective portion of the door jamb, and a second keeper element portion in alignment and mating therewith affixed to the respective portion of the door, as indicated respectively at **13***b* and **14***b*. Thus, when toggle arm **11** is positioned in the vertical position of FIG. 1, for example, the aforementioned outer ends of the latch arms **9** and **10** are fully engaged within the first and second keeper element portions **13***a*, **13***b* and **14***a*, **14***b* of the aforesaid pair of keeper elements **13**, **14** to positively latch or lock lower door section **3** in its closed position. Said toggle arm **11** may then be operated for rotation in the clockwise direction to its horizontal position by means of the operating handle **12** to thereby withdraw latch arms **9** and **10** inwardly to their fully retracted positions to thus slidably disengage the outer ends thereof from within first keeper element portions **13***a*, **14***a* to release or unlock lower door section **3**.

As hereinbefore stated, upper door section **4** incorporates a lower depending, overlapping portion **4***a* which portion **4***a* is disposed in overlapping relation to the previously-described upper portion **3***c* of lower door section **3**. As is seen clearly in FIG. 2 of the drawings, moreover, the previously-described emergency door-release mechanism indicated generally at **8** is positioned on the upper portion of lower door section **3** entirely within the recessed portion **7** thereof and, in this manner, it is entirely covered and/or protected from outside interference or operation thereof by means of the lower portion **4***a* (note FIG. 2) of the upper door section **4** so long as the latter remains in its locked or closed position. To operate the aforesaid upper door portion **4** between its closed and open positions, a latch arm **15** is provided on the inside of upper door section **4** as illustrated in dotted lines in FIG. 1 of the drawings. An operating handle **16** is shown pivotally attached at one end thereof to the inner end of latch arm **15**, the opposite outer end of the latter being slidably engaged within a pair of upper keeper elements indicated generally at **17** as including an inner keeper element portion **17***a* affixed to the upper door section **4** adjacent the edge thereof nearest its open side and an outer keeper element portion **17***b* fixedly mounted on the door jamb in mating relation to said inner keeper element **17***a*. Thus, in the position of FIG. 1, the outer end of latch arm **15** is in its fully engaged position within the pair of mating keeper elements **17** to thereby retain upper door section **4** in its closed or latched position. To open upper door section **4**, the operating handle **16** is pivoted in the clockwise direction (as viewed in FIG. 1) to slidably withdraw latch arm **15** to its fully retracted position thereby shifting the outer end thereof to its disengaged position relative to said keeper elements **17** and, more particularly, with respect to outer keeper element portion **17***b*. The latter operation unlocks or unlatches upper door section **4** and its complete or partial opening may then be effected from inside the vehicle by someone grasping and manually pushing outwardly against the door handle provided at **25**. Said upper door section **4** may then be opened to a limited extent, if desired, to provide limited entry or exit therefrom or, by means of the separable pair of hinges **5** and **6** be completely and automatically separated or jettisoned from the vehicle in one movement as will be hereinafter described in detail relative to FIG. 3 of the drawings.

