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(54) Lock for a motor vehicle door

(57) Lock (1) for a motor vehicle door with a fork (10) having a seat (16) for a striker (6) and rotatable about a first axis (A) between an opening and a complete closure position in which the striker (6) engages the seat (16), and a stop (11) hinged about a second axis (B), pushed by a spring (28) towards a peripheral edge (20) of the fork (10) and having a metal engaging portion (29) arranged to spring connect with the said peripheral edge (20) to lock in releasable manner the fork (10) in the complete closure position; the lock (1) has in addition a stop component (35) made of plastic material, carried integrally by the stop (11) and cooperating with the peripheral edge (20) of the fork (10) to prevent impact during the spring coupling stage between the engaging portion (29) of the stop (11) and the peripheral edge (20) of the fork (10).

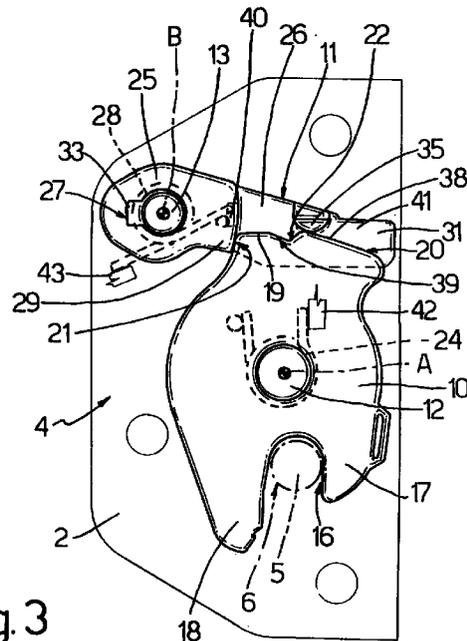


Fig. 3

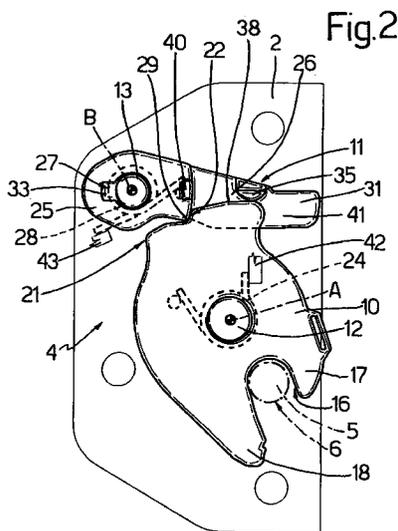


Fig. 2

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## Description

[0001] The present invention relates to a lock for a motor vehicle door.

[0002] It is emphasized that the term "door" is used in this description and in the claims in the widest possible sense, to indicate whatsoever component moving between an opening and a closing position of an access aperture to an internal compartment of a motor vehicle. The above terms consequently include in addition to the side doors of the motor vehicle, which will be referred to hereinafter without loss of their general sense, as well as the hoods or front or rear hatches.

[0003] As it is known the locks for motor vehicles generally comprise a support body arranged to be fixed to a motor vehicle door, and a closure mechanism carried by the support body and arranged to connect with a striker integral with an upright of the door itself.

[0004] The closure mechanism essentially comprises a fork hinged from the support body around a first fixed pin and having a first engaging seat for a generally cylindrical portion of the above striker, and a stop hinged about the support body around a second fixed pin and pushed by a spring to spring couple with a peripheral edge of the fork.

[0005] In particular, the fork moves between an opening position and a complete closure position, in which the said seat engages the striker; the stop has an engaging portion arranged to spring couple with a first and a second shoulder of the peripheral edge of the fork to lock in a releasable manner the fork in relation to the position of complete closure and in a position of part closure, or of first spring movement, intermediate between the opening and complete closure positions.

