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(54) **Vehicle door lock**

Kraftfahrzeugtürschloss

Serrure pour porte de véhicule automobile

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## Description

The present invention relates to a vehicle door lock.

Locks are known comprising a fork and latch closing mechanism; an external opening control lever connected to the outside door handle; a safety control lever for enabling or disabling opening of the door from the outside; and an internal opening control lever connected to the inside door handle.

The safety control lever of such locks is normally connected to a safety knob inside the passenger compartment and movable between a depressed or recessed position and a raised or visible position respectively corresponding to engagement and release of the safety mechanism. In addition to controlling the safety mechanism, the safety knob therefore also provides for indicating the state of the lock (safety mechanism engaged or released).

The internal opening control lever of known locks normally presents a cam surface cooperating with a corresponding surface on the safety control lever for moving this from the engaged to the released position during a first portion of the travel of the inside handle, and so moving the safety knob from the depressed to the raised position. As the inside handle is moved further into the limit position, the internal opening control lever is brought into contact with the latch which, when moved, releases the fork to open the lock.

Conventional locks therefore present two in-vehicle control elements (handle and knob) with partially overlapping functions, particularly as regards release of the safety mechanism, whereas, for obvious production and assembly cost reasons, all the manual control functions would be better performed by a single element.

To some extent - see European Patent n. 0169644 - the above problem has been solved by connecting both the safety control lever and the internal opening control lever to the inside handle using a single Bowden cable.

GB-A-2 259 734 discloses a vehicle door latch system in which both the safety control lever and the opening control lever are actuated by the inside handle through a rod linked to such levers by a lost motion mechanism.

The complications involved in such known solutions, however, fail to provide for entirely eliminating the above drawbacks.

It is an object of the present invention to provide a straightforward, reliable, low-cost vehicle door lock designed to overcome the above drawbacks, and whereby, in particular, all the in-vehicle manual control functions are performed solely by the inside handle, the position of which indicates the state of the lock.

According to the present invention, there is provided a vehicle door lock comprising a fork and latch closing mechanism; an external opening control lever connected to the outside door handle; a safety control lever movable between a first stable position preventing opening from the outside, and a second stable position

enabling opening from the outside; and an internal opening control lever connected to the inside door handle and traveling between a first idle position and a second position wherein it interacts with a pin of said latch to open the lock; characterized in that it comprises articulated connecting means between said safety control lever and said internal opening control lever, for moving said safety control lever between said first and second stable positions when the internal opening control lever is moved from the idle position to a third intermediate position of its travel, and vice versa.

A preferred non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a side view of a vehicle door lock in the closed position with the safety mechanism engaged;

Figure 2 shows a larger-scale section along line II-II in Figure 1;

Figure 3 shows a side view of the Figure 1 lock in the closed position with the safety mechanism released;

Figure 4 shows a side view of the Figure 1 lock in the open position.

With reference to Figures 1, 2 and 3, number 1 indicates a perfected lock for a vehicle door (not shown).

Lock 1 comprises a structure 2 fittable to the vehicle door and supporting a number of movable elements as described below.

More specifically, lock 1 comprises a known fork and latch type closing mechanism 3 cooperating with a striker element 4 on the door post (not shown) when the door is closed.

Lock 1 also comprises an external opening control lever 5 connected to the outside door handle; an internal opening control lever 6 connected to the inside door handle 7; and a safety control lever 8.

Lever 5 is hinged to structure 2 by a pin (not shown), and is movable between an idle position and an operating position (not shown) wherein it releases the latch of closing mechanism 3.

Lever 6 is hinged to structure 2 by a pin 13, and is movable between a first idle position a maintained stably by a known spring 14 associated with lever 6, and a second position b rotated clockwise in relation to position a (Figure 4) and wherein it interacts, by means of an appendix 25, with a latch pin 15 for releasing the latch.

Lever 6 is connected to handle 7 by a rigid rod 16, so that handle 7 is movable between a stable idle position A corresponding to position a of lever 6, and an unstable opening position B corresponding to position b of lever 6.

