Dec. 12, 1961 P. S. JEAVONS 3,012,804

RELEASABLE FASTENING DEVICES

Filed Oct. 15, 1957 2 Sheets-Sheet 1

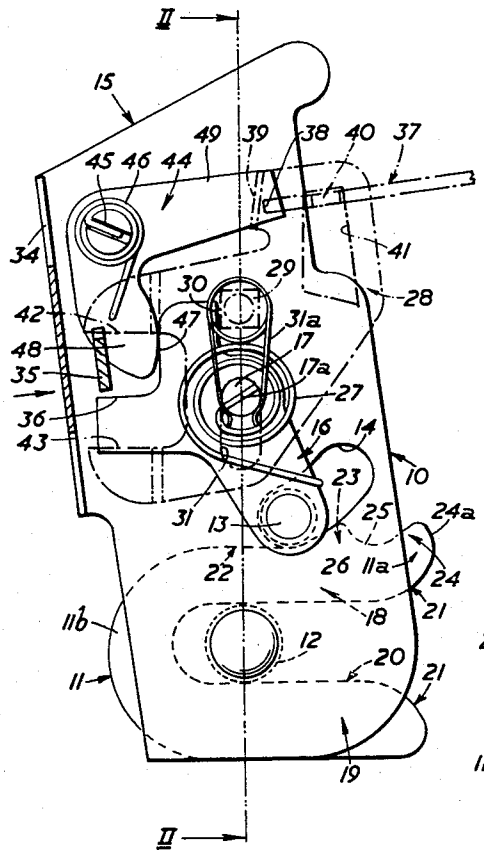


FIG. 1.

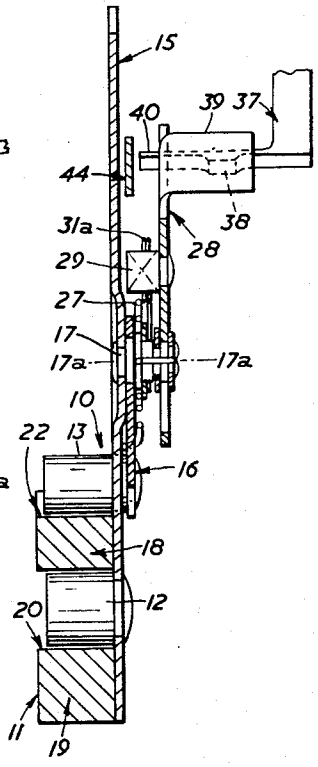


FIG. 2.

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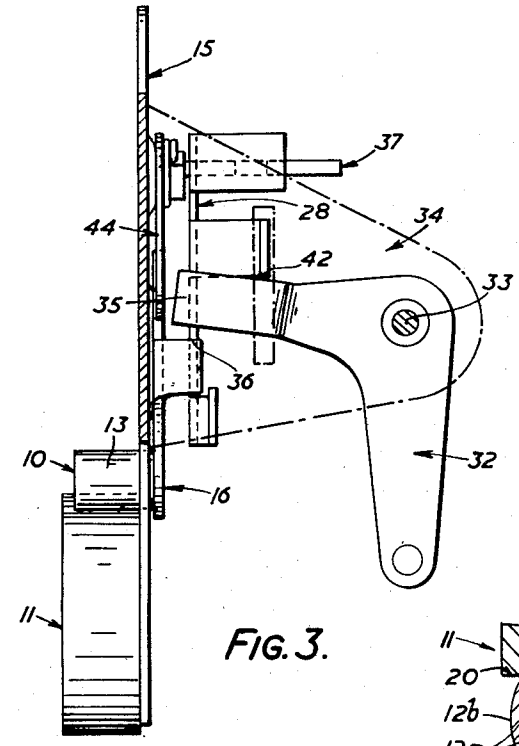


FIG. 3.

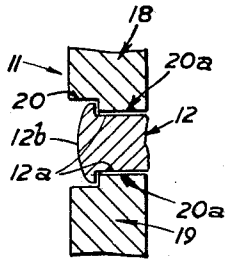


FIG. 5.

