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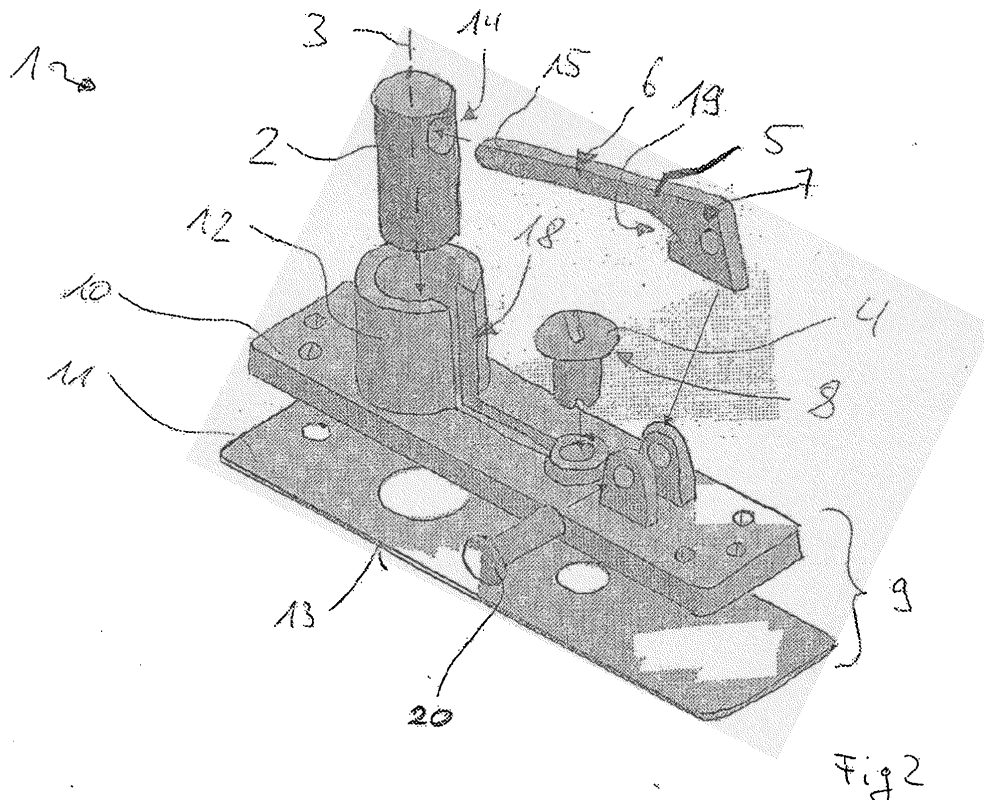
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**(54) Pivot for a door**

(57) The invention relates to a pivot (1) for a door, especially top pivot, comprising a pivot pin (2) having a center axis (3) and being slidable along the center axis (3), wherein the pivot pin (2) is engageable with the door, an adjusting element (4), and a connecting element (5) having a rotation center (7) about which the connecting element (5) is rotatable and having an arm portion (6),

wherein an end portion (15) of the arm portion (6) being connected with the pivot pin (2) for coupling a movement of the pivot pin (2) and the connecting element (5), wherein the adjusting element (4) is provided such that a force is providable to the arm portion (6) between the rotation center (7) and the end portion (15).



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## Description

**[0001]** The invention relates to a pivot for a door, in particular a top pivot for a door, and a door closer system including the pivot.

**[0002]** In the state of the art, top pivots are known to be combined with floor-concealed door closers. Floor concealed door closers are provided in a recess of the floor with a top surface being on the same level as the floor. A spindle is the only part protruding from the top surface, wherein the spindle is provided to be connected to a bottom part of a door. As soon as the door is released after opening, the spindle pulls the door back to the closed state.

**[0003]** Further, the door has to be mounted to a top portion of the door frame. For this reason, a pivot, in particular a top pivot, is provided. A conventional top pivot is shown in figure 1. Figure 1 discloses a top pivot 100 having the design of a conventional first class lever mechanism. For example, the effort is applied via a screw 500 along a first direction 600. The effort is applied to a rocker 300 on a first side of the fulcrum 400 such that the rocker 300 pushes a pivot pin 200, which is provided on a second side of the fulcrum 400, along the second direction 700. The second direction 700 is opposite to the first direction 600. Hence, the length of the rocker 300 determines the mechanical advantage of the system being load arm or effort arm. The screw 500 is fastened up or down which in turn moves the pin accordingly.