[0006] The known lock support body is advantageously fitted with a stop component, for instance a rubber buffer, which cooperates with the stop during the spring coupling phase with the fork to prevent any overrun and thereby impact between the stop engaging portion and the peripheral edge of the fork, allowing at the same time the elimination of noises associated with the said impacts.

[0007] The said stop component nevertheless forms an additional component to be manufactured and fitted to the support body, with consequent increased manufacturing costs for the lock.

[0008] In addition, in the event of the part and complete closure positions of the fork being defined by two stop angular positions differing from each other, the said stop component may only operate in one of the said angular positions, generally exclusively in that corresponding with the complete closure position of the fork, thus making inevitable the impact between the fork and the stop in the other position.

[0009] As an alternative, on the peripheral edge of the fork and corresponding with the contact zone with the stop, a shock absorber component is placed, for instance a rubber buffer, which reduces the noise gen-

erated during the course of the spring coupling of the stop and the fork though not eliminating it completely, in that it thus allows contact between the stop and the said fork. In addition, the said shock absorber once again represents an additional component to be manufactured and fitted to the fork, with consequent increased costs in the manufacture of the lock.

[0010] The purpose of the present invention is to achieve a lock for a motor vehicle door, which will allow the simple and economical operation of the disadvantages associated with known locks and as specified above.

[0011] The aforesaid scope is achieved with the present invention, in that it relates to a lock for a motor vehicle door comprising a closure mechanism arranged to cooperate with a striker, the said closure mechanism comprising:

- a fork hinged about a first axis, provided with a seat for a portion of the said striker, and rotating about the said first axis between an opening position and at least a complete closure position in which the said portion of the said striker engages with the said seat;
- a stop hinged about a second axis, pushed by elastic means towards the peripheral edge of the said fork and having a metal engaging portion arranged to spring connect with the said peripheral edge to lock in a releasable manner the said fork in the said complete closure position; and
- stop means arranged to prevent impacts between the said engaging portion of the said stop and the said peripheral edge of the said fork in the spring coupling phase of said stop with the said fork; characterized by the fact that the said stop means comprise at least a stop component made of plastic material, carried integrally by the said stop and cooperating with the said peripheral edge of the said fork.

[0012] For better comprehension of the present invention a preferred form of embodiment is described below, exclusively as a non-restrictive example and with reference to the appended drawings, wherein:

- Figure 1 is a longitudinal section with parts removed for greater clarity, featuring a lock for a motor vehicle door produced according to the invention and having a closure mechanism arranged in a first working position;
- Figures 2 and 3 are side views of the closure mechanism illustrated in Figure 1, respectively in a second and in a third operating position; and
- Figure 4 illustrates on an enlarged scale and in an opposing side view, the closure mechanism in Figure 3.

[0013] With reference to Figure 1, a lock for a motor

vehicle (not illustrated) is indicated as an assembly under reference 1.

**[0014]** A lock 1 comprises essentially an envelope 2 arranged to be secured to the said door and internally defining an aperture 3, and a closure mechanism 4 housed within the aperture 3 and arranged to cooperate with a cylindrical portion 5 of a striker 6 represented diagrammatically in dotted lines and integral with a fixed upright (not shown) of the door.

**[0015]** The envelope 2 consists of an intermediate body 7, essentially shaped with a moulded plate and made of plastic pressing material, and a pair of metal plates 8 (only one of which is visible in Figure 1) mounted on opposing faces of the body 7 and demarcating thereby the aperture 3; the envelope 2 also has a side aperture 9 arranged to allow the penetration of the portion 5 of the striker 6 in the aperture 3, recessed in particular in body 7 and in one of the plates 8.

**[0016]** The closure mechanism 4 comprises a fork 10 and a stop 11 hinged about respective fixed pins 12, 13 integral with the plate 8, extending to the inside of the aperture 3 through the said plates 8 and having respective axes A, B parallel with each other and orthogonal with the said plates 8.