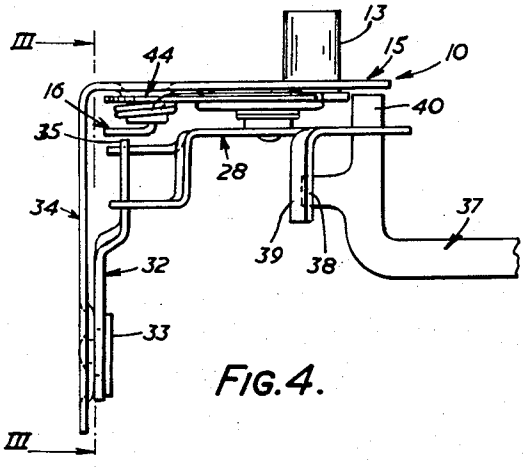


FIG. 4.

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RELEASABLE FASTENING DEVICES

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11 Claims. (Cl. 292—221)

This invention relates to releasable fastening devices, more especially for doors, and has particular though not exclusive reference to vehicle door fastenings.

Apart from merely preventing the doors from inadvertently opening, motor vehicle door fastenings have to comply with a variety of other requirements. For example, in modern saloon body construction it is important that the doors, when closed into the door openings, should adequately reinforce the body structure and ensure its structural stability. Accordingly, in addition to the restraint against door opening, the door fastening has to exert restraint against upward and downward movement of the doors relatively to the body and also restraint against unlimited further inward movement of the doors beyond their closed positions.

The foregoing further inward movement or "overtravel" occurs when a car door is slammed before being returned due to the resilience of the peripheral door seals and the elastic deformation of both body and door. It is accordingly very desirable that motor vehicle door fastenings should be able to tolerate a considerable amount of overtravel in order to perform the door-fastening operation. It will be understood also that the door-fastening operation has to be effected very rapidly, i.e. while the door is completing the last inch or thereabouts of its inward travel. In addition to the foregoing requirements the door fastenings must be readily releasable despite the pressure due to the peripheral seals which acts constantly outwards and results in quite a large outward force at the latch point.

By reason of the diverse requirements which they have to satisfy, and of the arduous conditions under which they operate, motor vehicle door fastenings are complex mechanisms, comprising not only the outside or visible interengaging elements fixed on to the door pillar and body pillar of the vehicle but also inside locking mechanism, i.e. components hidden from view within the panelling, which constitutes the lock mechanism proper of th door fastening.

It is the main object of the present invention to provide an improved releasable fastening device which, while intended for any fastening application to which it is suited, lends itself to construction as a motor vehicle door fastening capable of complying with the various requirements already mentioned while yet having fewer parts and being considerably less costly than motor vehicle door fastenings as at present constructed. Another object is to provide a releasable fastening device which will comply with the foregoing requirements without spring loading of its parts being absolutely essential to its operation. Further, the invention aims at providing a releasable fastening device with which only light operating loads will be required to release the fastening.

According to one aspect of the invention the releasable fastening device comprises two plate-like parts between which relative translatory movement in parallel planes occurs during the fastening operation and, due to a portion of one of the parts projecting into the plane of the other part to engage the latter, causes angular movement of the one part relatively to the other, about a horizontal axis substantially normal to the planes of said translatory movement, into a fastening position.

The said other part preferably comprises two surface

portions with one or the other of which the projecting portion of the first part engages during the fastening operation, said surface portions being of such form that forces exerted between them and said projecting portion due to relative translatory movement in the reverse direction pass substantially through said axis whereby substantially no torque is applied to the first part. One of said surface portions is engaged by the projecting portion of the first part in the fully locked engagement of the parts while the other provides a "safety lock" condition when full lock is not achieved.

According to another aspect the invention comprises a releasable fastening device where in a latch plate mounted for angular movement about a centre has a projecting portion which engages with a cam surface formed on an outer peripheral edge of the one jaw of a substantially C-shaped striker plate as a result of relative translatory movement between the latch plate and the striker plate during the fastening operation ,and enters into wedging contact with said surface on relative translatory movement in the reverse direction, the cavity of the C shape being elongated to form a guide for a member fixed in relation to the centre about which the latch plate is angularly movable.