**[0004]** However, the top pivot 100 according to the prior art requires a lot of space. In particular, a length dimension of the known top pivot is rather large due to the dimensions of the rocker arm.

**[0005]** Therefore, the object of the present invention is to provide a pivot of the species indicated in the generic part of patent claim 1, which can be manufactured at a low cost and which has a small overall size.

**[0006]** This problem is solved by the features of the inventive pivot. The inventive pivot for a door is especially a top pivot and comprises a pivot pin, an adjusting element and a connecting element. The pivot pin has a center axis and is slidable along the center axis. Further, the pivot pin is engageable with the door. In case the pivot pin is engaged with the door, the pivot pin provides a pivot point of the door. The connecting element has a rotation center about which the connecting element is rotatable. Further, the connecting element has an arm portion. An end portion of the arm portion of the connecting element is connected with the pivot pin for coupling a displacement of the pivot pin and the connecting element. Additionally, the adjusting element is provided such that a force is providable to the arm portion between the rotation center and the end portion. Therefore, the pivot sets up a third class lever system.

**[0007]** The dependent claims contain advantageous embodiments of the present invention.

**[0008]** In a preferred embodiment, the pivot comprises a base element for supporting the pivot pin and the ad-

justing element. The base element has at least a first surface. Particularly, the base element comprises a base plate which is covered by a cover plate. The surface of the cover plate not facing the base plate is regarded the first surface of the base element. In a particularly preferred embodiment, the center axis of the pivot pin is perpendicular to the first surface.

**[0009]** In a further particularly preferred embodiment, the pivot pin is slidable between a locking position and a retreat position. In the locking position the pivot pin protrudes more from the first surface of the base element than in the retreat position. In particular, the pivot pin does not protrude in the retreat position from the first surface. In the locking position, the pivot pin is engageable with the door.

**[0010]** In a yet further particularly preferred embodiment, the connecting member comprises a first stopping member and a second stopping member. The first stopping member abuts against the base element when the pivot pin is in the retreat position. Additionally, it is preferred that the second stopping member abuts against the base element when the pivot pin is in the locking position.

**[0011]** The adjusting element is preferably accessible for rotating from the first surface of the base element. The first surface is particularly the only surface which is accessible when the pivot is mounted in a door frame. Since the pivot is preferably a top pivot, the first surface is preferably a bottom surface of the pivot.

**[0012]** In a preferred embodiment, the base element comprises a hollow protrusion in which the pivot pin is supported. In particular, the hollow protrusion is a cylindrical hollow protrusion. The hollow protrusion preferably comprises a slit, in which the connecting element, especially the arm portion of the connecting element, can be moved without interfering with the base element. The hollow protrusion allows only a movement of the pivot pin along the center axis.

**[0013]** Preferably, the adjusting element comprises a flange portion. The flange portion is provided in a recess of the connecting element. Therefore, the adjusting element and the connecting element are joined in a form locking manner. As a result, any movement of the connecting element is only possible with simultaneous movement of the adjusting element.

**[0014]** In a preferred embodiment, the adjusting element comprises a first threat, in particular an external threat, which is engaged with a second threat provided in the base element. The second threat particularly is an internal threat. Preferably, the adjusting element is an adjusting screw such that the adjusting screw is displaced in relation to the base element when the adjusting screw is rotated.

**[0015]** Further, the adjusting element is preferably provided in parallel to the center axis of the pivot pin. Therefore, a rotation of the adjusting element with respect to the connecting element leads to a displacement of the connecting element in parallel to the center axis. Accord-

ingly, the direction of displacement of the connecting element is parallel to the only possible displacement directions of the pivot pin. Hence, the coupling of the movement of the pivot pin and the connecting element can be reached rather simple.

**[0016]** In a preferred embodiment, the pivot pin comprises a hole. Further, an end portion of the connecting element is provided within the hole. The connecting element preferably has an arm portion, while an end portion of the arm portion is provided within the hole. Particularly, the hole is a through hole.