**[0017]** The fork 10 consists of a moulded plate made of metal material, and hinged to correspond with an intermediate portion around pin 12, and having a peripheral C-shaped seat 16 arranged to receive portion 5 of the striker 6 and demarcated laterally by a pair of teeth 17, 18. The fork 10 also has along a stretch 19 of its peripheral edge 20 and in the opposing part of the seat 16, a first and a second shoulder 21, 22 arranged to spring cooperate with the stop 11, as is explained in detail below.

**[0018]** The fork 10 is advantageously covered externally by a shell 23 (Figure 4) of plastic material, from which the free ends of the teeth 17, 18 project demarcating the seat 16 and the shoulders 21, 22.

**[0019]** The fork 10 rotates between an opening position (Figure 1), in which the seat 16 is turned towards the aperture 9 of the envelope 2 and thus allows the disengagement of portion 5 of the striker 6 from the closure mechanism 4, and a complete closure position (Figures 3 and 4), in which the portion 5 of the striker 6 is locked within the seat 16 and the tooth 17 intercepts in a known manner the aperture 9 preventing its escape; the fork 10 is also pushed in a known manner towards the opening position by a spring 24 (Figures 2 and 3) wound around the pin 12 and secured to the said fork 10 and to a portion 42 (drawn in dotted lines) of the intermediate body 7 of the envelope 2.

**[0020]** The stop 11 comprises a metal bearing component 25, hinged about the pin 13 and arranged to spring cooperate with the shoulders 21, 22 of the fork 10, and an actuation arm 26 made of plastic material, arranged to be connected to a control lever system (not illustrated) for the opening of the lock 1, also hinged about the pin 13 and angularly coupled to the bearing compo-

nent 25 by means of a pair of key components 27, 40 projecting integrally to overhang from the said actuation arm 26. The stop 11 is also pushed towards the fork 10 by a spring 28 (Figures 2 and 3) wound about the pin 13 and secured to the stop 11 and to a portion 43 (shown in dotted lines) of the intermediate body 7 of the envelope 2.

**[0021]** In particular, the bearing component 25 consists of a plate essentially coplanar with the fork 10 and has an end L-shaped pin defining an engaging portion 29 arranged to spring couple with the shoulders 21, 22 to lock the fork 10 in releasable manner respectively in the complete closure position and in a part closure position or "first spring movement", the position being intermediate between the opening and the complete closure positions.

**[0022]** The actuation arm 26 has in transverse direction to the axis B of pin 13, a length greater than the length of the bearing component 25 in the same direction, and has a first portion 30 hinged about the pin 13 and placed in superimposition and in contact with the bearing component 25, and a second portion 31 projecting longitudinally in relation to the bearing component 25, carrying as an extension a pin 32 arranged to cooperate with the aforesaid control lever system, and placed offset in relation to the fork 10 in a direction parallel with axes A, B, in a manner not interfering with the rotation of the said fork 10.

**[0023]** The key component 27 consists of an essentially cylindrical tubular pin, extending in orthogonal manner from one base side 41 of the actuation arm 26, engaged by the pin 13, having externally a longitudinal projection 33 and mounted in a relative seat recessed in the bearing component 25 and having a profile matching the external profile of the key component 27. The key component 40 consists of an essentially oblong projection extending to overhang from the wall 41 in the same direction as the key component 27 and engaging in a relative seat recessed in a front surface of the bearing component 25.

**[0024]** According to the present invention, the actuation arm 26 of the stop 11 has integrally a stop component 35 operating with the peripheral edge 20 of the fork 10 to prevent impacts between the engaging portion 29 of the bearing component 25 and the peripheral edge 20 following angular spring displacements of the stop 11 during the coupling phase with the respective shoulders 21, 22 of the fork 10 in the complete and part closure position.

**[0025]** In particular, the stop component 35 consists of an essentially semi-cylindrical hollow dowel, extending to overhang from the walls 41 towards the fork 10 and corresponding with the portion 31 of the actuation arm 26. In addition, the stop component 35 cooperates with a curved bearing stretch 38 of the peripheral edge 20 of the fork 10, convex outwardly and placed adjacent to the stretch of the said peripheral edge 20, along which the shoulders are recessed 21, 22.