One form of construction of a releasable fastening device in accordance with the invention and suitable for application as a motor vehicle door fastening will now be described, by way of example, with the reference to the accompanying schematic drawings, in which:

FIGURE 1 is a side elevation of the fastening device with the parts in the fastening position,

FIGURE 2 is a sectional view of the fastening device shown in FIGURE 1 on the line II—II of that figure,

FIGURE 3 is a view of the fastening device of FIGURE 1 looking in the direction of the arrow shown in that figure,

FIGURE 4 is a top view of the fastening device, the striker plate forming one of the engaging parts being omitted, and

FIGURE 5 is a detail view.

Referring to the drawings, the fastening device indicated generally at **10** therein comprises a striker **11** in the form of a plate mounted on the body pillar (not illustrated) of the vehicle so as to be stationary not only in the translatory sense during the fastening operation but also in the angular sense. The door pillar of the vehicle has mounted thereon a striker pin **12**, which is fixed, and a latch pin **13** which projects through an arcuate opening **14** in the panelling of the door pillar and in a backplate **15** mounted thereon, in order to permit movement of the latch pin along the arcuate opening due to its engagement by the striker **11**. The latch pin **13** is carried by a latch plate **16** in the form of a lever mounted behind the panelling of the door pillar for angular movement about a main pivot pin **17** secured to the backplate **15** and the axis **17***a* of which coincides with the aforesaid axis about which relative angular movement of one part relatively to the other part occurs. The arcuate opening **14** is struck from the axis of the pivot pin **17** to allow the necessary arcuate movement of the latch pin **13**.

The striker **11** is preferably of substantially C shape placed upright with its upper and lower jaws **18**, **19** elongated in the horizontal direction to afford a narrow horizontal slot **20** outwardly flared as shown at **21** at the leading end **11***a* of the striker formed by the free ends of the jaws. Into this flared portion **21** the striker pin **12** fixed to the door pillar engages during a door-closing movement whereby the door is brought gradually to the correct height for relative engagement between the latch pin **13** and the upper edge or surface **22** of the C shape of the striker. Such upper edge or surface **22** is of cam

form, being provided with two protuberances or teeth 23, 24 separated by a trough 25 and the effect on the latch pin 13 when it is engaged by the leading end 11*a* of the upper jaw 18 of the striker 11 is for the pin to ride up the inclined surface 24*a* of the first tooth 24 and then to fall back into the trough 25 between the two teeth which provides a position of "safety lock." In this position the aforestaid parts, which consist of the latch plate 16 and the striker 11, are restrained against release by translatory movement between the door and the body in the reverse direction, should the door-closing movement have been made with insufficient force to take the latch pin 13 over the second tooth 23.

It will be understood that when the door is slammed with sufficient force to perform fully the door-fastening operation the latch pin 13 rides also over the second tooth 23 and thereafter falls back against the downwardly and rearwardly inclined surface 26 between such second tooth and the closed end 11*b* of the striker 11 which forms the position of full lock. The trailing faces of both teeth 23, 24 are shaped as arcs struck substantially from the axis of the pivot pin 17 when in the position it occupies relatively to the striker 11 in the full lock and safety lock positions respectively, with the result that both teeth are of such form that forces between the latch pin 13 and the striker 11 at these points pass substantially through the axis 17*a* about which the latch plate 16 is angularly movable and consequently exert no torque on the latter.

The axis 17*a* about which the latch plate 16 is angularly movable is preferably disposed substantially vertically above the striker pin 12. A torsion spring 27 is arranged around the pivot pin 17 and urges the latch plate 16 in a clockwise direction towards the engaged position. Also rotatably mounted on the pivot pin 17 is a contactor 28 which carries above the pivot pin a square peg 29 which engages with an edge 30 of the latch plate 16. An elongated substantially vertical slot 31 is formed in the contactor 28 to accept the pivot pin 17 so that the contactor is capable of substantially vertical sliding movement between upper and lower extreme positions and is indexed in either of these positions by a spring 31*a*.