Referring specifically to FIG. 3 of the drawings, reference will hereinafter be had relative to the upper hinge **5**, it being understood that lower hinge **6** is identical thereto. Said upper hinge **5** includes a first hinge plate portion indicated generally at **18** in partially broken-away form which hinge plate portion **18** is adaptable for rigid attachment to upper door section **4** adjacent the inner edge thereof. Affixed to said hinge plate portion **18** or made integral therewith as by means of the hinge pin arm **19** is the hinge pin **20** extending at right angles thereto in a downward direction parallel to one side edge of hinge plate portion **18**. A second hinge plate portion **21** is made adaptable for rigid attachment to the door jamb adjacent to and in appropriate alignment and only slightly out of contact with said first hinge plate portion **18**. Integrally formed with one side edge of said second hinge plate portion **21** is positioned the relatively elongated, cylindrical collar portion **22**, which collar portion **22** includes an enlarged opening indicated generally at **23** extending axially therethrough which axial opening **23** is provided for receiving the aforesaid relatively elongated hinge pin **20** of first hinge plate portion **18** in fully seated or engaged position therein when hinge **5** is fully assembled and in operative condition. A key feature of the aforesaid collar portion **22** resides in the provision of a longitudinally extending slot formed therein and indicated generally at **24** which slot **24** is in open communication with the enlarged axial opening **23** throughout its entire length of collar portion **22** and terminates in open, opposite end portions at both the top and bottom thereof. It is noted that the diameter of enlarged opening **23** corresponds to the width of the relatively elongated hinge pin **20** so that the latter is disposed in sung-fit relation in the former when said hinge pin **20** is positioned therewithin, as when the emergency escape door **2** is in its assembled and closed condition. When the aforesaid emergency escape door **2** is in its fully closed position and hinge pin **20** is engaged within the axial opening **23**, hinge pin arm **19** extends therefrom in contact along the circumference of said collar portion **22** at an angular position relative thereto substantially remote from said longitudinal slot **24**. As hereinbefore stated, emergency escape door **2** may be partially opened outwardly to a point wherein said hinge pin arm **19** has been pivoted relative to the circumference of said collar portion **22** to an angular position just short of alignment between the aforesaid hinge pin arm **19** and the aforesaid longitudinal slot **24** whereby the hinged relation between door plate **18** and door jamb plate **21** still remains positively interconnected. At this point, emergency escape door **2** has been opened to a sufficient extent to permit limited entry and exit thereform. However, in the event of an accident or an emergency situation in which rapid escape of passengers from within the wrecked vehicle is of the utmost importance, emergency escape door **2** may then be pivoted to its fully open position wherein the aforesaid hinge pin arm **19** is pivoted relative to the circumference of said collar portion **22** to a position in exact alignment with said longitudinal slot **24** to enable complete separation or jettisoning of said emergency escape door **2** from its hinged supports. The latter event, of course, results in the previously-mentioned uncovering or exposure of the previously-described emergency door-release operating handle **12** mounted in the recessed portion **7** incorporated in lower door section **3**. The afore-

said handle 12 may then be actuated to unlock or unlatch said lower door section 3 to thus permit the latter to drop downwardly away from rear end door opening 1*a* to its bottom or lower position about its horizontally disposed hinges 3*a* and 3*b*. In this manner, both upper door section 4 and lower door section 3 have been opened to clear the entire rear end door opening 1*a* and thereby permit rapid escape therefrom.

Thus, a new and improved and yet simplified emergency door-release mechanism has been developed by the present invention wherein both more rapid and certain separation of the door from its opening are facilitated. Moreover, the emergency release mechanism of the instant invention also incorporates novel and yet simplified and improved combined door means for protecting against premature or spurious release of the emergency escape door by persons either from within or outside the particular vehicle.

I claim:

1. An emergency escape door adapted for mounting within the rear-end door opening of a passenger vehicle in combination with an emergency door-release mechanism and comprising a lower door section mounted for pivotal movement between closed and open positions about a hinge axis horizontally disposed along the bottom edge thereof and an upper door section mounted for pivotal movement between closed and open positions about a vertically disposed hinge axis including a pair of vertically-arranged, separable hinges providing positive interconnection between said emergency escape door and the door jamb associated therewith on pivotal movement thereof to a predetermined angle only, each of said separable hinges comprising a door plate having rigidly formed therewith a hinge pin arm and a relatively elongated hinge pin integrally formed therewith, and a door jamb plate having a relatively elongated cylindrical body element integrally formed thereto and incorporating a relatively enlarged axial bore opening extending therethrough for receiving said hinge pin in snug-fit engagement therein when in assembled condition with said emergency escape door in the closed position or opened to a predetermined angle and a relatively restricted longitudinal opening formed in the side wall of said cylindrical body element and extending from top to bottom in open communication with said axial bore opening for aligned, disengaging relation with said hinge pin arm on pivoting of said emergency escape door beyond the predetermined angle, said emergency door-release mechanism being positioned on the interior of the upper portion of said lower door section within a recessed portion integrally formed therein and comprising a main toggle arm pivotally mounted within said recessed portion and a pair of relatively elongated latch arms inwardly pivoted on opposite ends of said main toggle arm and extending outwardly thereof in opposite directions thereto terminating in oppositely disposed outer end portions extending in overlapping relation to the respective opposite sides of said emergency escape door and the appropriate door jamb portion adjacent thereto when in the latched position, a pair of keeper elements arranged on each side of said emergency escape door and rigidly mounted between said door and the door jamb for slidably receiving said outer end portions of said pair of latch arms when in normal fully engaged, latched position therein and an emergency operating handle affixed to said main toggle arm for rotation of said main toggle arm and the inner ends of said pair of latch arms to retract said pair of latch arms inwardly to their disengaged, unlatched position relative to said pair of keeper elements subsequent to release operation of said upper door section.