**[0026]** In service the closure of the lock 1 from the outside or the inside of the motor vehicle, is effected by simple slamming of the door in such a way as to cause an impact of the portion 5 of the striker 6 upon the tooth 18 of the fork 10, which rotates clockwise from the opening position in Figure 1 towards the complete closure position in Figures 3 and 4.

**[0027]** Rotation of the fork 10 initially defines the sliding of the stretch 38 of the peripheral edge 28 on the engaging portion 29 of stop 11; immediately thereupon, the shoulder 22 overtakes engaging portion 29 (part closure position of the fork 10), the stop 11, following the pressure of the spring 28, further pushed towards the fork 10 and contacting a surface 39 of the peripheral edge 20 facing away from the engaging portion 29 and contiguous with the shoulder 22.

**[0028]** At the same time the stretch 38 of the peripheral edge 20 makes contact with the bearing component 35, which maintains a preselected clearance between the engaging portion 29 and the surface 39, preventing the impact between the stop 11 and the fork 10 (Figure 2).

**[0029]** Further rotation of the fork 10 causes in a similar manner the spring coupling of the engaging portion 29 with shoulder 21, locking the fork 10 in the complete closure position (Figures 3 and 4); although in that case the angular position of the stop 11 in relation to axis B, corresponding with the complete closure position of the fork 10, is defined by the cooperation of the bearing component 35 and the stretch 38 of peripheral edge 20.

**[0030]** The locking on the fork 10 by the stop 11 may result either in the complete closure position or in the part closure position, depending on the load applied to the door. In particular, the complete closure position is achieved in the event of the load applied to the door defining a pressure on the fork 10 sufficient to take both shoulders 21, 22 beyond the engaging portion 29 of the stop 11, whereas the part closure position is achieved in the event of load imposed on the door defining a pressure on the fork 10 sufficient only to take the shoulder 22 beyond the engaging portion 29 of the stop 11.

**[0031]** From an examination of the characteristics of the lock 1 according to the present invention the advantages that can be achieved will be evident.

**[0032]** In particular, the bearing component 35, being integral with the actuation arm 26 of the stop 11, is active regardless of the relative position between the fork 10 and the stop 11; more specifically, the bearing component 35 prevents impacts between the engaging portion 29 of the stop 11 and the peripheral edge 20 of the fork 10 in both part and complete closure positions of the said fork 10, although when the said positions are defined by respective angular positions of the stop 11 which differ from each other.

**[0033]** In addition, as a difference from known locks, the stop component 35 no longer forms an additional component to be manufactured and fitted to the envelope 2, but is formed integrally on the actuation arm 26

of the stop 11 thus not involving additional costs.

**[0034]** Finally it is clear that modifications and variations may be made to the lock 1 while not exceeding the protective scope of the present invention.

**[0035]** In particular, the lock 1 could be secured to the upright of the door and could cooperate with a striker integral with the door itself.

## Claims

1. Lock (1) for a motor vehicle door comprising a closure mechanism (4) arranged to cooperate with a striker (6), the said closure mechanism (4) comprising:

- a fork (10) hinged about a first axis (A), complete with a seat (16) for a portion (5) of the said striker (6) and rotating about the said first axis (A) between an opening position and at least a complete closure position in which the said portion (5) of the said striker (6) engages the said seat (16);
- a stop (11) hinged about a second axis (B), pushed by elastic means (28) towards a peripheral edge (20) of the said fork (10) and having a metal engaging portion (29) arranged to spring couple with the said peripheral edge (20) to lock in a releasable manner the said fork (10) in the said complete closure position; and
- a stop means (35) arranged to prevent impacts between the said engaging position (29) of the said stop (11) and the said peripheral edge (20) of the said fork (10) during the spring coupling phase of the said stop (11) with the said fork (10);

characterized by the fact that the said stop means comprise at least a stop arrangement (35) made of plastic material, carried integrally by the said stop (11) and cooperating with the said peripheral edge (20) of the said fork (10).

