(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 579 374 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.07.2025 Bulletin 2025/27

(21) Application number: **23220479.2**

(22) Date of filing: **28.12.2023**

(51) International Patent Classification (IPC):
G05G 5/04 *(2006.01)* *G05G 1/04* *(2006.01)*
G05G 9/047 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
G05G 5/04; G05G 1/04; G05G 9/047;
G05G 2009/04718

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(71) Applicant: **elobau GmbH & Co. KG**
88299 Leutkirch im Allgäu (DE)

(72) Inventors:
- **BOETZELEN, Gregor**
88239 Wangen i.A. (DE)
- **BECKERS, Ralf**
88410 Bad Wurzach (DE)
- **MORENT, Ulrich**
88299 Leutkirch (DE)
- **PRINZ, Markus**
88299 Leutkirch (DE)
- **EINSLE, Felix**
88316 Isny (DE)

(74) Representative: **VKK Patentanwälte PartG mbB**
Edisonstraße 2
87437 Kempten (DE)

(54) **OPERATING ELEMENT WITH MECHANICAL OVERLOAD PROTECTION**

(57) Operating element (1), having an operating lever (2) mounted pivotably about at least one axis, wherein the operating lever (2) has a frame (3) at a free end and is guided with this free end and the frame (3) in a housing (4), wherein the operating element (1) further has means (5) limiting the deflection of the operating lever (2) to a first deflection angle (α_1), wherein the frame (3) has at least one first stop (6) and the housing (4) or means (5) for limiting the deflection of the operating lever (2) has a first counter-stop (7) corresponding to the at least one first stop (6), wherein first stops (6) and first counter-stops (7) do not contact each other at the first deflection angle (α_1) of the operating lever (2), whereas they contact each other at a deflection exceeding the first deflection angle (α_1) to a larger second deflection angle (α_2) of the operating lever (2).

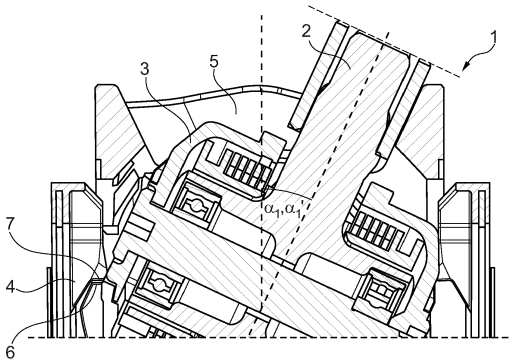

Fig. 1

EP 4 579 374 A1

Description

[0001] The present invention relates to an operating element with mechanical overload protection.

[0002] Operating elements having an operating lever are widely used in agricultural or construction vehicles, but also in other vehicles like forklifts. Since such operating elements are used in many different areas, they also need to be suitable for various requirements. For example, the operating elements have to endure heavy loads while also being able to execute sensitive controls where necessary. These contradictory requirements may need to be fulfilled with a varying focus on one of the requirements. Therefore, it is sometimes necessary to produce an operating element more suitable for heavy loads while other operating elements are more focused on sensitive controls.

[0003] In the named areas of expertise, it is common for heavy impacts to occur on the controlled vehicle. This may cause irritations on both the vehicle and its parts and the vehicle operator, who may for example grab hold on the operating lever, pulling it in a non-intended way and maybe even overloading it. In another example, the vehicle operator may also misuse the operating element, for example when he is used to another operating element with a different sensitivity. By overloading the operating element, it is exposed to heavy stress that can cause the operating element and specific parts of it to wear down or be damaged. In the state of the art, such disadvantages are usually compensated by using thicker or heavier materials that are suitable to sustain heavier stress, but at the same time are way more expensive than usual materials and are limited in their ways of use.

[0004] At the same time, many operating elements use a gimbal arrangement such that the operating lever may be pivotably mounted around two axes. Such a gimbal arrangement often has some sensitive parts being very susceptible to damages because of heavy loads, which cannot always be compensated by using thicker or heavier materials.

[0005] The underlying task of the invention is therefore avoiding the disadvantages of the prior art and proposing an operating element that has a stable and cost-effective overload protection that allows only minimal wear of the components in the event of an overload and that may be adapted to the requirements of the area of use.

[0006] This problem is solved by an operating element, having an operating lever mounted pivotably about at least one axis, wherein the operating lever has a frame at a free end and is guided with this free end and the frame in a housing, wherein the operating element further has means for limiting the deflection of the operating lever to a first deflection angle, wherein the frame has at least one first stop and the housing or means for limiting the deflection of the operating lever has one first counter-stop per first stop each corresponding to one of the at least one first stop, wherein first stops and first counter-stops do not contact each other at the first deflection angle of the operating lever, whereas they contact each other at a second deflection angle of the operating lever exceeding the first deflection angle.

[0007] In the following, the phrasing one or at least one stop or counter-stop refers to one or more stops or counter-stops. At the same time, the invention assumes that the number of stops and counter-stops is always the same, whereby a counter-stop always corresponds to a stop.