**[0017]** The invention also relates to a door closer system. The door closer system comprises a floor-concealed door closer and a pivot as described above. The inventive door closer system therefore is advantageous with respect to available space, in which the door closer system shall be installed.

**[0018]** In the following, the invention is explained in more detail on the basis of the accompanying drawing, in which:

Fig. 1 is a pivot for a door according to the prior art,

Fig. 2 is a first view of an inventive pivot according to a preferred embodiment,

Fig. 3 is a second view of the inventive pivot according to a preferred embodiment, and

Fig. 4 is a third view of the inventive pivot according to a preferred embodiment.

**[0019]** Fig. 2 is an exploded view of the inventive pivot 1 according to a preferred embodiment. Figure 3 is a sectional view of the pivot 1 shown in figure 1. The pivot 1 comprises a base element 9 having a base plate 10 and a cover plate 11. The cover plate 11 covers the base plate 10. The base element 9 comprises a first surface 13 which is the surface of the cover plate 11 not facing the base plate 10. The base element may 9 be attached to a door frame, in particular to a top portion of the door frame, such that the first surface 13 is a bottom surface.

**[0020]** The first surface 13 comprises two holes, one for a pivot pin 2 and another for an adjusting element 4. The adjusting element 4 is therefore accessible for rotating from the first surface 13, wherein a rotation of the adjusting element 4 causes a displacement of the pivot pin 2. Due to the displacement, a length of the pivot pin 2 protruding from the first surface 13 can be adjusted.

**[0021]** The pivot pin 2 has a cylindrical shape and comprises a center axis 3. The above described displacement of the pivot pin 2 can only performed along said center axis 3. To allow displacement along the center axis 3 only, the pivot pin 2 is supported within a hollow protrusion 12. The hollow protrusion 12 is provided on the base plate 2 on the opposite side of the surface facing the cover plate 11. In particular, an axis of an inner cylindrical shape of the hollow protrusion 12 is identical to the center

axis 3 of the pivot pin 2.

**[0022]** Further, the hollow protrusion 12 as well as the center axis 3 of the pivot pin 2 is orientated perpendicular to the first surface. Additionally, the adjusting element 4 is also provided perpendicular to the first surface 13. With such a design, an engagement of the pivot pin 2 with the door is made very simple.

**[0023]** The pivot pin 2 is provided slidable within the hollow protrusion 12. A movement of the pivot pin 2 is caused by the adjusting element 4 and transferred to the pivot pin 2 by a connecting element 5. The pivot pin 2 and the connecting element 5 are coupled as follows:

A hole 14, in particular a through hole, is provided within the pivot pin 2. The connecting element comprises an arm portion 6 which has an end portion 15. The hole 14 and the arm portion 6 are both orientated basically perpendicular to the center axis 3 of the pivot pin 2. With the end portion 15 extending into the hole 14, a movement of the pivot pin 2 and the connecting element 5 along the center axis is coupled. In order to allow proper movement of the coupled pivot pin 2 and connecting element 5, a slit 18 is provided within the hollow protrusion 12. The slit 18 is provided within the whole hollow protrusion 12 in parallel to the center axis 3 and may end into a recess provided within the base plate 10 to enlarge the possible amount of displacement of the connecting element.

**[0024]** A third class lever system is set up by the connecting element 5. The connecting element 5 comprises a rotation center 7, which is formed as a hole. Said hole is penetrated by a bolt 20 which joins the connecting element 5 and the base element 9. Since the connecting element 5 comprises an arm portion 6 being connected to the pivot pin 2, a rotation of the connecting element 5 about the rotation center 7 causes the pivot pin 2 to slide along the center axis 3 within the hollow protrusion 12.

**[0025]** The adjusting element 4 is formed as an adjusting screw which is screwed into the base plate 10. The adjusting element 4 can be rotated with respect to the base element 9 such that the adjusting element 4 is screwed in or screwed out the base element 9. The displacement caused when rotation the adjusting element 4 is transferred to the connecting element 5. To allow such a transfer, the adjusting element 4 is provided between the rotation center 7 and the end portion 15 of the connecting element 5. In this way, said third class lever system is created.

**[0026]** The details of the movement of the pivot pin 2 are shown in figures 3 and 4. Figure 3 shows the pivot pin 2 in a retreat position while figure 4 shows the pivot pin 2 in a locking position.