Safety control lever 8 is hinged to structure 2 by a pin 17, and is movable in known manner between a first engaged position (Figure 1) wherein lever 5 is made ineffective by conventional linkages (not described in de-

tail), and a second position (Figures 3 and 4) rotated clockwise in relation to the first position and enabling lock 1 to be opened externally by means of lever 5. The first and second positions of the lever are defined by striker elements (not shown) fitted to supporting structure 2 and with which lever 8 cooperates, and are made stable by a known bistable spring 24 securing lever 8 to structure 2.

More specifically, lever 6 comprises a first bottom arm 18 secured to rod 16; and a second substantially lateral arm 19 secured to one arm 20 of lever 8 by a connecting rod 21 pivoting on levers 6 and 8 by means of respective end pins 22, 23 (Figure 2). Pin 22 on lever 6 engages a longitudinal slot 28 formed in connecting rod 21 for the purpose described later on.

Operation of lock 1 will now be described as of the closed condition, with the safety mechanism engaged, shown in Figure 1 wherein handle 7 and lever 6 are set to respective positions A, a, and lever 8 to said first position.

When handle 7 is operated, in particular rotated towards position B, pull is exerted on rod 16 which, being secured to internal opening control lever 6, rotates lever 6 along a first portion of its travel; which rotation is transmitted by connecting rod 21 to lever 8 so that lever 8 moves into the second position stabilized by spring 24 and wherein the safety mechanism is released. Lever 6 and handle 7 at this point are set to respective intermediate positions c, C of their travel, which configuration is stabilized by spring 24 overcoming the recall action exerted by spring 14 on lever 6.

Further displacement of inside handle 7 into position B rotates internal opening control lever 6 into position b (Figure 4) wherein appendix 25, contacting pin 15 of the latch, rotates the latch to release the fork and so open lock 1. The above configuration is obviously only achievable by virtue of slot 28 which provides for disconnecting internal opening control lever 6 and safety control lever 8 along the second portion of effective travel; and the above configuration (Figure 4) is obviously unstable by virtue of internal opening control lever 6 being subjected to the recall action of spring 14 which tends to restore the device to the Figure 3 position.

To re-engage the safety mechanism, the handle is simply restored from position C to position A, in which case also, rotation of lever 6 is transmitted to lever 8 by connecting rod 21.

The advantages of lock 1 in accordance with the teachings of the present invention are as follows.

In particular, all in-vehicle control of lock 1 is performed by handle 7, so that the traditional safety knob and the linkages for connection to the lock may be dispensed with. Handle 7 also provides for indicating the state of the lock, by assuming two stable positions A and C corresponding respectively to engagement and release of the safety mechanism.

Moreover, the lock as described is highly straightforward, reliable and cheap to produce.

Clearly, changes may be made to lock 1 as described and illustrated herein without, however, departing from the scope of the present invention.

For example, the dotted line portion of Figure 4 shows an alternative embodiment of lock 1 wherein the traditional safety knob is retained if requested by the vehicle manufacturer. In this case, the safety knob, indicated 26, is connected to lever 8, conveniently provided for the purpose with a longer arm 20', by means of a tie 27, and performs the usual function of engaging or releasing the safety mechanism when set to the depressed or raised position corresponding to the first and second position of safety control lever 8.

## Claims

1. A vehicle door lock (1) comprising a fork and latch closing mechanism (3); an external opening control lever (5) connected to the outside door handle; a safety control lever (8) movable between a first stable position preventing opening from the outside, and a second stable position enabling opening from the outside; and an internal opening control lever (6) connected to the inside door handle (7) and traveling between a first idle position (a) and a second position (b) wherein it interacts with a pin (15) of said latch to open the lock (1); characterized in that it comprises articulated connecting means (21) between said safety control lever (8) and said internal opening control lever (6), for moving said safety control lever (8) between said first and second stable positions when the internal opening control lever (6) is moved from the idle position (a) to a third intermediate position (c) of its travel, and vice versa.
2. A lock (1) as claimed in Claim 1, characterized in that said first and second positions of said safety control lever (8) are maintained stable by a spring (24); said third position (c) of said internal opening control lever (6) being maintained stable by said spring (24) via said articulated connecting means (21).
3. A lock (1) as claimed in Claim 1 or 2, characterized in that said articulated connecting means (21) comprise a connecting rod connected to respective arms (20, 19) of said safety control lever (8) and said internal opening control lever (6) via hinge means (23, 22).
4. A lock (1) as claimed in Claim 3, characterized in that said hinge means (23, 22) comprise at least a sliding connection (28) disconnecting said internal opening control lever (6) from said safety control lever (8) during a portion of travel extending between said third (c) and said second (b) position.