[0008] According to the invention, the operating lever is pivotably mounted in such a way that the pivot axis is not arranged at one of the two ends of the operating lever. Thus, a frame is arranged on the operating lever at its free end located in the housing, whereas the frame is pivoted together with the operating lever. In particular, the operating lever is connected to the frame or the frame is molded onto the operating lever. As the part of the operating lever on which the frame is arranged is guided in the housing, this part is not accessible to a user from the outside of the housing. In addition, the frame can be designed in such a way that part of the frame closes off the interior of the housing so that neither unwanted objects nor materials can enter the interior of the housing or operating element. The means for limiting the deflection of the operating lever, in turn, are arranged in such a way that the operating lever is guided through the means and any deflection of the operating lever is restricted by said means. In particular, this restriction is a physical restriction achieved by contact between the operating lever and the means for limiting the deflection of the operating lever at a specific maximum deflection angle. At the same time, the frame has at least one stop while the housing has a corresponding counter-stop. The stop and counter-stop form a further restriction on the deflection of the operating lever, whereby only the operating lever and means for limiting the deflection of the operating lever, but not the stop and counter-stop, are in contact under a simple, normal load. Only when the operating lever is overloaded, for example when a user leans on the operating lever in an unintentional way, the means for limiting the deflection of the operating lever are at least partially dented by the operating lever, i.e. the operating lever is pivoted beyond the physical limitation of the means for limiting the deflection of the operating lever and contact is thus established between the stop and counter-stop, which further limit the deflection angle. According to the invention, a reversal of this concept is also conceivable, in which the stop and counter-stop contact each other at a certain deflection angle of the operating lever, while at the same time the operating lever is at a distance from the means for limiting the deflection of the operating lever and contact between the latter is only established when the operating lever is overloaded accordingly, at which time the stop and counter-stop and, if applicable, the parts on which they are arranged, at least partially yield. It is particularly advantageous if two or more stops are arranged on the frame for each direction of deflection, so that the forces are evenly distributed when the oper-

ating lever is overloaded and no undesirable shearing forces arise, for example. Any other symmetrical arrangement of the stops and counter-stops that avoids such forces is also suitable for this purpose. In this sense, for an operating lever pivoted about two pivot axes, the deflection direction is understood as a direction perpendicular to a pivot axis of the operating lever in a plane spanned by its pivot axes.

[0009] In a further embodiment of the invention, it is proposed that the means for limiting the deflection of the operating lever are arranged on the housing, in particular connected to the housing. This makes it possible for the means for limiting the deflection of the operating lever to be rigid relative to the housing and for a pivoting movement of the operating lever to have no effect on the means for limiting the deflection of the operating lever. Thus, a limitation of the deflection of the operating lever by the means for limiting the deflection of the operating lever is constant and repeatable. If the means for limiting the deflection of the operating lever are also connected to the housing, in particular if it can be repeatedly and detachably connected, the means for limiting the deflection of the operating lever can be easily replaced in the event of wear due to overloading of the overload protection.

[0010] In an embodiment of the invention, it is proposed that the frame is a gimbal, preferably as part of a gimbal set, which in particular is pivotably mounted about one axis. In this way, an operating lever pivotably mounted about two axes can dispense with an additional frame and instead the gimbal frame can have the at least one stop of the frame and thus fulfill several functions simultaneously. By a gimbal frame, the invention understands in particular a component relative to which the operating lever mounted therein is pivotably mounted about a pivot axis, the gimbal frame also being simultaneously pivotably mounted about a pivot axis, in particular a pivot axis oriented perpendicular to the pivot axis of the operating lever in respect to the gimbal frame.

[0011] In a further embodiment of the invention, it is proposed that the housing and/or the frame have at least one reinforcement, in particular in the form of a reinforcing brace. Thus, stop and counter-stop are pressed against each other when the operating lever is deflected beyond the limit of the means for limiting the deflection of the operating lever, so that these must absorb all overload forces that exceed this and dissipate them into the system via the frame and/or the housing. The reinforcement can give the housing and/or the frame particular stability, but can also optimize the force dissipation of stops and counter-stops in the event of an overload of the operating lever, so that the parts are less stressed by the overload.

[0012] In an embodiment of the invention, it is proposed that the reinforcement is arranged in the area of the stop and/or counter-stop. In this way, the reinforcement can act in a particularly targeted manner where the greatest forces occur in the event of overloading the operating lever.

[0013] In a further embodiment of the invention, it is proposed that the means for limiting the deflection of the operating lever are at least partially formed from a tough or ductile material, in particular from a material selected from the following group: polyacetals (POM), polyamides, polyvinyl chloride (PVC), brass, steel, cast materials, cast iron materials, aluminum. Polyamide materials, preferably polyamide materials reinforced with glass beads, whose dimensional stability can be influenced by a suitable selection of the proportion of reinforcing elements such as glass beads, are particularly advantageous. According to the invention, however, any materials are suitable which allow deformation but are nevertheless fundamentally dimensionally stable. Such materials are particularly advantageous when used in the means for limiting the deflection of the operating lever, as said means should form an angular limitation for the deflection of the operating lever and sufficient dimensional stability is advantageous for this purpose, but at the same time should allow deformation so that the means for limiting the deflection of the operating lever can yield when the operating lever is overloaded and thus pressed against the means for limiting the deflection of the operating lever. This protects the operating lever and the means for limiting the deflection of the operating lever from wear or other damage.

