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(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)
- **EINSLE, Felix**
  88316 Isny (DE)

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

(54) SLIDING SLEEVE, OPERATING UNIT AND METHOD FOR MANUFACTURING AN OPERATING UNIT

(57) A sliding sleeve (1) comprising two substantially cylindrical sleeve portions (2), wherein the two sleeve portions each have a first axial end (3), a second axial end (4) and an outwardly directed receiving region (5) between the first axial end and the second axial end, wherein the second axial end or the first and the second axial ends have a larger outer diameter than the receiving region, wherein an axial extension of the receiving region is limited at least on one side by at least the second axial end, wherein connection means (6) are formed at the first axial ends to connect the two sleeve portions coaxially and rotationally fixed to one another, an operating unit (10) comprising a control adapter (13), a sliding sleeve (1), especially a sliding sleeve according to the invention, restoring means (12) and a housing (11) and a method for manufacturing an operating unit.

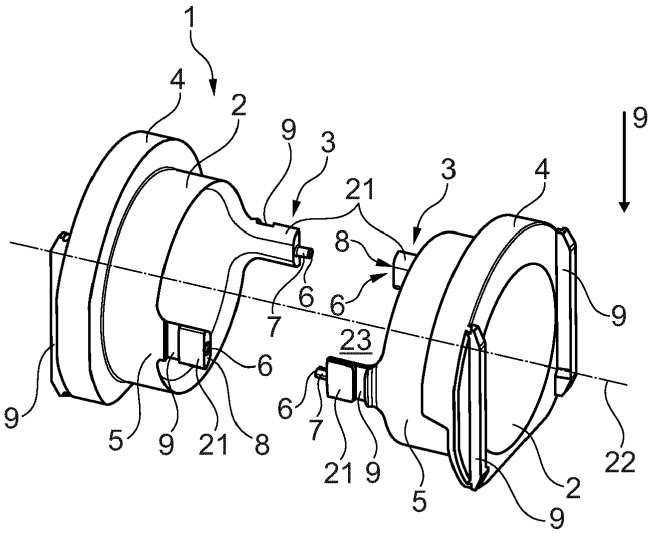

Fig. 1

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Description

[0001] The present invention relates to a sliding sleeve comprising two substantially cylindrical sleeve portions, an operating unit comprising a control adapter, a sliding sleeve, especially a sliding sleeve according to the invention, restoring means and a housing and a method for manufacturing an operating unit.

[0002] Nowadays electronic systems are used to control machines such as agricultural vehicles, in particular excavators. To facilitate user feedback in such systems that are nearly free of sensible mechanical resistance, which has typically given rise to user feedback, special components need to be integrated. These create an artificial mechanical resistance that is noticeable by a machine user. Especially in agricultural vehicles, these feedback forces need to be stronger than the vibrations and jerking that are omnipresent in the typical use environment of these vehicles to be sensible by the user.

[0003] Operating levers are widely used in agricultural vehicles. They are commonly controlled by an operating unit. The form of the operating unit amongst others gives rise to an opposing force enabling user feedback in an electric steering system.

[0004] Known operating units integrated in operating levers are large assemblies comprising pre-loaded springs and are thus complicate to integrate. Further, the inner friction of operating units can highly increase during use, due to the relative motion of the components adapted to the lever and the static ones and/or the springs.

[0005] Therefore, the problem to be solved of the present invention is, to reduce inner mechanical friction of an operating unit during use and provide an easily manufactured, individual and cheap operating unit.

[0006] This object is achieved by a sliding sleeve comprising two substantially cylindrical sleeve portions, wherein the two sleeve portions each have a first axial end, a second axial end and an outwardly directed receiving region between the first axial end and the second axial end, wherein the second axial end or the first and the second axial ends have a larger outer diameter than the receiving region, wherein an axial extension of the receiving region is limited at least on one side by at least the second axial end, wherein connection means are formed at the first axial ends to connect the two sleeve portions coaxially and such that they are rotationally fixed to one another.