5. A lock (1) as claimed in one of the foregoing Claims from 2 to 4, characterized in that said handle (7) is connected to said internal opening control lever (6) by a rigid rod (16); said handle (7) being movable between an idle position (A) and an opening position (B) corresponding respectively to said first (a) and second (b) positions of said internal opening control lever (6); and said handle (7) presenting a third intermediate stable position (C) corresponding to said third position (c) of said internal opening control lever (6).
6. A lock (1) as claimed in any one of the foregoing Claims, characterized in that it comprises a safety knob (26) connected to said safety control lever (8) and movable between a depressed position and a raised position respectively corresponding to said first and second positions of said safety control lever (8).

### Patentansprüche

1. Fahrzeug-Türschloß (1) mit folgenden Teilen: einem Gabelund Klinken-Schließmechanismus (3); einem mit dem äußeren Türgriff verbundenen äußeren Öffnungssteuerhebel (5); einem zwischen einer ersten stabilen Position, die das Öffnen von außen verhindert, und einer zweiten stabilen Position, die das Öffnen von außen ermöglicht, bewegbaren Sicherungssteuerhebel (8); und einem mit dem inneren Türgriff (7) verbundenen inneren Öffnungssteuerhebel (6), der sich zwischen einer ersten, unaktiven Position (a) und einer zweiten Position (b), in der er mit einem Stift (15) der Klinke zum Öffnen des Schlosses (1) zusammenwirkt, bewegt; gekennzeichnet durch gelenkig angeschlossene Verbindungsmittel (21) zwischen dem Sicherungssteuerhebel (8) und dem inneren Öffnungssteuerhebel (6) zum Bewegen des Sicherungssteuerhebels (8) zwischen der ersten und der zweiten stabilen Position, wenn der innere Öffnungssteuerhebel (6) von der unaktiven Position (a) zu einer dritten, im Verlauf seines Bewegungswegs liegenden Position (c), und umgekehrt, bewegt wird.
2. Türschloß (1) nach Anspruch 1, dadurch gekennzeichnet, daß die erste und die zweite Position des Sicherungssteuerhebels (8) durch eine Feder (24) stabil gehalten sind; und daß die dritte Position (c) des inneren Öffnungssteuerhebels (6) durch diese Feder (24) über die gelenkig angeschlossenen Verbindungsmittel (21) stabil gehalten ist.
3. Türschloß (1) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die gelenkig angeschlossenen Verbindungsmittel (21) eine Verbindungsstange umfassen, die über Scharniereinrichtungen (23, 22)

mit einem Arm (20) des Sicherungssteuerhebels (8) bzw. mit einem Arm (19) des inneren Öffnungssteuerhebels (6) verbunden ist.

4. Türschloß nach Anspruch 3, dadurch gekennzeichnet, daß die Scharniereinrichtungen (23, 22) wenigstens eine Gleitverbindung (28) umfassen, die während eines Teils des Bewegungswegs zwischen der dritten Position (c) und der zweiten Position (b) den inneren Öffnungssteuerhebel (6) vom Sicherungssteuerhebel (8) löst.
5. Türschloß (1) nach einem der vorhergehenden Ansprüche 2 bis 4, dadurch gekennzeichnet, daß der Türgriff (7) mit dem inneren Öffnungssteuerhebel (6) über eine starre Stange (16) verbunden ist, zwischen einer Leerlaufstellung (A) und einer Öffnungsstellung (B), die der ersten Position (a) bzw. der zweiten Position (b) des inneren Öffnungssteuerhebels (6) entsprechen, bewegbar ist und eine dritte dazwischenliegende stabile Stellung (C) aufweist, die der dritten Position (c) des inneren Öffnungssteuerhebels (6) entspricht.
6. Türschloß (1) nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es einen Sicherungsknopf (26) umfaßt, der mit dem Sicherungssteuerhebel (8) verbunden ist und zwischen einer niedergedrückten Stellung und einer angehobenen Stellung bewegbar ist, die der ersten Position bzw. der zweiten Position des Sicherungssteuerhebels (8) entsprechen.