[0014] In an embodiment of the invention, it is proposed that the housing and/or the frame is formed from a material with a high rigidity, in particular from a material from the following group: reinforced plastics, dimensionally stable plastics, polyamides, alloys, steel. In particular, polycaprolactam (PA6), especially PA66+PA61/X have proven to be particularly advantageous. Here too, the reinforcement or stiffness can be influenced by the appropriate choice of a glass fiber or carbon fiber content. Cast parts as well as cast alloys or metal powder injection molded parts have also proven to be particularly suitable. Generally, it is advantageous to use materials with a high rigidity for the manufacture of at least part of the housing and/or the frame, so that the forces occurring between the stop and the counter-stop can be distributed and dissipated via the system and deformation of the parts is avoided. Accordingly, it is in accordance with the invention to design only those parts of the housing and/or frame made of one of the materials mentioned so that the forces can be dissipated via these parts. In this way, even a severe overload of the operating unit can be absorbed by the housing and frame without permanently damaging these parts.

[0015] In a further embodiment of the invention, it is proposed that the first deflection angle has a value of more than 20° to 30°, in particular 25°. Such a deflection angle has proven to be particularly advantageous in many different applications and enables any type of operation of a wide variety of working equipment.

[0016] In an embodiment of the invention, it is proposed that the value of the second deflection angle is 0.5° to 1.5°, in particular 1°, higher than the value of the

first deflection angle. This angle is particularly preferable because, although it provides a certain amount of play in which the operating lever might also be moved beyond the limit of the means for limiting the deflection of the operating lever, at the same time the means for limiting the deflection of the operating lever are not overstressed and the overload protection of the stop and counter-stop can take effect. In this way, the limitation by the means for limiting the deflection of the operating lever can serve as a tactile signal to the user that the operating lever should not be deflected beyond this point, while the overload protection only engages when it is actually required.

[0017] In a further embodiment of the invention, it is proposed that the means for limiting the deflection of the operating lever is replaceable by alternative means for limiting the deflection of the operating lever which, in particular, limit the deflection of the operating lever up to an alternative first deflection angle. In this way, the alternative means for limiting the deflection of the operating lever can be installed in the operating element in order to adapt it to the user's wishes. This can be particularly useful for different equipment to be operated with the operating element, as is regularly the case with agricultural vehicles and the working equipment coupled to them. For example, it can be useful to enable a particularly large deflection for a delicate working equipment, while a small deflection angle of the operating lever is sufficient for coarse working equipment, for which a directional on/off switch is almost sufficient. While it may enhance the versatility of the operating element once already in use, it may also lower the costs of its production since the operating element without the means for limiting the deflection of the operating lever may be mass produced while the means for limiting the deflection of the operating lever may even be custom made for the specific field of use. This makes the invention particularly versatile and adaptable to the conditions while also lowering its costs.

[0018] In an embodiment of the invention, it is proposed that the frame has at least one second stop and the alternative means for limiting the deflection of the operating lever have one second counter-stop per second stop each corresponding to one of the at least one second stop, wherein second stops and second counter-stops do not contact each other at the alternative first deflection angle of the operating lever, while they contact each other at an alternative second deflection angle of the operating lever exceeding the alternative first deflection angle. For the second stop and second counter-stop, the same applies as for the at least one first stop and the corresponding counter-stop. Thus, one counter-stop is provided for each stop. At the same time, a symmetrical distribution and/or arrangement of the stops and counter-stops is useful in order to avoid any shearing forces. This means that the at least one second stop and the corresponding second counter-stop have the same function as the first stop and the first counter-stop. However, the counter-stop is not arranged on the housing but on the alternative means for limiting the deflection of the operating lever. At the same time, the at least one second stop is arranged on the frame in the same way as the at least one first stop. In this way, the at least one first stop on the frame can form an overload protection with the first counter-stop in the event of a particularly large deflection angle of the operating lever. Meanwhile, the at least one second stop on the frame is arranged and/or designed in particular in such a way that it forms the overload protection with the second counter-stop at an alternative deflection angle deviating therefrom. This is due to the alternative means for limiting the deflection of the operating lever, which, for example, differ in shape from the means for limiting the deflection of the operating lever in such a way that it limits the deflection of the operating lever to an alternative first deflection angle, which is preferably smaller than the first deflection angle that represents the limitation by the means for limiting the deflection of the operating lever. This means that the overload protection of the at least one second stop and second counter-stop engages earlier, while the first stop and first counter-stop remain inactive, i.e. at a distance from each other, and do not prevent contact between the second stop and second counter-stop.

