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DOOR LATCH MECHANISMS

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2 Sheets-Sheet 1

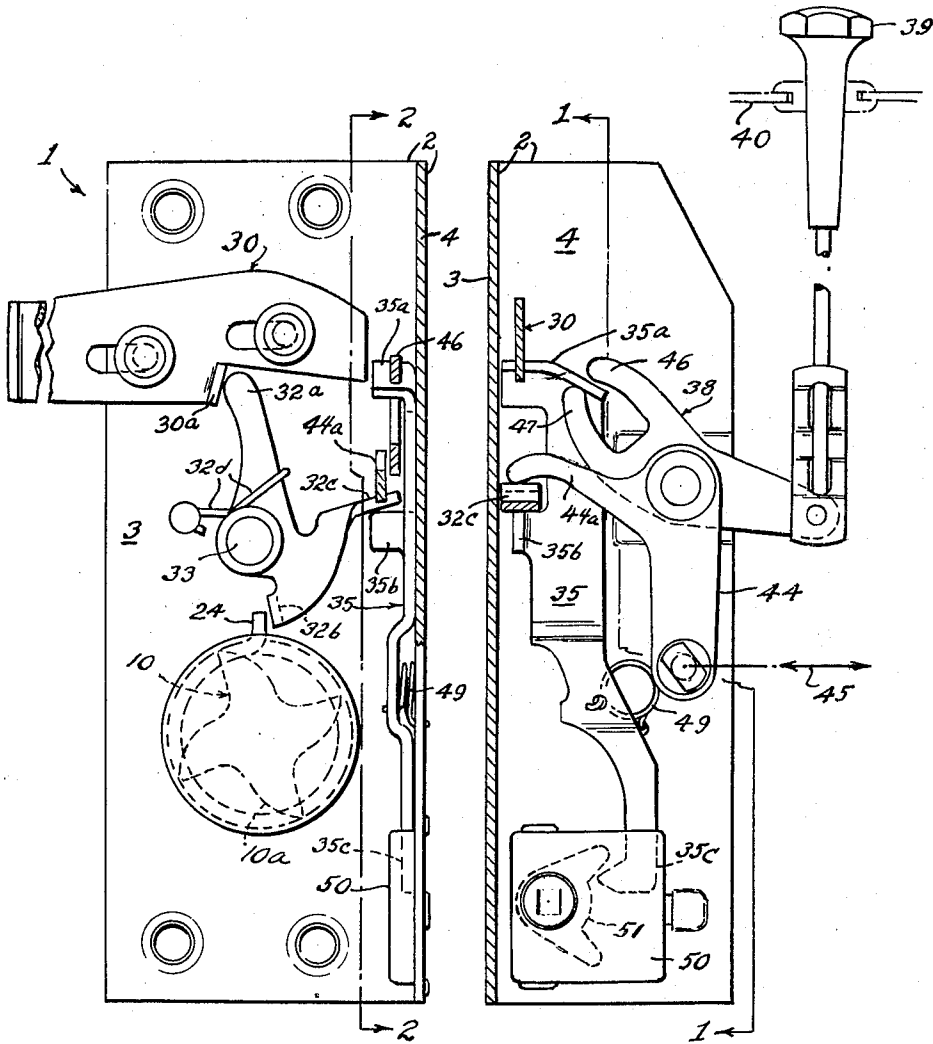


FIG-1

FIG-2

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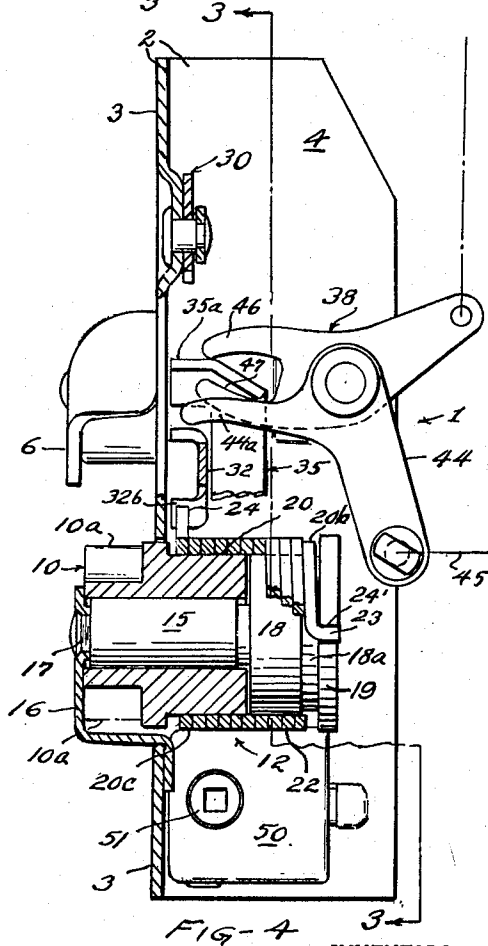
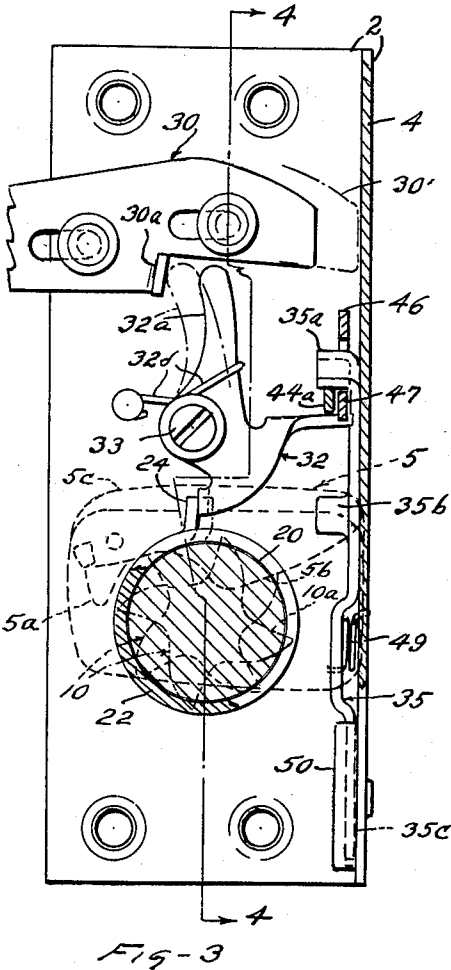
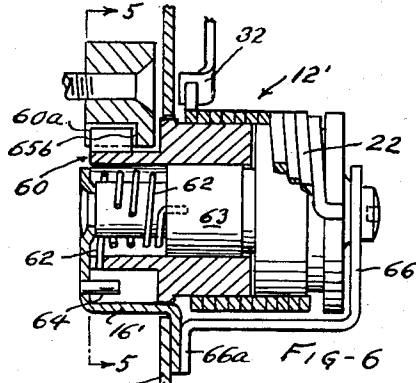
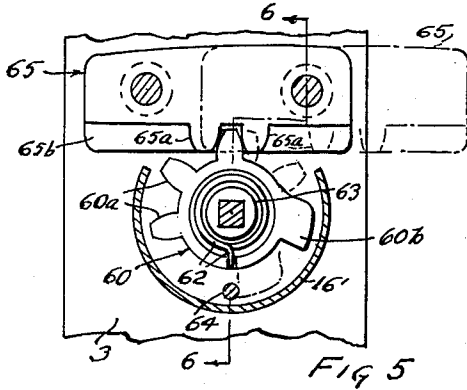
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DOOR LATCH MECHANISMS

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DOOR LATCH MECHANISMS

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The invention relates to latch and/or lock mechanisms for doors and other closure elements, and particularly to such mechanisms when adapted to be used on vehicle body doors or in analogous situations involving vibration tending to loosen the closure elements from latched or locked positions and involving provision for latching or locking of the closure elements and release thereof for ingress and egress at a plurality of control points (e.g. inside and outside of a vehicle body or cab capable of being closed and locked against unauthorized entrance thereto). The herewith-illustrated embodiment of the present subject invention is a latch and key-operated lock mechanism for automobile doors, all the fastening functions (hereinafter usually called latching) being accomplished through the intermediary of a so-called rotary bolt on the door cooperating with a suitable striker or keeper of conventional or appropriate form on the fixed framework or jamb adjacent to the door.