2. Lock according to claim 1, characterized by the fact that the said peripheral edge (20) of the said fork (10) has a first and a second shoulder (21, 22) and that the said engaging portion (29) of the said stop (11) is pushed by the said elastic means (28) so as to spring-couple with the said first and second shoulder (21, 22) to lock in a releasable manner the said fork (10) respectively in the complete closure position and in a part closure position interposed between the said opening position and the said complete closure position, the said stop component (35) cooperating with the said peripheral edge (20) of the said fork (10) to prevent impacts between the said engaging portion (29) of the said stop (11) and the said peripheral edge (20) of the said fork (10) as a result of angular spring displacement of the stop

(11) during the coupling stage with the first and second shoulder (21, 22).

3. Lock according to claim 1 or 2, characterized by the fact that the said stop (11) comprises a metal bearing component (25) hinged about the said second axis (B) and integrally fitted with the said engaging portion (29), an actuation arm (26) made of plastic material and hinged also about the second axis (B), and angular coupling means (27, 40) between the said bearing component (25) and the said actuation arm (26), the said stop component (35) being integrally carried by the said actuation arm (26). 5  
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4. Lock according to claim 3, characterized by the fact that the said first and second axes (A, B) are parallel with each other and the said actuation arm (26) is placed superimposed over the said bearing component (25) and has a projecting portion (31) related to the bearing component (25) and placed offset in relation to the said fork (10) in a parallel direction to the said first and second axis (A, B) in a manner to obviate interference with the rotation of the fork (10), the said stop component (35) extending in overhang towards the said fork (10) of the said projecting portion (31) of the said actuation arm (26). 15  
20  
25
5. Lock according to any one of the preceding claims, characterized by the fact that the said stop component (35) is hollow. 30
6. Lock according to any one of the preceding claims, characterized by the fact that the said stop component (35) consists of an essentially semi-cylindrical dowel. 35
7. Lock according to any one of the claims 2 to 6, characterized by the fact that the said stop component (35) cooperates with a curved bearing stretch (38) of the said peripheral edge (20) of the said fork (10) placed laterally in relation to a stretch (19) of the peripheral edge (20) along which are recessed the said first and second shoulders (21, 22). 40  
45
8. Lock according to claim 7, characterized by the fact that the said bearing stretch (38) of the said peripheral edge (20) of the said fork (10) is outwardly convex. 50
9. Lock according to anyone of claims 2 to 8, characterized by the fact that the said fork (10) is made of metal material and externally covered by a shell (23) made of plastic material, from which the said shoulders (21, 22) at least are projecting. 55