[0019] In a further aspect of the invention, it is proposed that the alternative first deflection angle has a value of 10°, 15° or 20°. Alternative means for limiting the deflection of the operating lever that allow alternative first deflection angles with these values have proven to be particularly advantageous and versatile, especially complementary to means for limiting the deflection of the operating lever that allow a first deflection angle with a value of 25°.

[0020] In an embodiment of the invention, it is proposed that the value of the alternative second deflection angle is 0.5° to 1.5°, in particular 1°, higher than the value of the alternative first deflection angle. The same applies here as to the embodiment in which the value of the second deflection angle is 0.5° to 1.5°, in particular 1 °, higher than the value of the first deflection angle. The angle thus provides a certain amount of play in which the operating lever can also be moved beyond the limit of the alternative means for limiting the deflection of the operating lever, but at the same time the alternative means for limiting the deflection of the operating lever is not overstressed and the overload protection of the stop and counter-stop can take effect.

[0021] In addition, a set is proposed comprising an operating element according to one of the previous claims and at least one alternative means for limiting the deflection of the operating lever with which the sleeve of the operating element can be exchanged. This means that an operating element can be prepared for a different application simply by replacing the means for limiting the deflection of the operating lever with alternative means for limiting the deflection of the operating lever, without the need for a completely different operating element. This makes the operating element particularly sustain-

able and yet versatile, for example in the case of different working equipment to be controlled.

[0022] The invention is described by way of example in a preferred embodiment with reference to a drawing, further advantageous details being shown in the figures in the drawing. Functionally identical parts are provided with the same reference signs.

[0023] The figures in the drawing show in detail:

Fig. 1: a sectional view of the operating element according to the invention with the operating lever in a first deflection angle,

Fig. 2: a sectional view of the operating element according to the invention with the operating lever in a second deflection angle,

Fig. 3: a schematic view of the frame according to the invention,

Fig. 4a: a schematic view of the bottom of means for limiting the deflection of the operating lever according to the invention in a first embodiment,

Fig. 4b: a schematic view of the bottom of means for limiting the deflection of the operating lever according to the invention in a second embodiment,

[0024] **Fig. 1** shows a sectional view of the operating element 1 according to the invention with the operating lever 2 in a first deflection angle α_1. The operating element 1 has a pivotably mounted operating lever 2 with a frame 3 arranged thereon and pivotably mounted with the operating lever 2. Furthermore, the operating element 1 has a housing 4 with means 5 for limiting the deflection of the operating lever arranged thereon, which are rigidly arranged in space, i.e. not pivotable. The means 5 for limiting the deflection of the operating lever are arranged on the housing 4 in such a way that the means 5 for limiting the deflection of the operating lever 2 close off the housing 4 with the frame 3 at the upper end facing a user, thus making the interior of the housing 4 inaccessible to a user. In this embodiment, these means have the form of a sleeve. Accordingly, the operating lever 2 is guided through the sleeve 5, whereby the frame 3 is arranged in the interior of the housing 4 on the operating lever 2. A first stop 6 is formed on the frame 3, which is moved in the direction of the corresponding first counter-stop 7 formed on the housing 4 when the operating lever 2 is deflected. At the same time, on the side of the housing 4 opposite the stop 6 and counter-stop 7, the operating lever 2 is pivoted in the direction of the means 5 for limiting the deflection of the operating lever 2, which physically limits the deflection angle of the operating lever 2. In the example shown here, the operating lever 2 has been pivoted to a first deflection angle α_1 of 25°, so that the operating lever 2 rests against the means 5 for limiting the deflection of the operating lever 2 at the top right of the illustration. At the same time, the first stop 6 and the first counter-stop 7 have been moved closer together, but are not yet in contact. The limitation of the deflection angle by the means 5 for limiting the deflection of the operating lever 2 thus signals the user that a further deflection of the operating lever 2 is not intended, while the means 5, however, due to its soft material properties, can give way if the operating lever 2 is subjected to a further or heavier load without causing mechanical, in particular irreversible, damage to the means 5 or other components. Moreover, depending on the design of the means 5, an alternative first deflection angle α_1' that deviates from the first deflection angle α_1 is also conceivable.

[0025] **Fig. 2** shows a sectional view of the operating element 1 according to the invention with the operating lever 2 in a second deflection angle α_2. The embodiment shown here is similar to that shown in **Fig. 1.** In contrast to the operating element 1 in Fig. 1, here the operating lever 2 is pivoted by a second deflection angle α_2 of 26°, i.e. by a deflection angle 1° higher than the one shown in **Fig. 1.** This means that the operating lever 2 is pivoted beyond the physical limit of the means 5 for limiting the deflection of the operating lever 2, i.e. overloaded, so that the means 5 are displaced or dented by the operating lever 2. To make this possible, the means 5 are made of a relatively soft yet dimensionally stable material. Further overloading of the operating lever 2 is prevented by the first stop 6 and first counter-stop 7, which rest against each other at the second deflection angle α_2. For this purpose, frame 3 and housing 4 are at least partially made of a stiffer and more stable material, so that the forces occurring at the first stop 6 and first counter-stop 7 during any further overloading of the operating lever 2 can be absorbed and dissipated via the system without damaging or significantly wearing out the parts. Again, depending on the design of the means 5 for limiting the deflection of the operating lever, an alternative second deflection angle α_2' that deviates from the second deflection angle α_2 is also conceivable.