**[0027]** As can be seen from figures 3 and 4, the adjusting element 4 comprises a flange portion 8. The flange portion 8 is provided within a recess 19 of the connecting element 5 for a form locking joint. Therefore, the rotation

of the connecting element 5 about the rotation center 7 is connected to a displacement of the adjusting element 4 which is connected rotation of the adjusting element 4.

**[0028]** Figure 3 shows the pivot 1 with the pivot pin 2 in the retreat position. In this position, a first stopping member 16 of the connecting element 5 abuts against the base element 9, in particular against the base plate 10. Therefore, a further rotational movement of the connecting element 5 about the rotation center 7 is blocked. The pivot pin 2 maintains in the retreat position until the adjusting element 4 is rotated.

**[0029]** When the adjusting element 4 is rotated, the flange portion 8 pulls the recess 13 down to the base plate 10. Therefore, a rotational movement of the connecting element 5 about the rotation center 7 is caused, which makes the pivot pin 2 protrude from the first surface 13 of the base element 9. Said rotational movement is stopped when a second stopping member 17 of the connecting member 5 abuts the base element 9. In figure 4 it is shown, that the arm portion 6 of the connecting element 5 functions as second stopping member 17. With the second stopping member 17 abutting against the base element 9, the pivot pin 2 is in the locking position. The pivot pin 2 maintains the locking position as long as the second stopping member 17 abuts against the base plate 9, i.e. as long as the adjusting member 4 is not rotated.

#### List of reference numerals

##### **[0030]**

- |     |                        |
|-----|------------------------|
| 1   | pivot                  |
| 2   | pivot pin              |
| 3   | center axis            |
| 4   | adjusting element      |
| 5   | connecting element     |
| 6   | arm portion            |
| 7   | rotation center        |
| 8   | flange portion         |
| 9   | base element           |
| 10  | base plate             |
| 11  | cover plate            |
| 12  | hollow protrusion      |
| 13  | first surface          |
| 14  | hole                   |
| 15  | end portion            |
| 16  | first stopping member  |
| 17  | second stopping member |
| 18  | slit                   |
| 19  | recess                 |
| 20  | bolt                   |
|     |                        |
| 100 | top pivot (prior art)  |
| 200 | pivot pin (prior art)  |
| 300 | rocker (prior art)     |
| 400 | fulcrum (prior art)    |
| 500 | screw (prior art)      |

- |     |                              |
|-----|------------------------------|
| 600 | first direction (prior art)  |
| 700 | second direction (prior art) |

#### 5 Claims

1. Pivot (1) for a door, especially top pivot, comprising
  - a pivot pin (2) having a center axis (3) and being slidable along the center axis (3), wherein the pivot pin (2) is engageable with the door,
  - an adjusting element (4), and
  - a connecting element (5) having a rotation center (7) about which the connecting element (5) is rotatable and having an arm portion (6), wherein an end portion (15) of the arm portion (6) being connected with the pivot pin (2) for coupling a movement of the pivot pin (2) and the connecting element (5),
  - wherein the adjusting element (4) is provided such that a force is providable to the arm portion (6) between the rotation center (7) and the end portion (15).
2. Pivot (1) according to claim 1 comprising a base element (9) for supporting the pivot pin (2) and the adjusting element (4), the base element (9) having at least a first surface (13).
3. Pivot (1) according to claim 2, **characterized in that** the center axis (3) of the pivot pin (2) is perpendicular to the first surface (13).
4. Pivot (1) according to claim 2 or 3, **characterized in that** the pivot pin (2) is slidable between a locking position and a retreat position, wherein in the locking position the pivot pin (2) protrudes more from the first surface (13) of the base element (9) than in the retreat position.
5. Pivot (1) according to any one of claims 2 to 4, **characterized in that** the connecting element (5) comprises a first stopping member (16) and a second stopping member (17), wherein the connecting arm (5) abuts against the first stopping member (16) when the pivot pin (2) is in the retreat position and the connecting arm (5) abuts against second stopping member (17) when the pivot pin (2) is in the locking position.
6. Pivot (1) according to any one of the claims 2 to 5, **characterized in that** the adjusting element (4) is accessible for rotating from the first surface (13) of the base element (9).
7. Pivot (1) according to any one of the claims 2 to 6, **characterized in that** the base element (9) comprises a hollow protrusion (12) in which the pivot pin (2)

is supported.