### Revendications

1. Serrure (1) de portière de véhicule comprenant un mécanisme de fermeture (3) à fourchette et pêne; un levier de commande d'ouverture externe (5) relié à la poignée extérieure de portière; un levier de commande de condamnation (8) mobile entre une première position stable empêchant l'ouverture depuis l'extérieur, et une deuxième position stable permettant l'ouverture depuis l'extérieur; et un levier de commande d'ouverture interne (6) relié à la poignée intérieure (7) de la portière et se déplaçant entre une première position inactive (a) et une deuxième position (b) dans laquelle il interagit avec une pointe (15) dudit pêne pour ouvrir la serrure (1); caractérisée par le fait qu'elle comprend des moyens de liaison articulés (21) entre ledit levier de commande de condamnation (8) et ledit levier de commande d'ouverture interne (6), destinés à déplacer ledit levier de commande de condamnation (8) entre lesdites première et deuxième positions stables lorsque le levier de commande d'ouverture interne (6) est déplacé de la position inactive (a) à une troisième position intermédiaire (c) de son déplacement,

et vice-versa.

2. Serrure (1) selon la revendication 1, caractérisée par le fait que lesdites première et deuxième positions dudit levier de commande de condamnation (8) sont rendues stables par un ressort (24); ladite troisième position (c) dudit levier de commande d'ouverture interne (6) étant rendue stable par ledit ressort (24) via lesdits moyens de liaison articulés (21). 5  
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3. Serrure (1) selon la revendication 1 ou 2, caractérisée par le fait que lesdits moyens de liaison articulés (21) comprennent une tige de liaison reliée à des bras (20, 19) respectifs dudit levier de commande de condamnation (8) et dudit levier de commande d'ouverture interne (6) via des moyens à charnière (23, 22). 15
  
4. Serrure (1) selon la revendication 3, caractérisée par le fait que lesdits moyens à charnière (23, 22) comprennent au moins une liaison coulissante (28) qui désolidarise ledit levier de commande d'ouverture interne (6) dudit levier de commande de condamnation (8) sur une partie de déplacement qui s'étend entre lesdites troisième (c) et deuxième (b) positions. 20  
25
  
5. Serrure (1) selon l'une des revendications 2 à 4 précédentes, caractérisée par le fait que ladite poignée (7) est reliée audit levier de commande d'ouverture interne (6) par une tige rigide (16); ladite poignée (7) étant mobile entre une position inactive (A) et une position d'ouverture (B) qui correspondent respectivement aux dites première (a) et deuxième (b) positions dudit levier de commande d'ouverture interne (6); et ladite poignée (7) présentant une troisième position stable intermédiaire (C) qui correspond à ladite troisième position (c) dudit levier de commande d'ouverture interne (6). 30  
35  
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6. Serrure (1) selon l'une quelconque des revendications précédentes, caractérisée par le fait qu'elle comprend un bouton de condamnation (26) relié audit levier de commande de condamnation (8) et mobile entre une position enfoncée et une position relevée qui correspondent respectivement aux dites première et deuxième positions dudit levier de commande de condamnation (8). 45  
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Fig.1