[0026] **Fig. 3** shows a schematic view of the frame 3 according to the invention. The frame 3 has lateral projections by means of which the frame 3 is pivotably mounted on the housing. At the end faces, the frame 3 has both first stops 6 and second stops 10, whereby the first stops 6 come into contact with the corresponding first counter-stops at a greater deflection angle of the operating lever than the second stops 10 come into contact with the corresponding second counter-stops due to the arrangement of the first and second counter-stops. The frame 3 has two first stops 6 and two second stops 10 on each end face, which makes it four first stops 6 and four second stops 10 in total, so that a load in any direction can be absorbed and any shearing forces are avoided due to the symmetrical arrangement of the stops 6 and 10. To further stabilize the frame 3, it has reinforcements 8, in this case in the form of material reinforcements, at se-

lected points, particularly in the area of the stops 6, 10. This allows the forces occurring at the stops 6, 10 when the operating lever is overloaded to be effectively absorbed and dissipated by the frame 3 without causing undesirable deformations or other damages to the frame 3.

[0027] **Fig. 4a** is a schematic view of the bottom of alternative means 9 for limiting the deflection of the operating lever in a first embodiment. The alternative means 9 for limiting the deflection of the operating lever in particular serve to replace the means 5 for limiting the deflection of the operating lever shown in **Fig. 1** and thus the first deflection angle α_1 with an alternative first deflection angle α_1'. The embodiment of the alternative means 9 for limiting the deflection of the operating lever shown in **Fig. 4a** has four second counter-stops 11, which form the overload protection with corresponding second stops. The second counter-stops 11 are arranged on the underside of the alternative means 9 for limiting the deflection of the operating lever in such a way that the second stops on the frame are pivoted upwards when the operating lever is pivoted and are thus pressed against the bottom of the alternative means 9 for limiting the deflection of the operating lever. They may also be in a form of a sleeve.

[0028] **Fig. 4b** shows a schematic view of the bottom of an alternative means 9 for limiting the deflection of the operating lever in a second embodiment. In contrast to the first embodiment according to **Fig. 4a,** the alternative means 9 for limiting the deflection of the operating lever shown here have a narrower opening, which limits a deflection angle of an operating lever to a lower value. In order to enable contact of the second stops on the frame with the second counter-stops 11, the second counter-stops 11 are slightly raised compared to those of the embodiment of **Fig. 4a,** so that contact is already established with a smaller deflection angle of the operating lever. This means that the same second stops on the frame can be used for both of the alternative means 9 for limiting the deflection of the operating lever of Fig. **4a** and **Fig. 4b** and the frame together with its second stops does not need to be adapted.

REFERENCE NUMERALS LIST

[0029]

1	Operating element
2	Operating lever
3	Frame
4	Housing
5	Means for limiting the deflection of the operating lever
6	First stop
7	First counter-stop
8	Reinforcement
9	Alternative means for limiting the deflection of the operating lever
10	Second stop
11	Second counter-stop
α_1	First deflection angle
α_2	Second deflection angle
α_1'	Alternative first deflection angle
α_2'	Alternative second deflection angle

Claims

1. Operating element (1), having an operating lever (2) mounted pivotably about at least one axis, wherein the operating lever (2) has a frame (3) at a free end and is guided with this free end and the frame (3) in a housing (4), wherein the operating element (1) further has means (5) for limiting the deflection of the operating lever (2) to a first deflection angle (α_1), wherein the frame (3) has at least one first stop (6) and the housing (4) or means (5) for limiting the deflection of the operating lever (2) has one first counter-stop (7) per first stop (6) each corresponding to one of the at least one first stop (6), wherein first stops (6) and first counter-stops (7) do not contact each other at the first deflection angle (α_1) of the operating lever (2), whereas they contact each other at a second deflection angle (α_2) of the operating lever (2) exceeding the first deflection angle (α_1).

2. Operating element (1) according to claim 1, **characterized in that** means (5) for limiting the deflection of the operating lever (2) are arranged on the housing (4), in particular is connected to the housing (4).

3. Operating element (1) according to claim 1 or 2, **characterized in that** the frame (3) is a gimbal, preferably as part of a gimbal set, which in particular is mounted pivotably about an axis.

4. Operating element (1) according to claim 1, 2 or 3, **characterized in that** the housing (4) and/or the frame (3) have at least one reinforcement (8), in particular in the form of a reinforcing brace.

5. Operating element (1) according to claim 4, **characterized in that** the reinforcement (8) is arranged in the region of the stop (6) and/or counter-stop (7).

6. Operating element (1) according to one of the preceding claims, **characterized in that** means (5) for limiting the deflection of the operating lever (2) are at least partially formed from a tough or ductile material, in particular from a material selected from the following group: polyacetals (POM), polyamides, polyvinyl chloride (PVC), brass, steel, cast materials, cast iron materials, aluminium.