2. In an emergency escape door as in claim 1, said upper door section incorporating a lower depending portion normally mounted in overlapping, sealed relation relative to the recessed portion of said lower door section and the emergency door-release mechanism mounted therein and movable away therefrom on opening of said upper door section to expose said emergency operating handle mounted on said lower door section.

3. In an emergency escape door as in claim 1, said emergency door-release mechanism further comprising an emergency operating handle adapted for pivotal mount on said upper door section substantially adjacent the hinge axis thereof, a relatively elongated latch arm positioned on the interior of said upper door section and extending thereacross from an inner end portion pivotally positioned on one end of said operating handle to an outer end portion positioned in overlapping relation to the open end of said upper door section and a pair of keeper elements positioned in fixed relation respectively between the outer edge of said upper door section and door jamb and in aligned and contiguous relation to each other for slidably receiving said outer end portion of said latch arm when the latter is in its fully engaged, latched position.

4. An emergency escape door-release mechanism comprising a combined emergency door including upper and lower portions mounted independently of each other, and a quick-release mechanism operatively associated with each of said upper and lower portions, said upper door portion including a depending portion disposed in overlapping relation to an upper part of said lower portion and said lower portion including a relatively narrow band part offset to the rear to provide a laterally extending recessed portion hidden by the overlapping, depending portion of said upper door portion, said quick-release mechanism comprising a pair of toggle arms extending from an intermediate position within said laterally extending, recessed portion outwardly thereof in opposite directions to terminate in slidably disposed, corresponding outer end portions arranged in latched relation relative to said emergency door lower portion and the door jamb adjacent thereto when in their extended condition, and an emergency door-release handle pivotally positioned at an intermediate position within said recessed portion and including a toggle-arm operating element pivotally attached at opposite ends to the respective inner ends of said pair of toggle arms and fixed to said emergency door-release handle for pivotal movement therewith on release operation thereof to retract said toggle arms inwardly to their withdrawn, outer end portion-disengaged position, the upper portion of said combined emergency door being mounted for movement between closed and open positions about a vertical hinge axis incorporating a pair of spaced, vertically disposed break-away hinges, said break-away hinges each comprising a hinge pin portion rigidly fixed to, and movable with, said emergency door upper portion and a cylindrical collar element affixed to said door jamb adjacent to and in alignment with the hinge pin positioned on said upper door portion, said collar element including a relatively elongated axially-extending opening adapted to accommodate said hinge pin in operative relation therein and a longitudinally extending side wall opening formed in said collar element in continuous communication with said axially extending opening, said hinge pin incorporating a hinge pin arm element extending at right angles thereto and integrally formed with a hinge plate and initially retaining said hinge pin in engaged position within said collar element axial opening when said emergency door is in its closed position and in limited open position and subsequently being aligned with said longitudinal opening for complete disengagement of said hinge pin from said collar element when said emergency door is rotated to its fully opened position.

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