8. Pivot (1) according to any one of the claims 2 to 7,  
**characterized in that** a flange portion (8) of the ad-  
justing element (4) is provided in a recess (18) of the  
connecting element (5). 5
9. Pivot (1) according to any one of the claims 2 to 8,  
**characterized in that** the adjusting element (4) com-  
prises a first threat which engages with a second  
threat of the base element (9). 10
10. Pivot (1) according to any one of the previous claims,  
**characterized in that** the adjusting element (4) is  
provided in parallel to the center axis (3) of the pivot  
pin (2). 15
11. Pivot (1) according to any one of the previous claims,  
**characterized in that** the pivot pin (2) comprises a  
hole (14) and the end portion (15) of the arm portion  
(6) is provided within the hole (14). 20
12. Door closer system, comprising a floor-concealed  
door closer and a pivot (1) according to one of the  
previous claims. 25

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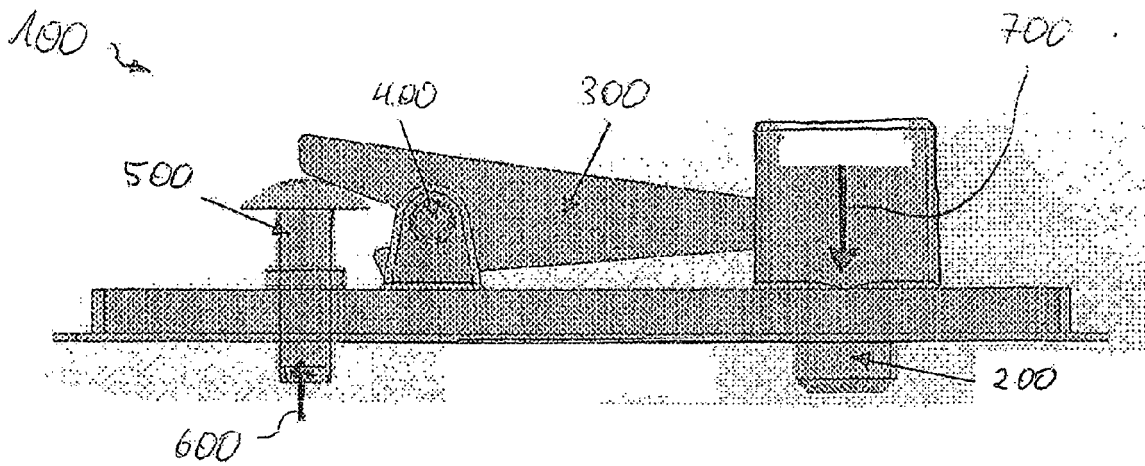


Fig 1  
(prior art)