7. Operating element (1) according to one of the preceding claims, **characterized in that** the housing (4) and/or the frame (3) is formed from a material with a

high rigidity, in particular from a material from the following group: reinforced plastics, dimensionally stable plastics, polyamides, alloys, steel.

8. Operating element (1) according to one of the preceding claims, **characterized in that** the first deflection angle (α_1) has a value of more than 20° to 30°, in particular 25°.

9. Operating element (1) according to one of the preceding claims, **characterized in that** the value of the second deflection angle (α_2) is 0.5° to 1.5°, in particular 1 ° higher than the value of the first deflection angle (α_1).

10. Operating element (1) according to one of the preceding claims, **characterized in that** means (5) for limiting the deflection of the operating lever (2) is replaceable by alternative means (9) for limiting the deflection of the operating lever (2), which in particular limits the deflection of the operating lever (2) up to an alternative first deflection angle (α_1').

11. Operating element (1) according to claim 10, **characterized in that** the frame (3) has at least one second stop (10) and the alternative means (9) for limiting the deflection of the operating lever (2) have one second counter-stop (11) per second stop (10) each corresponding to one of the at least one second stop (10), wherein second stops (10) and second counter-stops (11) do not contact each other at the alternative first deflection angle (α_1') of the operating lever (2), while they contact each other at an alternative second deflection angle (α_2') of the operating lever (2) exceeding the alternative first deflection angle (α_1').

12. Operating element (1) according to one of claims 10 or 11, **characterized in that** the alternative first deflection angle (α_1') has a value of 10°, 15° or 20°.

13. Operating element (1) according to one of claims 10 to 12, **characterized in that** the value of the alternative second deflection angle (α_2') is 0.5° to 1.5°, in particular 1° higher than the value of the alternative first deflection angle (α_1').

14. A set comprising an operating element (1) according to one of the preceding claims and at least one alternative means (9) for limiting the deflection of the operating lever (2) with which the means (5) for limiting the deflection of the operating lever (2) of the operating element (1) is interchangeable.