Control of the contactor 28 and latch plate 16 may be achieved through the agency of any desired form of mechanism. In the embodiment illustrated such mechanism includes a remote control lever 32 in the form of a bellcrank, pivoted for movement in a plane transversely of the latch plate on a pivot pin 33 secured to a portion 34 of the backplate 15 which projects substantially normally from the remainder of such plate. Actuation of the remote control lever 32 in an anti-clockwise direction by the operation of an inside door handle (not illustrated), causes an extremity 35 of the lever to bear downwardly on an edge 36 of the latch plate 16 and turn the latter about the pivot pin 17 in an anti-clockwise direction to release the latch pin 13 from the striker 11. The same result may be achieved by direct pushbutton pressure, the pushbutton (not illustrated) having a shaft 37 the inner end 38 of which presses on a platform 39 formed on the contactor 28. Rotation of the latter causes the peg 29 carried thereby to make contact with the edge 30 of the latch plate 16 and release the latch pin 13 from the striker 11.

In the fully locked position of the parts the striker pin 12 lies in the guide formed by the elongated cavity or slot 20 of the C shape of the striker 11 towards the closed end 11*b* of the latter while the latch pin 13 bears against the trailing face 26 of the second tooth 23, i.e. pin 12 is positioned forwardly of the striker pin and the pivot pin 17 about which the latch plate is angularly movable. This staggered disposition of the striker pin 12 and latch pin 13 ensures that the upper jaw 18 of the C shape is trapped rigidly in a vertical direction.

In order to lock the vehicle door against release by means of the pushbutton, the latter is fitted with a locking device arranged so that insertion and rotation of a key in the pushbutton also rotates the pushbutton shaft 37 about its longitudinal axis. A transversely projecting portion 40 of such shaft projects into an aperture 41 in the contactor 28 so that rotation of the pushbutton shaft 37 raises the contactor to its upper position in which it is indexed by the spring 31*a*. When the contactor 28 is in this upper position the peg 29 is lifted clear of the edge 30 so that movement of the contactor does not effect release of the mechanism 10. To unlock by means of a key the pushbutton shaft 37 is rotated in the reverse direction to that taken by the shaft during the locking operation so that the contactor 28 is moved to its lower position whereupon rotation of the contactor brings the peg 29 into contact with the edge 30 of the latch plate 16. A self centering spring is provided in the pushbutton mechanism so that both when the mechanism is locked or unlocked the pushbutton shaft 37 and locking device return to the neutral position.

Locking of the door from inside the vehicle is effected by rotating the remote control lever 32 in a clockwise direction so that the extremity 35 bears against a substantially horizontal edge 42 of the contactor 28 to raise the latter to its inoperative position. After locking of the door the remote control lever 32 returns to its neutral control position. Unlocking the door by means of the remote control lever 32 is effected by rotating the lever in an anti-clockwise direction from its neutral position so that the extremity 35 bears against a further substantially horizontal edge 43 of the contactor to lower the latter to its operative position.

In the arrangement described in which locking by means of both a key and a remote control lever is incorporated it is necessary to arrange that the member used for locking should automatically return to its neutral position so that the subsequent unlocking by the other member can be performed.

If the vehicle door is locked when in the open position, the arrangement is such that the act of closing the door cancels the locking action and allows release of the mechanism 10 by means of the outside pushbutton. This is achieved by the provision of an interacting lever 44 of bellcrank form pivotally mounted on a pivot pin 45 secured to the backplate 15. A spring 46 loads the interacting lever 44 in an anti-clockwise direction. On closure of the door the latch pin 13 engages with the striker 11 and the latch plate 16 is rotated in an anti-clockwise direction. This rotation causes an edge 47 of the latch plate 16 to bear against a shorter arm 48 of the interacting lever 44 and rotate the latter about its pivot pin 45 against the spring loading in consequence of which a longer substantially horizontal arm 49 of the interacting lever is brought into contact with the peg 29 of the contactor 28 to move the latter downwardly into its operative position.

As already described the latch plate 16 is lightly loaded into position to hold the latch pin 13 in contact with the cam surface 22 of the upper jaw 18 of the striker 11, this being achieved by means of the light torsion spring 27. It will be understood, however, that in the embodiment which has been described, in which the latch and striker plates 16, 11 are vertical and the latch pin 13 movable about a horizontal axis, the spring loading is not absolutely essential as the latch pin will turn to its safety lock and full lock positions by gravity. This is of importance as it involves that the fastening is not rendered inoperative by spring failure. If desired the latch pin may be provided with a roller for engagement with the cam surface 22 of the striker 11.