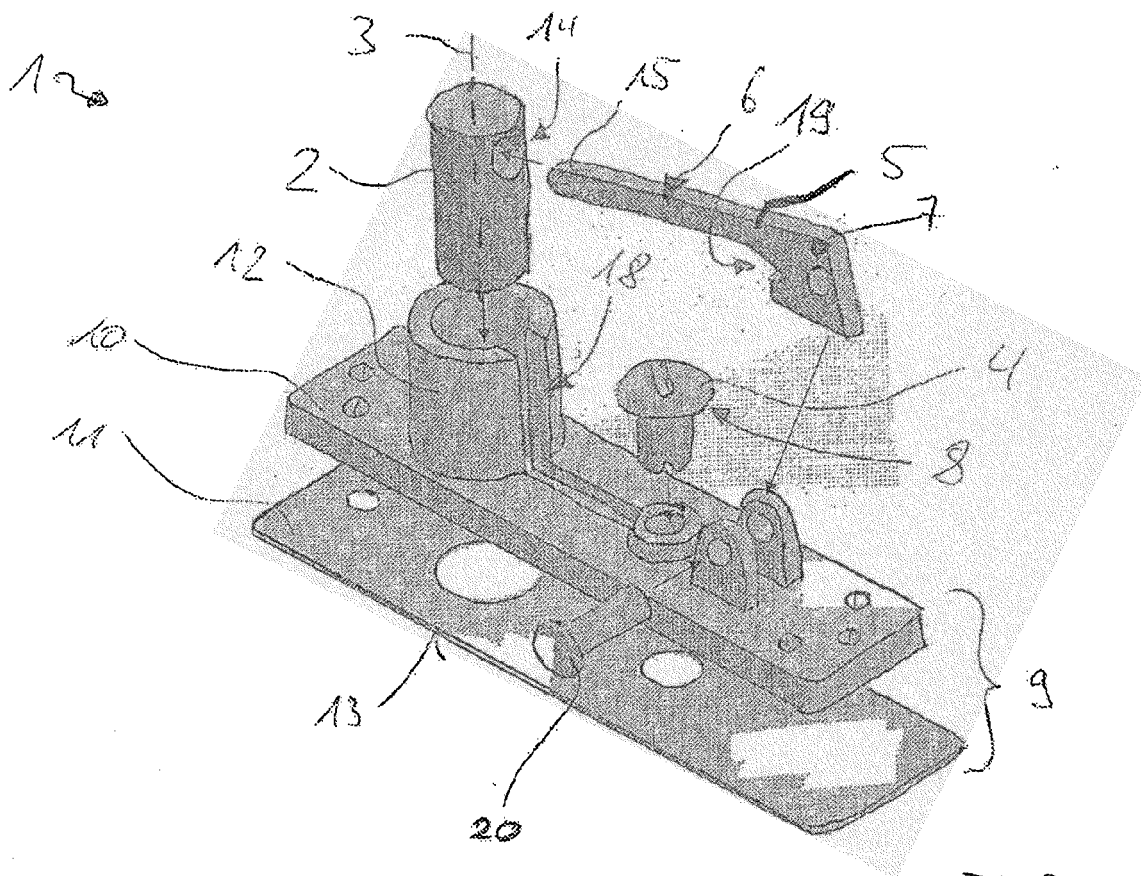
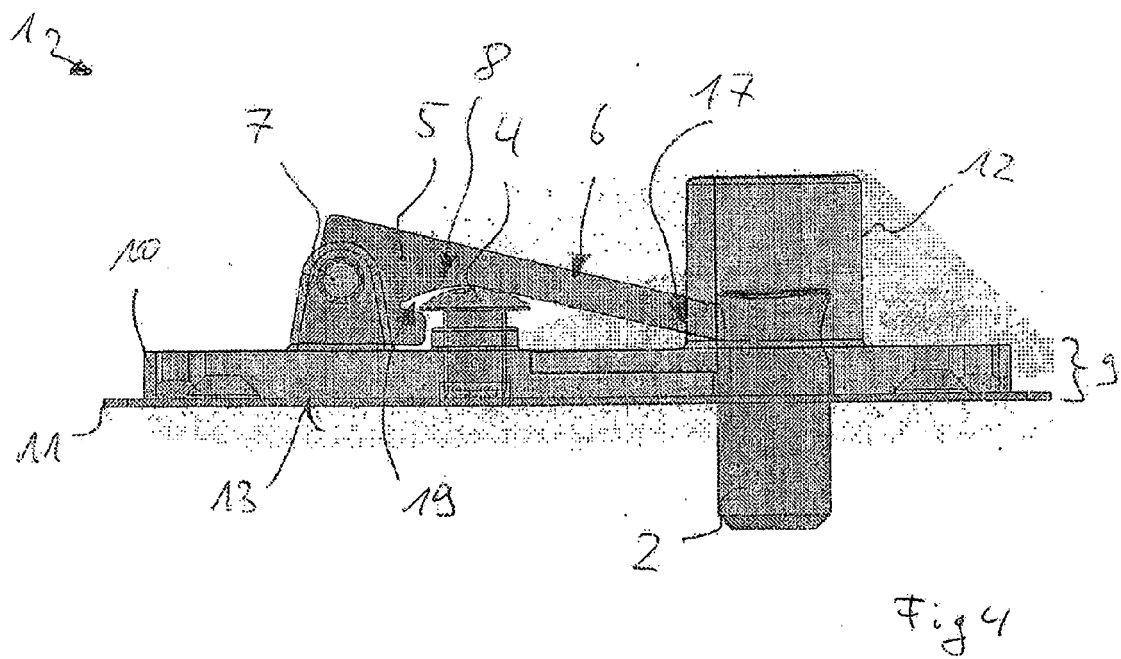
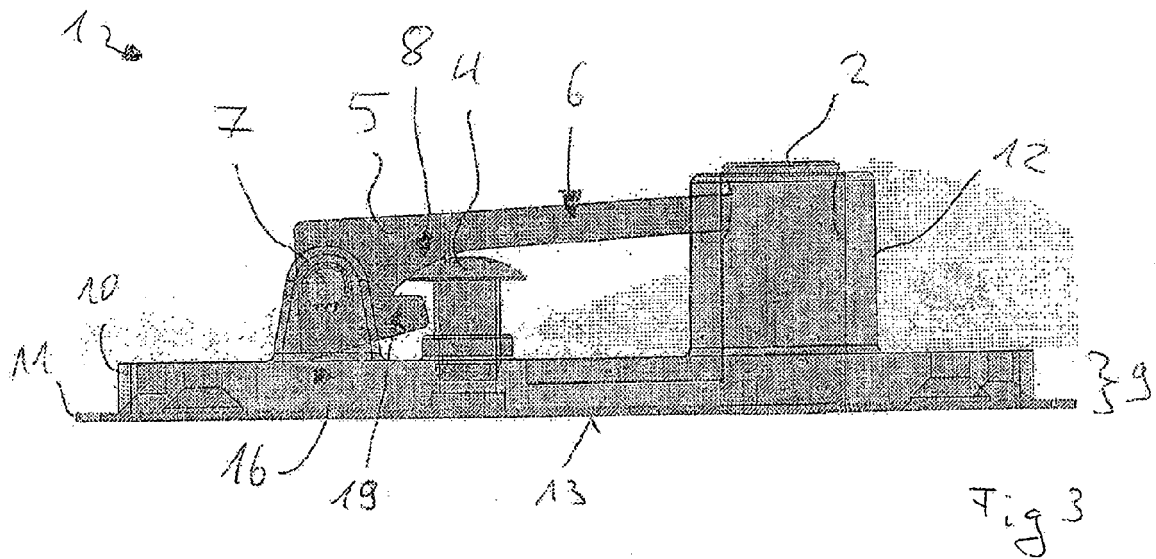