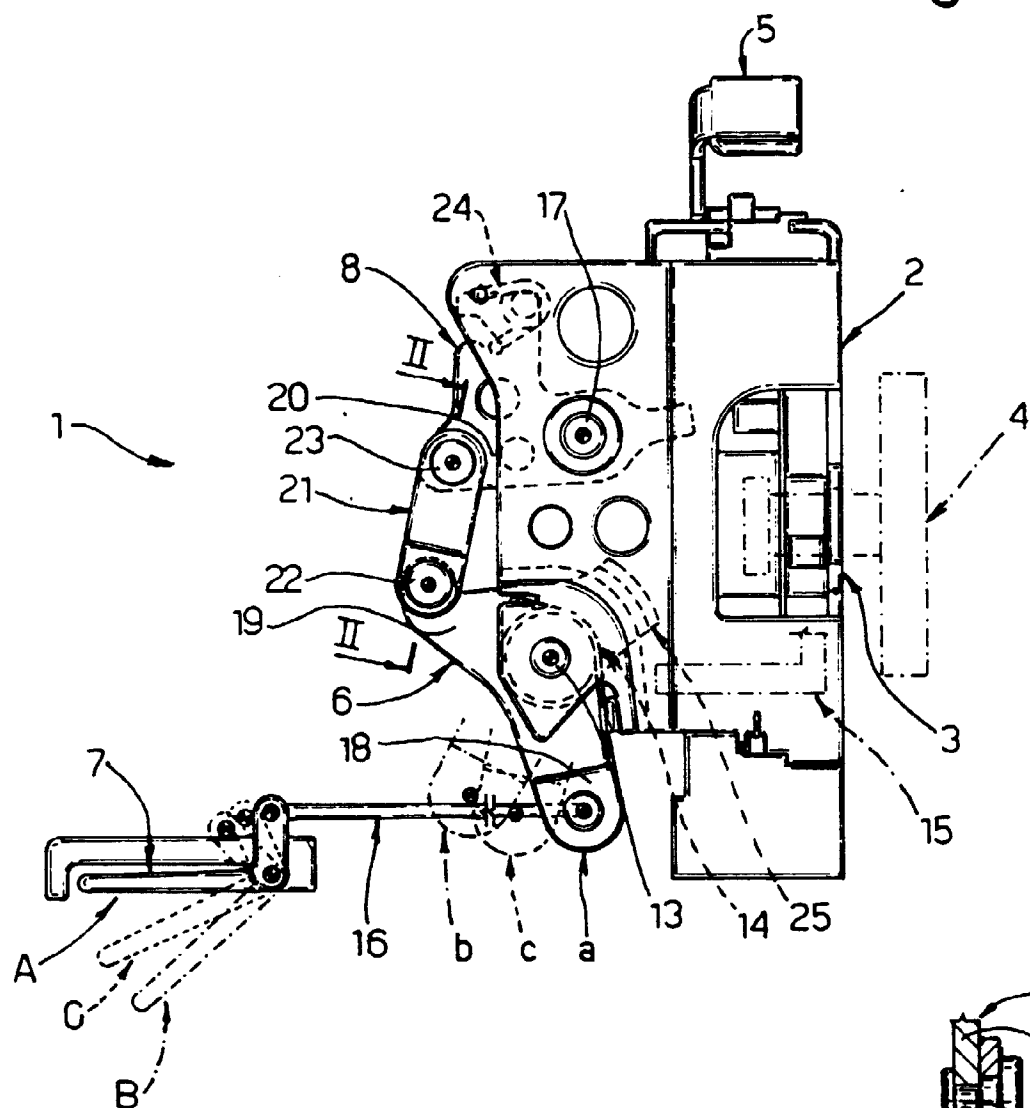


Fig.2

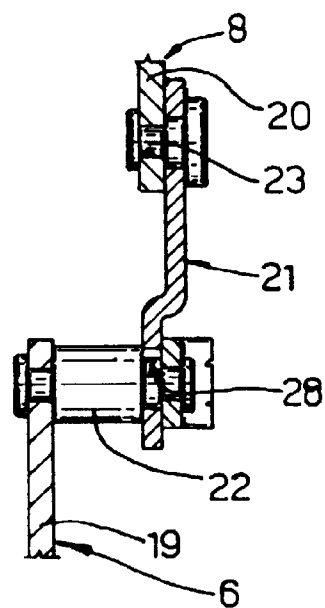