The present invention is applicable to other types of latch mechanisms operating or operable through angular or rotary movement of a control element about a relatively fixed axis to effect release of a closure element or door from latched or locked condition.

Most presently used automobile door latches having rotary bolts employ pivoted detents which operate on ratchet type tooth formations on or connected with the rotary bolts to block rotary movement of the bolts in the direction which will allow opening of the associated doors. To unlatch the doors, the detents are moved out of rotation-blocking positions. All those latches with which we are familiar require more or less critical angular relationships in the design of the bolt heads or teeth in reference to the keepers or strikers and further in reference to the effective latching surfaces against which the detents operate and the detents themselves must have extremely accurate dimensions and placement. A particular object of the present invention is to obviate the necessity for such critical angular relationships in design and construction, while nevertheless accomplishing essentially positive latching or locking and, additionally, enabling unlatching or release through application of relatively small, appropriately applied, forces. Concomitantly, an object is to reduce complexity, and expense in the production of latch mechanisms for automobile doors and other closure elements without sacrifice of functional requirements either from the standpoint of personal safety of vehicle occupants or facility of control or manipulation by users.

Other objects and features of the invention will be explained in or made apparent from the following description of the herewith illustrated embodiment.

In the drawings:

Figs. 1 and 2 are mutually complementary views, of the present latch mechanism unit partly broken away or in cross section, as indicated by lines 1—1 and 2—2 on Figs. 2 and 1 respectively.

Fig. 3 is a further partly sectional view of the mecha-

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nism or unit, similar to Fig. 1, taken as indicated by line 3—3 on Fig. 4.

Fig. 4 is a partially sectional view taken as indicated by line 4—4 on Fig. 3.

Fig. 5 is a fragmentary view of a modified form of latch mechanism wherein the latching heads on the rotary bolt and cooperating lugs on the keeper or striker (both shown in elevation) are of more or less conventional gear and rack tooth form.

Fig. 6 is a sectional fragmentary view of the modified mechanism taken along the line 6—6 on Fig. 5.

As is usual, the various operating components of the present latch unit 1 are carried by a frame or mounting plate 2 of L-shaped cross section (sectional shape not shown), providing a mounting flange 3 adapted to be secured to an edge portion of the door (not shown) adjacent the door jamb (not shown) and a flange 4 adapted to lie against or flush with the inside panel (not shown) of the door. Thus the point of view in respect to Figs. 1 and 3 is from the interior of the latch unit 1 looking toward the associated door jamb or body pillar which supports a suitable keeper or striker unit 5, partially shown by dotted lines in Fig. 3. Thus the exterior of the body is at the left in Figs. 1 and 3; the door is closed by movement from left toward right (same views), and, as the door closes, the rotary bolt 10 is turned in a counterclockwise direction from, for example, the dot-and-dash line illustrated position, Fig. 3, into the dotted line illustrated position Figs. 1 and 3 by appropriate surface portions of the keeper unit. Such portions, in the illustrated arrangement, include a first encountered spring loaded safety latch pawl 5a, Fig. 3, and a main keeper lug or shoulder formation 5b operatively mating any of the head formations 10a on the bolt 10. Formation 5b of the keeper unit 5 is rigid with the door jamb or body framework. A cooperating dovetail or strike 6 on the latch unit 1 (partially shown in Fig. 4) bears against an upwardly facing surface 5c on a rigid portion of the keeper unit, in the "home" or fully closed position of the door in reference to its framework. The above described arrangement is illustrative or typical of present day practice; and operatingly equivalent forms of bolt and keeper devices can be substituted therefor.