Fig 2





## EUROPEAN SEARCH REPORT

Application Number  
EP 14 00 1441

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                     |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
| X                                                                                                                                                                                                                       | US 3 786 534 A (FERGUSON P)<br>22 January 1974 (1974-01-22)                   | 1-4,6,7,11                                                                                                                                                                                                                                                                            | INV.<br>E05D7/081                       |
| A                                                                                                                                                                                                                       | * sentence 3 - sentence 12; figures 7,8 *<br>* abstract *                     | 5,8-10,12                                                                                                                                                                                                                                                                             | E05D7/04<br>E05D7/10<br>E05D7/00        |
| -----                                                                                                                                                                                                                   |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
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| A                                                                                                                                                                                                                       | * column 2, line 25 - column 4, line 53;<br>figures 1,2 *<br>* abstract *     | 9,12                                                                                                                                                                                                                                                                                  |                                         |
| -----                                                                                                                                                                                                                   |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
| X                                                                                                                                                                                                                       | CH 331 159 A (VER BAUBESCHLAG GRETSCH CO [DE])<br>15 July 1958 (1958-07-15)   | 1-4,6-12                                                                                                                                                                                                                                                                              |                                         |
| A                                                                                                                                                                                                                       | * page 2, line 6 - page 3, line 40;<br>figures 1,3-5 *                        | 5                                                                                                                                                                                                                                                                                     |                                         |
| -----                                                                                                                                                                                                                   |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
|                                                                                                                                                                                                                         |                                                                               |                                                                                                                                                                                                                                                                                       | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                         |                                                                               |                                                                                                                                                                                                                                                                                       | E05D<br>E05F                            |
| The present search report has been drawn up for all claims                                                                                                                                                              |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                     |                                                                               | Date of completion of the search<br><b>9 July 2014</b>                                                                                                                                                                                                                                | Examiner<br><b>Rémondot, Xavier</b>     |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                             |                                                                               | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                         |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                               |                                                                                                                                                                                                                                                                                       |                                         |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 00 1441

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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09-07-2014

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82