Fig.3

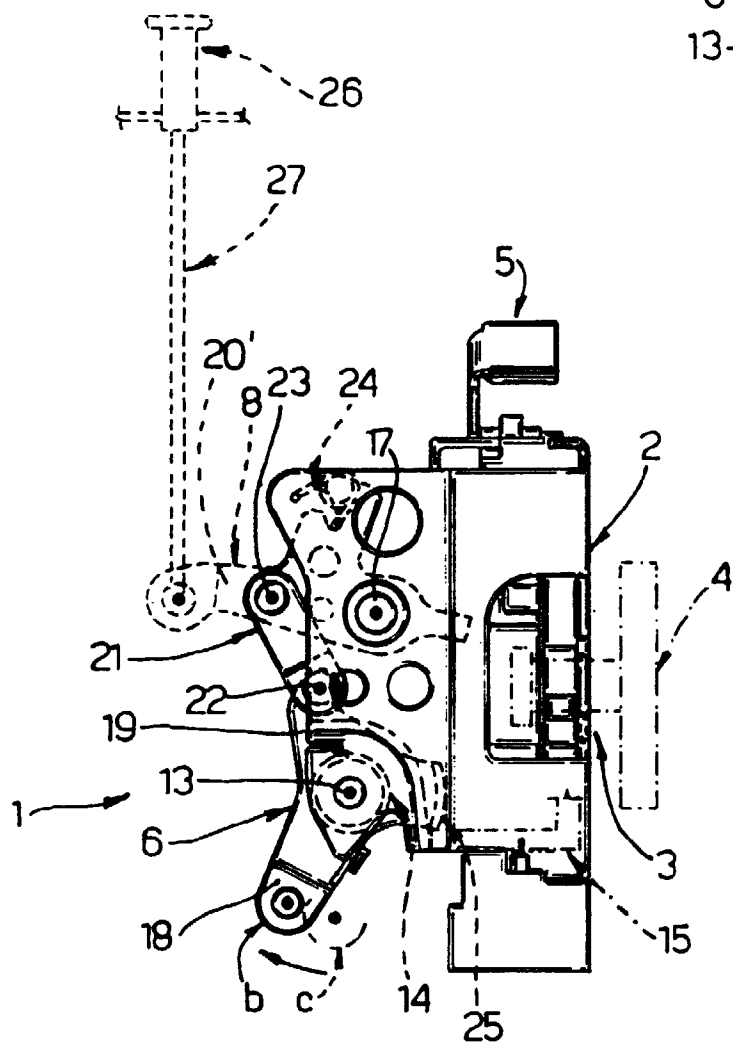
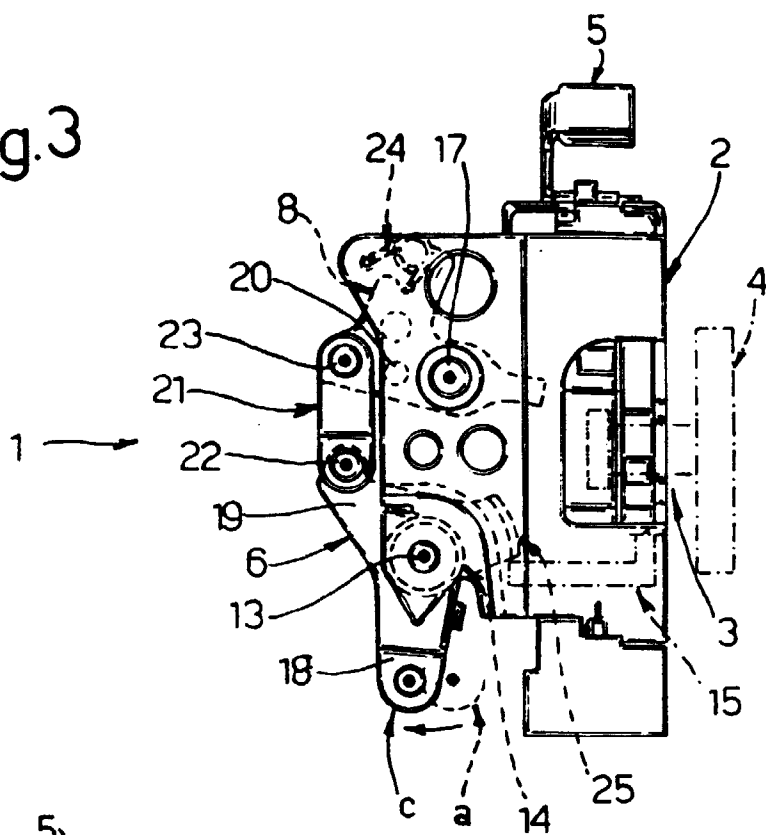


Fig.4