Movement between the striker 11 and striker pin 12 in a direction fore and aft of the vehicle is preferably limited to such an extent that disengagement of the latch pin from the striker is prevented. This may be achieved by reducing the width of the elongated guide slot 20 in the striker 11 at the outer surface of the striker, as

shown at **20***a* in FIGURE 5, while the striker pin **12** is also reduced where it passes through the outer surface portion, as shown at **12***a*, and is formed with a head **12***b* which lies in the wider rear portion of the slot.

It will be appreciated that in the fastening device of the invention the door can be locked against release and also unlocked from inside or outside the vehicle and that when the door is locked the pushbutton is free to move but does not release the mechanism. Moreover, as already stated, the act of closing the door cancels the locking action if such has been performed and allows release of the fastening device by means of the outside pushbutton.

I claim:

1. A releasable fastening device comprising in combination two plate-like parts between which relative translatory movement in spaced substantially parallel planes occurs during the fastening operation, one of said plate-like parts comprising a latch plate mounted for angular movement about an axis disposed transversely of said planes and forming part of an inside locking mechanism of the fastening device and the other of said plate-like parts comprising a striker plate having three spaced generally parallel surfaces one of which forms a cam surface which faces towards said axis during the fastening operation, said latch plate having a transversely projecting portion offset from said axis which engages with said cam surface during the fastening operation and enters into wedging contact therewith on any tendency for relative translatory movement in the reverse direction to that occuring during said fastening operation, and a member fixed relatively to said axis and which enters between two of said spaced surfaces which form a guide for said member during the fastening operation and one of which makes contact with said member to provide a reaction to said wedging contact.

2. A releasable fastening device according to claim 1, wherein said latch plate has a fully fastened position in which the plane containing said axis and the point of engagement between said latch plate and said cam surface is inclined at a greater angle to the direction of said relative translatory movement than to a line at right angles to that direction.

3. A releasable fastening device according to claim 2, wherein said striker plate is substantially C-shaped and said cam surface and said one spaced surface are formed on one jaw thereof, the cavity of the C shape being elongated and its sides providing the two spaced surfaces which form said guide.

4. A releasable fastening device according to claim 1, wherein said cam surface comprises two surface portions spaced longitudinally of the striker with each of which said projecting portion engages in turn during the fastening operation, said surface portions being arranged to lie outwardly of a line passing through the centre of said member and said axis when said latch plate and striker are in the full lock position and being of such form that forces exerted between them and said projecting portion due to said tendency for relative translatory movement in the reverse direction pass substantially through said axis and apply no torque to said latch plate about said axis.

5. A releasable fastening device according to claim 4, wherein the outer of said surface portions is engaged by said projecting portion to provide a "safety lock" condition and the inner surface portion is engaged by said projecting portion in the fully locked engagement of said latch plate and keeper, said inner surface portion being disposed relatively to said axis and said member so that the distance between the point at which said projecting portion makes contact with said inner surface portion in said fully locked engagement and said line is small as compared with the distance between said point and said axis so that the reaction force produced by said wedging contact has a component acting towards said axis in the direction of said line which is of considerably greater magnitude than the component acting in a direction normal to said line.

6. A releasable fastening device comprising in combination two plate-like parts between which relative translatory movement in spaced substantially parallel planes occurs during the fastening operation, one of said plate-like parts comprising a latch plate mounted for angular movement about an axis disposed transversely of said planes and which forms part of an inside locking mechanism of the fastening device and the other of said plate-like parts comprising a substantially C-shaped striker plate, said latch plate having a portion which projects transversely therefrom and engages with a cam surface formed on an outer peripheral edge of one jaw of said striker plate as a result of said relative translatory movement during the fastening operation and enters into wedging contact with said surface on any tendency for relative translatory movement in the reverse direction to that occurring during the fastening operation, the device also comprising a member fixed in relation to said axis and which enters the cavity of the C shape during said relative translatory movement and engages an inner peripheral edge of said jaw of the striker plate during said wedging contact to provide a wedging reaction thereto with one jaw of the striker plate wedged between said member and said latch plate, said cavity being elongated and having sides which are parallel over the major portion of their length and embrace opposite sides of said member to guide it during the fastening operation.