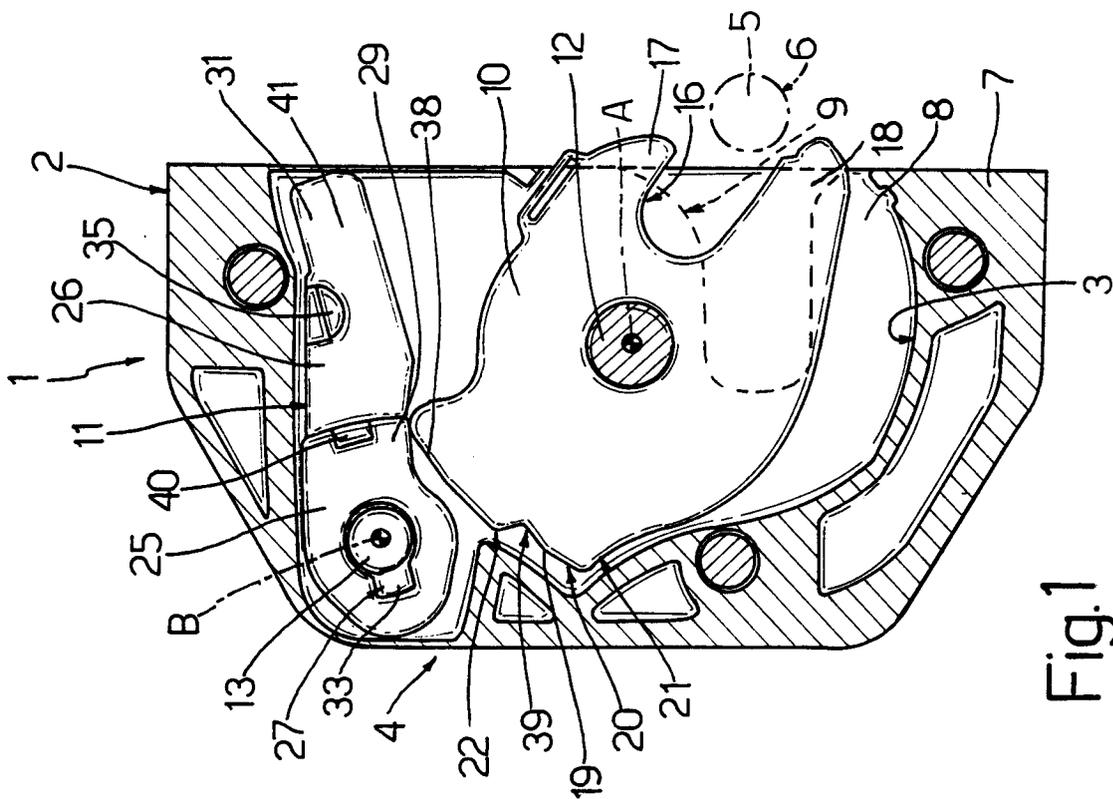


Fig.1

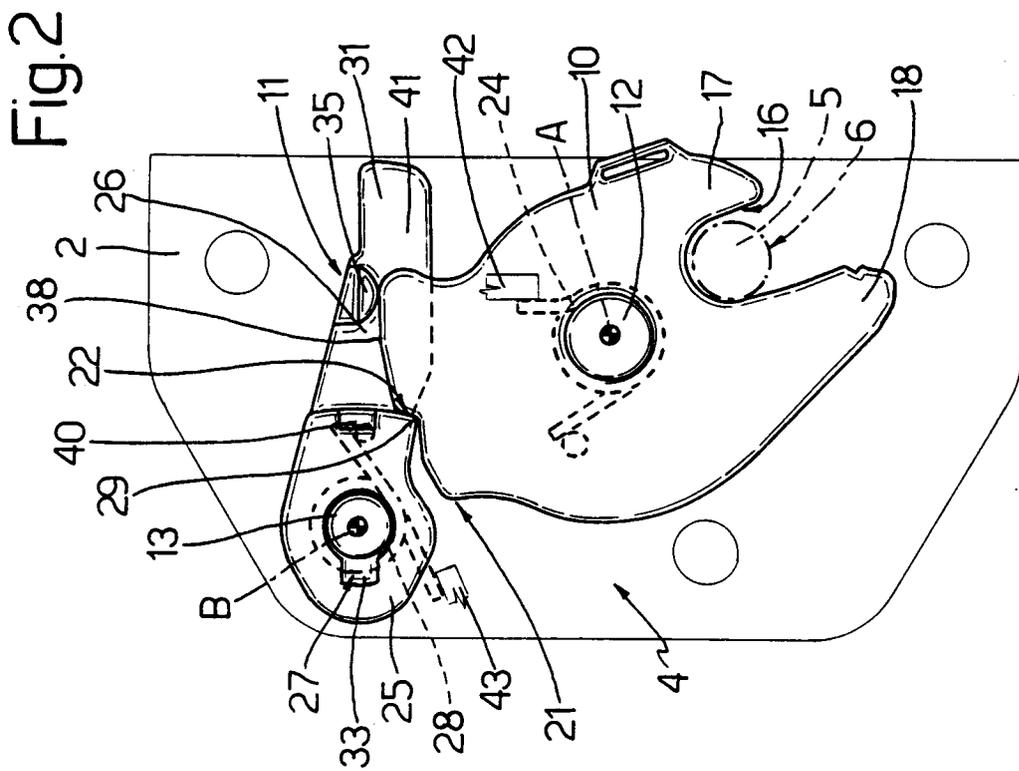


Fig.2

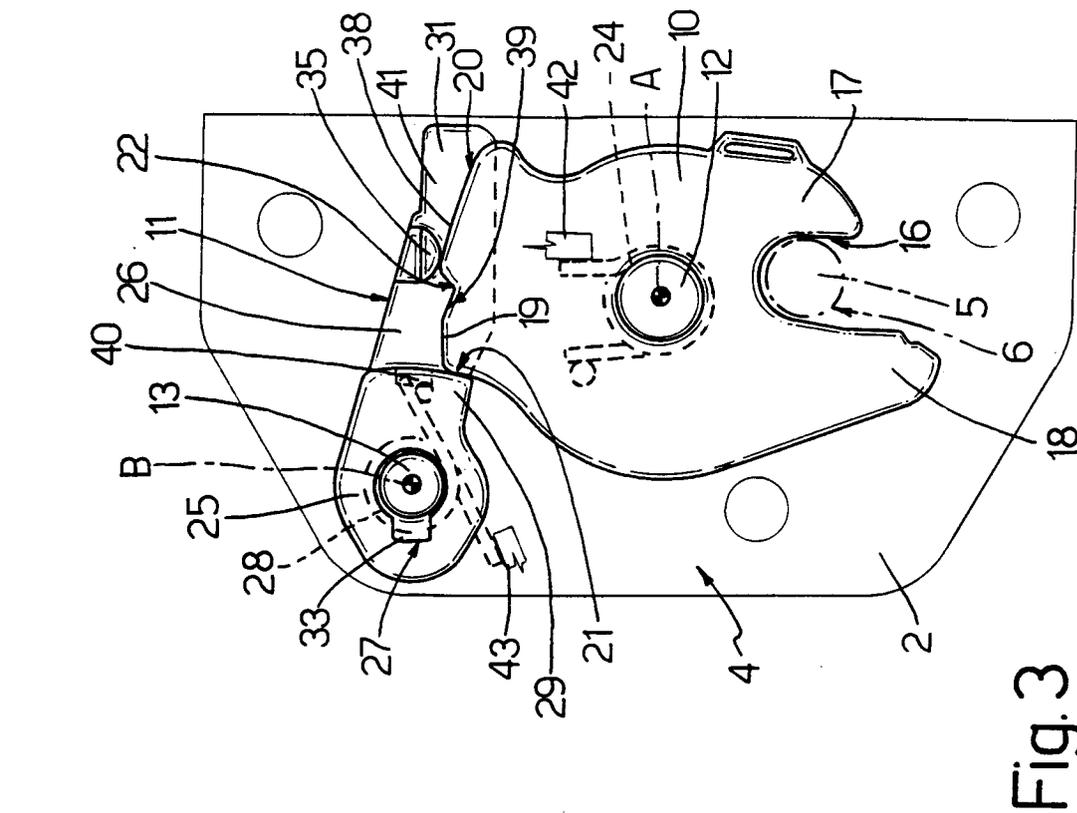


Fig. 3

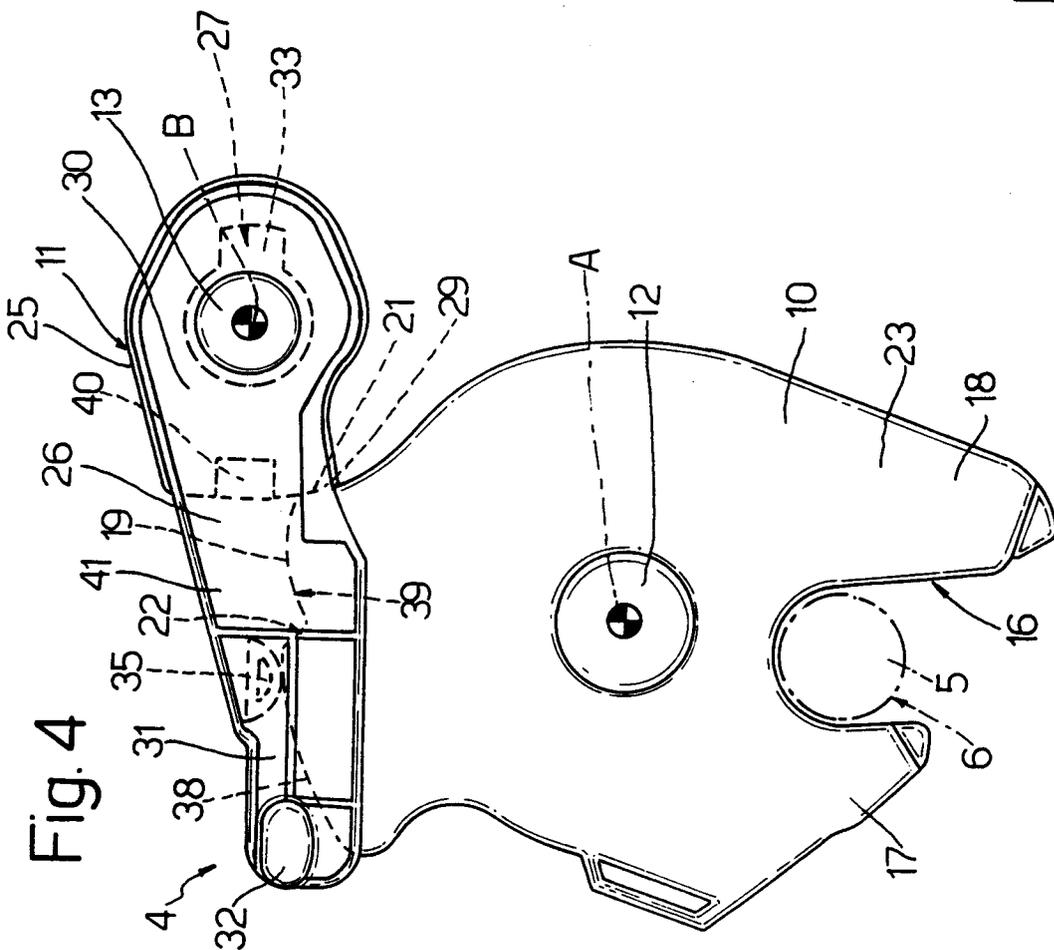


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number  
EP 98 11 4304

| DOCUMENTS CONSIDERED TO BE RELEVANT   |  |  |  |
|---|--|--|--|
| Category  | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim  | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| X   | US 4 235 462 A (TORII ET AL.)<br>25 November 1980<br>* the whole document *  | 1,2,7,8  | E05B65/32                                    |
| X   | PATENT ABSTRACTS OF JAPAN<br>vol. 3, no. 12 (M-47), 31 January 1979<br>& JP 53 138127 A (TOYO KOGYO K.K.),<br>12 February 1978<br>* abstract * | 1,2,7,8  |  |
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| A   | US 5 632 517 A (PAULIK ET AL.) 27 May 1997<br>* abstract *   | 1,9  |  |
|   |  |  | TECHNICAL FIELDS SEARCHED (Int.Cl.6)         |
|   |  |  | E05B   |
| The present search report has been drawn up for all claims  |  |  |  |
| Place of search   |  | Date of completion of the search   | Examiner                                     |
| THE HAGUE   |  | 10 November 1998   | Westin, K                                    |
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