When a bolt contour such as exhibited in dotted lines at 10, 10a in Fig. 1 (asymmetrical tooth or locking head formation) is employed, then, in the open position of the door, the bolt can occupy any possible angular relationship to the keeper without possibility of jamming. If the locking head or tooth formations of the bolt and keeper are similar to conventional pinion and rack teeth then the tooth formations on the bolt may have to avoid occupying certain angular positions prior to engagement with the teeth of the keeper. In that event a spring or magnetic positioner arrangement (not shown) can be used in association with the bolt in order to compel the bolt teeth to assume proper attitudes when the bolt is free from the keeper. Another solution will be described later in connection with Figs. 5 and 6.

Assuming the rotary bolt 10 can occupy any angular disposition with reference to the keeper unit (illustrated arrangement) it is evident that when the door is closed against its framework, either against a positive stop or a yieldable or cushioning stop, the bolt requires only application thereto of an adequate restraining force against counter-rotational movement (clockwise, Figs. 1 and 3) in order effectually to block accidental or unintentional release. In the present construction such restraining force is applied by an automatically acting coil brake mechanism indicated generally at 12 in Figs. 1, 3 and 4.

The brake mechanism 12, as shown in Figs. 3 and 4 particularly, includes a fixed or non-rotary spindle 15 on

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which the bolt 10 is mounted to turn freely into required latching positions in reference to the keeper unit 5. The spindle 15 may be secured to the latch frame 2 via a housing member 16 partially shrouding the bolt head formations 10a (see Fig. 4), and suitably rigid with the frame 2. For example a non-circular portion 17 of the spindle 15, mating a non-circular opening in the wall of the housing member 16, can be satisfactorily secured to the housing member by riveting as illustrated. The fixed spindle 15 can, of course, be provided with suitable additional support (not shown), as at the end thereof opposite connection 17 etc. Fixed spindle 15 has a relatively enlarged diameter circular drum portion 18 and a further enlarged head portion 19. The latch bolt 10 has a circular drum portion 20 of approximately the same diameter as fixed drum portion 18 of the spindle; and a one-way gripping helical friction brake spring 22 is anchored to the spindle 15 (as by a lug or toe 23) on the spring occupying a radial slot 24 in the head formation 19. An appropriate number of free end coils 22a of the helical spring 22 are preloaded against the drum surface 20 of the rotary bolt, or in other words the coils have sufficient interference fitting relationship to the drum surface 20 so as to insure self energizing extremely powerful, braking effect thereon in one direction only, while not substantially interfering with free turning of the bolt in the opposite direction. The helical spring 22 can be prevented from moving out of position axially of the coacting drum surfaces by seating of a portion of one anchored end coil (e. g. 20b, Fig. 4) in a peripheral groove 18a intersecting drum surface 18.

The terminal free end coil 20c of helical spring 20 (left Fig. 4) has a brake-releasing lug or toe 24 rigid therewith. The illustrated spring 22 is left hand wound (would be right hand wound for the relatively opposite door), and a very small force applied to the toe 24 in a counterclockwise direction (Figs. 1 and 3) permits the rotary bolt 10 to turn freely in the direction to permit the door to be opened by movement of the latch unit 1 leftwardly (Fig. 3) in reference to the keeper unit 5.

Since the coil brake mechanism 12 is automatic in its action of retaining the rotary bolt in full or partial latching relationship to its cooperating keeper (e.g. 5), it will be apparent that any vibrations resulting in application of horizontal forces to the door can only result in tighter closing of the door against its jamb or fixed stop, assuming, of course, that no releasing force is then being applied to the spring toe 24. Such vibrations necessarily occur in all vehicles. Consequently no special provision has to be made (i.e. other than proper hand holds on the door), for urging the door to fully closed position. Moreover, no matter how tightly or forcibly the door is closed against its stop, the required releasing force for the mechanism 12 is not increased. The bolt 10 is held tightly in whatever angular relationship of bolt heads 10a to coacting keeper surfaces will hold the door snugly closed.