7. A releasable fastening device comprising in combination two plate-like parts between which relative translatory movement in spaced substantially parallel planes occurs during the fastening operation, one of said plate-like parts comprising a latch plate mounted for angular movement about an axis and which forms part of an inside locking mechanism of the fastening device and the other of said plate-like parts comprising a substantially C-shaped striker plate, said latch plate having a portion which projects transversely therefrom to engage with a cam surface formed on an outer peripheral edge of one jaw of said striker plate as a result of said relative translatory movement during the fastening operation and enter into wedging contact with said surface on any tendency for relative translatory movement in the reverse direction to that occurring during the fastening operation, a member fixed in relation to said axis and which enters the cavity of the C-shape during said relative translatory movement, said cavity being elongated to form a guide for said member, manually operable release means arranged on one side of a door with which the fastening device is operatively associated, further manually operable release means actuated from the opposite side of said door, said release means and said further release means being operable to impart angular movement to said latch plate about said axis in a direction which releases it from engagement with said cam surface, angular movement of said latch plate towards said release position by said manually operable release means being effected by a pivoted contactor having a portion which bears against said latch plate when angular movement is imparted to said contactor by said manually operable release means, said release means and said further release means having portions which can be brought to bear on said contactor to move it to an inoperative position in which said portion thereof is moved to a position in which it clears the latch plate to lock the device against release by said release means.

8. A releasable fastening device according to claim 7, wherein said release means comprise a pushbutton and a shaft operable thereby to press directly on said contactor and said further release means comprise a remote control lever, said contactor and said latch plate being mounted on a common pivot pin and said contactor being

formed with a slot to accept the latter to enable it to be slid to two extreme positions, operative and inoperative, in both of which it is indexed and in one of which said portion thereof can bear against the latch plate whilst in the other said portion clears the latch plate, movement of the contactor from one position to the other and back again being effected by appropriate movement of said shaft of the pushbutton and by the remote control lever.

9. A releasable fastening device according to claim 8, and further comprising an interacting element having a portion which bears against said latch plate and a further portion which moves the contactor into an operative position, if the device is locked against release when the door is open, upon closing movement of the door and consequent contact of the latch plate with the striker plate.

10. A fastening device according to claim 9, wherein said pushbutton shaft is rotated about its axis to effect sliding movement of the contactor from one extreme position to the other by means of a releasable key which is inserted into the pushbutton whilst similar sliding movement of the contactor is effected by the remote control lever by causing a portion thereof to bear on spaced surfaces of the contactor, the pushbutton shaft and remote control lever being returned to a neutral position after locking or release of the mechanism has been effected.

11. A releasable fastening device comprising in combination a backplate, a latch plate pivotally mounted on the backplate adjacent the inner surface thereof and having an off-centre projecting portion which projects through a slot formed in said backplate, a pivot for said latch plate, a generally C-shaped striker plate adapted for mounting for translatory movement relatively to the backplate in a plane adjacent and parallel to the outer surface of the latter, one jaw of the C shape providing two opposed surfaces one of which forms a cam surface having two projecting teeth separated by a trough and over which in use said projecting portion of the latch plate slides during the fastening operation and enters into wedging contact therewith on any tendency for relative translatory movement in the reverse direction to that occurring during the fastening operation, engagement of said projecting portion in said trough providing a safety lock position and engagement of said projecting portion with a rearwardly inclined surface behind the second tooth providing a fully fastened condition, and a striker pin mounted on said backplate to project from the outer face thereof in fixed relation to said pivot for engagement with the other of said opposed surfaces of said jaw to provide a reaction to said wedging contact in which said one jaw of the striker plate is wedged between said striker pin and said latch plate, the cavity of the C shape being elongated and having sides which are substantially parallel over the greater portion of their length and embrace opposite sides of the striker pin to guide it during the fastening operation, said striker pin being positioned relatively to said pivot so that the reaction produced by said wedging contact has a greater component at right angles to the direction of said translatory movement than in that direction.

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