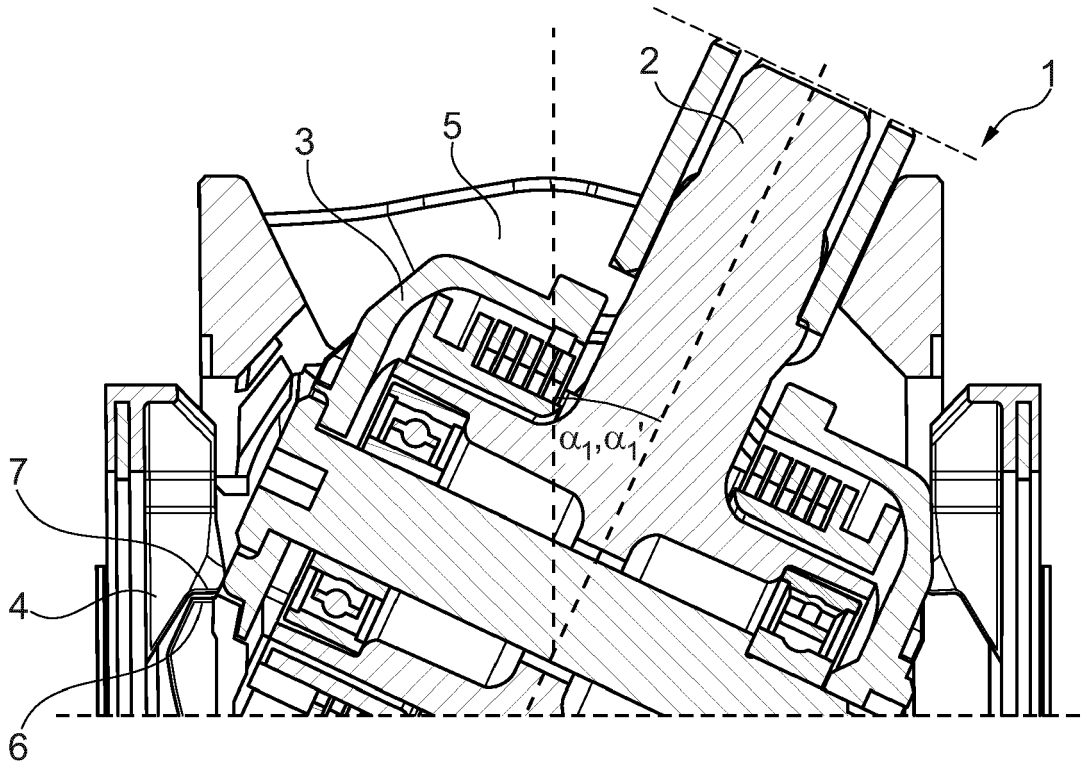

Fig. 1

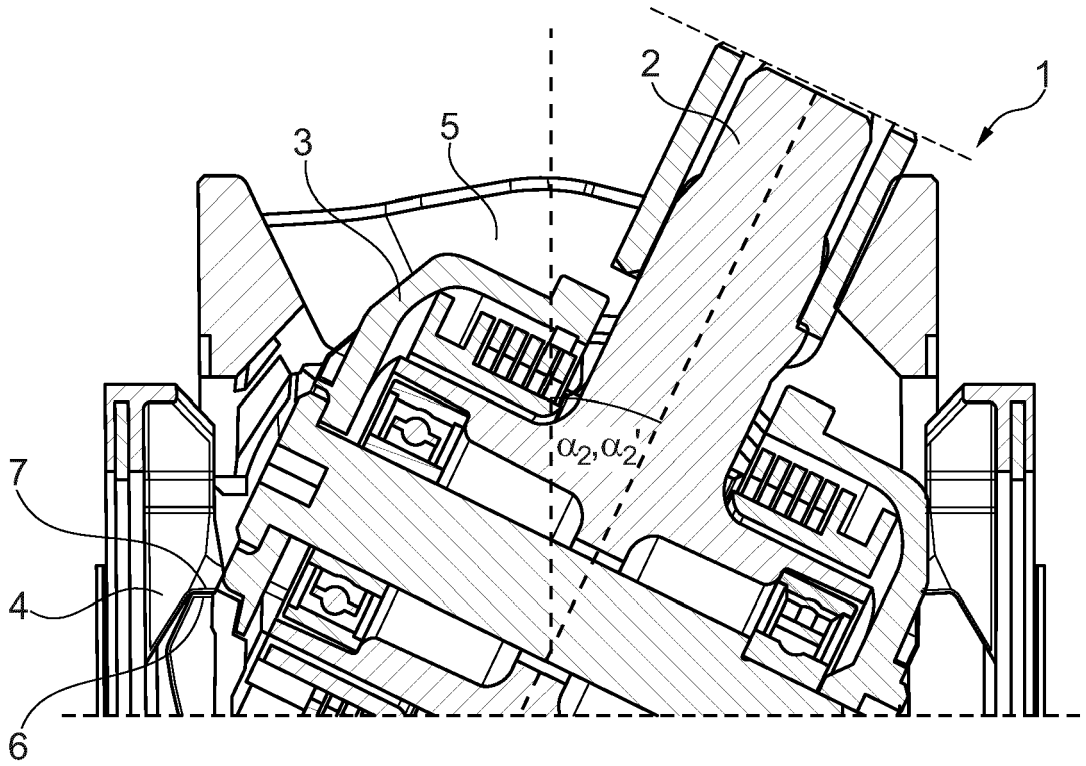

Fig. 2

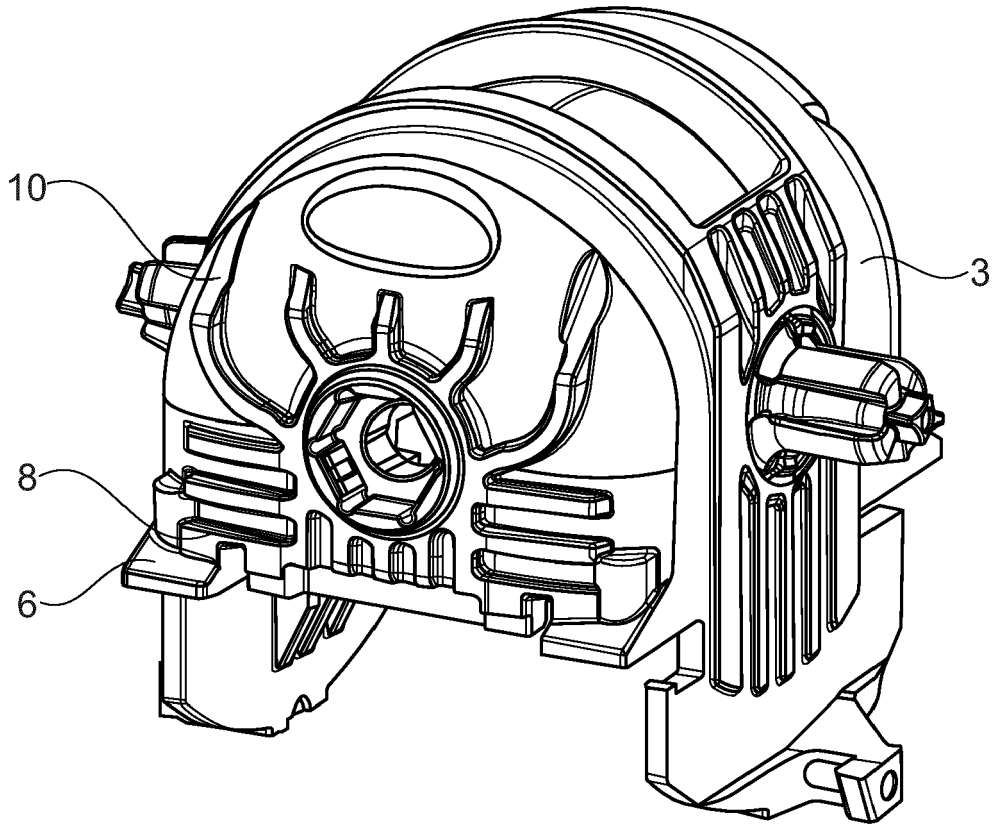

Fig. 3

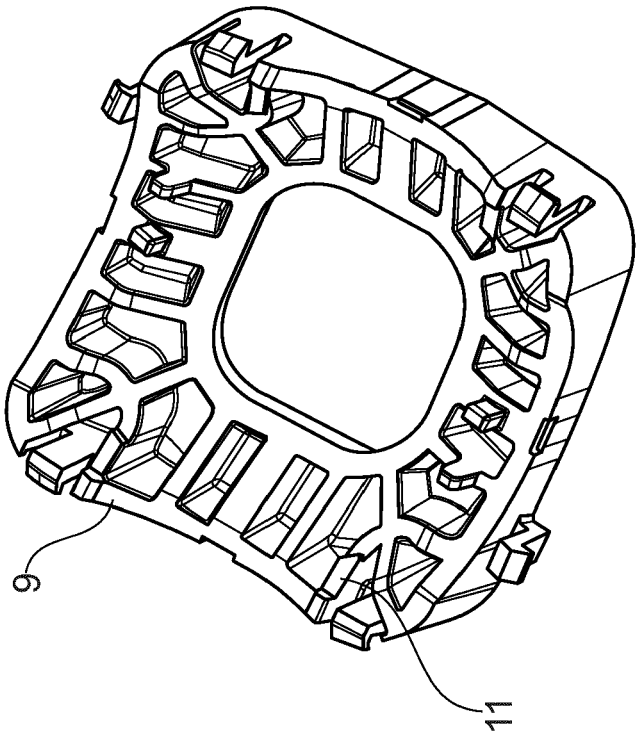

Fig. 4b

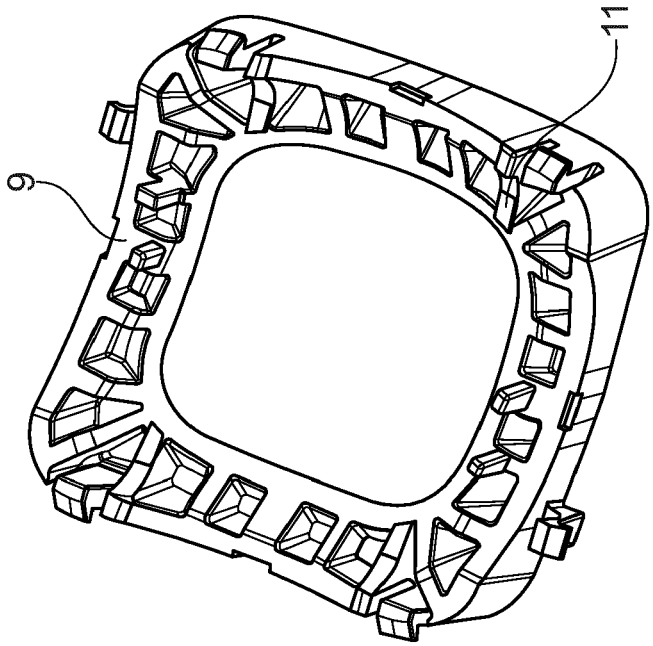

Fig. 4a

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 22 0479

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	DE 10 2009 024950 A1 (SIEMENS AG [DE]) 3 February 2011 (2011-02-03)	1,2,4-7, 9,10, 12-14	INV. G05G5/04
Y	* figures 5, 6 *	8	ADD.
A		3,11	G05G1/04 G05G9/047

X	JP H06 59916 U (UNKNOWN) 19 August 1994 (1994-08-19)	1,3-5	
A	* paragraph [0005]; figures *	2	

X	US 3 602 065 A (RATCLIFF RALPH A) 31 August 1971 (1971-08-31)	1,4-7,9	
A	* figures *	2,3	

Y	FR 3 122 945 A1 (APEM [FR]) 18 November 2022 (2022-11-18)	8	
A	* paragraphs [0052], [0003] *	1	

A	JP 4 613004 B2 (ZANAVY INFORMATICS KK) 12 January 2011 (2011-01-12) * figures 3, 4 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

G05G
E02F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 June 2024	Huyge, Kevin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 22 0479

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-06-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102009024950 A1	03-02-2011	DE 102009024950 A1	03-02-2011
		EP 2440438 A2	18-04-2012
		PL 2440438 T3	30-09-2013
		WO 2010142516 A2	16-12-2010
JP H0659916 U	19-08-1994	JP H0650019 Y2	14-12-1994
		JP H0659916 U	19-08-1994
US 3602065 A	31-08-1971	NONE	
FR 3122945 A1	18-11-2022	EP 4338290 A1	20-03-2024
		FR 3122945 A1	18-11-2022
		JP 2024520919 A	27-05-2024
		WO 2022238657 A1	17-11-2022
JP 4613004 B2	12-01-2011	JP 4613004 B2	12-01-2011
		JP 2005165608 A	23-06-2005

EPO FORM P0459

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