As illustrative of suitable multi-position controls for the one-way-acting friction detent mechanism 12 hereof for a rotary or "swinging" bolt, the various views show inter alia, by way of example, a control member 30 (illustrated as a sliding element of the latch unit 1) adapted to be moved rightwardly (Figs. 1 and 3) as by a conventional externally accessible button, not shown, for bolt brake release. Sliding control member 30 has a lug 30a disposed in the plane of movement of an arm 32a of a brake release lever 32 freely pivoted as on a stud 33 attached to the latch unit flange portion 3, and having an ear portion or lug 32b (Figs. 1, 3 and 4) so disposed as to be operative to release the coil brake mechanism 12 when the control member 30 is moved rightwardly or inwardly toward the vehicle body (broken line position 30', Fig. 3, of member 30). That movement of release slide 30 turns the lever 32 as from its Fig. 1 illustrated position into approximately the full-

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line-illustrated position of the lever as shown in Fig. 3, causing expansion of the free end coils 22a out of gripping contact with drum surface portion 20 of the bolt 10.

A second control is represented, in part, by a slidably mounted locking and release bar or link 35 on flange portion 4 (see particularly Figs. 1 and 2). The position of link 35 shown in Fig. 1 is such that an end flange portion 35a of the link blocks inward movement of slide member 30 to the brake-releasing position 30' thereof (Fig. 3). Link 35 can be moved to the position illustrated in Figs. 1 and 2 interchangeably by two levers 38 and 44. Lever 38 (as shown in Fig. 2) is connected to a conventional "inside" latch control button 39 which, as shown, projects, for manipulation, above the window sill or garnish molding 40 Fig. 2. If button 39 is depressed then the "outside" release slide member 30 is blocked by the lug 35a of link 35 from causing release of the brake mechanism 12 as will be apparent from comparison of Figs. 1 and 2.

For enabling occupants of the vehicle body to open the door from inside the body the lever 44 is operable through suitable mechanism (usually a swingable inside handle, not shown) attached to the lever 44 by a slip link diagrammatically represented at 45, Figs. 2 and 4. The linkage and lever mechanism are so designed as to enable an occupant of the vehicle to release the brake mechanism 12 and leave the vehicle body at will. The operation of depressing the button 39 prevents opening of the door from the outside of the body via manipulation of the exteriorly accessible button or the like (not shown) connected to the slide member 30 while not interfering with such opening of the door by means of the latch-associated inside handle because movement of the slip link 45 toward the right, Fig. 2, causes clockwise (brake mechanism release) rotation of release lever 32 through abutment of an arm 44a of lever 44 with a lug 32c of release lever 32. The lug 32c, in turn, causes downward movement of the link 35 by abutment with a lug 35b on the link (compare Figs. 1, 2 and 4). The just described door unlatching operation by the inside handle, via link 45, swings the button-connected lever 38 counterclockwise (Fig. 2) replacing the button 39 into its raised position (assuming it has been in the lowered or safety latching position or as illustrated by Fig. 2) due to a camming double finger connection 46, 47 between the lever 38 and the flange or lug 35a of link 35. The link 35 is preferably biased toward its raised and lowered positions (Figs. 2 and 4 respectively) by a toggle or snapover spring 49 of well known construction. A downwardly extending claw portion 35c enters a lock case 50, Figs. 1 and 2, for cooperation with a rotor element 51 therein of suitable construction. Element 51 can be turned by a key (not shown) applied in the usual manner from outside the vehicle body so as to block downward movement of the link 35 hence release of the latch mechanism.

Referring to the form of the present invention partially shown in Figs. 5 and 6, the bolt 60 has an adequate complement of (e.g.) involute gear form teeth 60a constituting latching heads, and the keeper or striker 65 has suitable complementary teeth 65a for approximate rolling contact with teeth 60a and with negligible backlash. A flange 65b on the keeper extends behind the bolt teeth so as to prevent separation of the bolt and keeper in event of damage to the vehicle creating forces acting to pull the door and framework relatively apart at the door jamb parallel to the principal plane of the door as tends to happen in crash accidents.

Prior to meshing engagement of the keeper teeth 65a with those of the bolt 60, the latter, as illustrated in broken lines in Fig. 5, is maintained by a suitable torsion spring 62 (see particularly Fig. 6), connected between the fixed spindle 63 and the bolt 60, in such angular position that a lug element 60b of the bolt is in engage-

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ment with a fixed stop pin 64 on the bolt housing 16'. Thereby, assuming the inside or outside operating means are manipulated to bolt-releasing positions as part of the customary action of closing the door, the bolt and keeper teeth will be in non-jamming relationship. The lug 60b is moved away from the stop pin 64 when the bolt and keeper are in the full line illustrated relationship (fully latched position) shown in Fig. 5; and, when the door is again opened, the spring 62 immediately returns the bolt to its first described position on the latch mechanism.

The coil brake mechanism 12', Fig. 6, is essentially the same in construction as already described in reference particularly to Fig. 4, except that the fixed or non-rotating spindle 63 has an additional support, namely the bracket 66 which is shown as though secured, as by welding of bracket portion 66a to a portion of the main mounting flange 3 of the latch mechanism.

We claim:

1. In a latch mechanism for operation releasably to secure one edge portion of a closure element to a frame element of the closure element, a keeper on one of said elements having a shoulder in the form of a rack tooth disposed for operation to block relative opening movement of said elements, a latching bolt having gear teeth cooperable with said shoulder, said bolt being mounted on a relatively fixed support carried by the other element for angular movement in relative opposite latching and releasing directions while in contact with the shoulder of the keeper, a releasable detent for the bolt comprising a generally circular drum member coaxial with the bolt and connected to turn therewith in one direction when the bolt is approaching latching position and in the opposite direction when the bolt is departing from latching position, a helical friction spring having one end portion in substantially fixed relation to said other element, the opposite end portion of the spring having a plurality of free end coils in self energizing one-way gripping relationship to the drum member such as effectually to block movement of the bolt in the unlatching direction when the bolt is engaged with the keeper shoulder while allowing incremental further movement in the latching direction when the bolt is in latching association with the shoulder, separable abutment surfaces on the bolt and its relatively fixed support respectively and a torsion spring connecting the bolt and relatively fixed support and cooperating with said abutment surfaces in a manner tending to hold the teeth of the bolt in an attitude relative to said keeper shoulder favoring meshing of the bolt teeth therewith, and control means operatively associated with the helical spring and movable in a manner to cause release of said gripping relationship of coils and drum member.

2. In a latch mechanism for closures, a latch frame or casing, a rotary latching bolt having circumferentially spaced teeth angularly movable about its axis in one di-

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rection in a manner to initiate latching engagement of a tooth of said element with a coacting shoulder on a keeper and to maintain latching engagement if prevented from angular movement in the opposite direction, a coil brake mechanism including a circular drum fixedly mounted on the frame coaxial with the latching bolt and an axially adjacent rotary circular drum supported for rotation and against axial movement by the fixed drum and operatively rigid with the latching bolt, a helical friction spring and means to hold one end thereof in fixed, non-rotating position on the first mentioned circular drum, said spring having coils preloaded on both drums including free end coils in one way gripping relationship to the rotary drum surface so as normally to prevent angular movement of the latching element in said opposite direction, and releasing means mounted for movement on the frame into contact with a free end coil of the spring in a direction to release the spring from gripping contact with said rotary drum surface, whereby to permit the latching bolt to be detached from the keeper.

3. In a latch mechanism for operation releasably to secure one edge portion of a door to a frame element of the door, a keeper on the frame element, a rotary latching bolt on the door and turnable in opposite directions to latch and release the door, and a releasable detent for the bolt comprising a rotary drum member operatively integral with the bolt to turn therewith, a pin extending axially through the drum member and non-rotatably connected to the door to support the rotary drum member on a fixed axis, the pin having an enlarged head portion constituting a fixed drum member of approximately the same diameter as the rotatable drum member, a helical friction spring having one end secured to the fixed drum member, said spring having coils preloaded on the two drum members so as to be in self energizing, one way gripping relationship to the rotary drum member to block movement of the bolt out of latching engagement with the keeper, and control means on the door and engageable with a free end coil of the spring to release the rotary drum member and bolt.

4. The latch mechanism according to claim 3, wherein the head portion of said pin has a radial flange thereon having an axial socket for receiving an axial toe portion of the helical spring and a peripheral groove adjacent the flange for retaining a toe-associated preloaded end coil of the spring so that the spring cannot move out of position toward the rotary latching bolt.

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