[0007] An advantage of the two sleeve portions according to the invention are lower variety and complexity of the components and therefore less costs during manufacturing. The first axial ends are preferably partially circumferential. The first axial end of each sleeve portion has preferably two elongated webs, which are positioned radially on the opposite of each other. The first axial ends and a part of the receiving region provide a lever opening. The second axial ends have a substantially hollow cylindrical shape. Preferably, the two sleeve portions are equal or at least provide equal first axial ends and an equal longitudinal total length.

[0008] An embodiment of the invention provides that the connection means are formed by at least one pin and at least one socket. The connection means are positioned in such a way on each of the first axial end that they can be positively and/or non-positively mounted to each other. Thus, each pin is positioned opposite to a respective socket to insert the pin in the socket while connecting the sleeve portions to generate the sliding sleeve. Preferably, the outer diameter of the pin is equal or greater than the inner diameter of the socket to generate a transition tolerance or an interference fit. No additional components are needed to manufacture the sliding sleeve, which decrease costs of components, manufacturing and assembly.

[0009] According to an embodiment of the invention, an outer diameter of the receiving region is axially constant. By the means of axially constants, such shape of the outer diameter of the receiving region is included, which differs from constant by a value that can appear during manufacturing process. Further, the outer diameter of the receiving region is especially formed even.

[0010] A further development of the invention provides that the two sleeve portions each have position means for positioning the sliding sleeve on an operating unit, especially on a housing of the operating unit, wherein the position means are formed at the first axial end and/or at the second axial end and/or are especially formed as a part of a dovetail connection. Positioning the position means on the second axial ends of the sliding sleeve is preferable, due to the fact that the receiving region is not interrupted. Further, possible external forces are evenly absorbed by the sliding sleeve and can be evenly transferred to the housing. The position means are preferably evenly positioned on the second axial ends of the sliding sleeve, wherein the sliding sleeve can be guided and fixed by the position means at once. Therefore, the guiding direction of each position means is preferably equal to easily insert the sliding sleeve into the housing in use.

[0011] In an embodiment of the invention, it is provided that restoring means, especially at least one torsion spring rest against the receiving region when in use, wherein the second axial end or the first and second axial ends form an axial stop for the restoring means when in use. In case of different restoring means, the second axial end is modified in such a way, that the length of the receiving region along a longitudinal axis of the sliding sleeve is adapted to the respective restoring means, which are adapted to the receiving region in use. As larger, the second axial end becomes in its longitudinal length, the smaller the receiving regions becomes in its longitudinal length. The total length of the sliding sleeve itself remains equal, wherein the total length of each sleeve portion remains equal too. The second axial end of each of the two sleeve portions can have a different length and therefore different restoring

means can be rested against the receiving regions of each of the two sleeve portions. Advantageously, different torsion springs can be rested against the receiving regions of each sleeve portion to provide different restoring force depending on the motion of the control adapter in use.

[0012] An embodiment of the invention provides that the sliding sleeve is formed from a plastic, in particular from a non-reinforced plastic. The function of the sliding is to generate less friction during a motion of a control adapter in use. Therefore, the outer surface of the sliding sleeve is preferably even. Reinforced plastic includes especially glass fibre, which changes the macro structure of the plastic and constitute a rough surface. In a preferable embodiment of the invention, the receiving region is reworked to create better sliding properties. Such a rework can preferably be done by grinding or coating. Further, in a preferable embodiment of the invention, the sleeve portions and the sliding sleeve are made by injection moulding or any printing processes. In general, the sleeve portions and the sliding sleeve can be formed from any material that can be used in an injection moulding process or printing process.

[0013] The problem to be solved is further achieved by an operating unit comprising a control adapter comprising a lever adapter and a substantially cylindrical bearing seat, a sliding sleeve, especially a sliding sleeve according to the invention, wherein the sliding sleeve covers a lateral surface of the bearing seat at least partially radially and the sliding sleeve is arranged at a distance from the bearing seat, restoring means, wherein the restoring means rest against a receiving region of the sliding sleeve, and a housing, wherein the control adapter, the sliding sleeve and the restoring means are at least partially accommodated in the housing, wherein the control adapter is pivotally mounted relative to the housing, wherein the sliding sleeve is fixedly mounted in the housing, wherein the restoring means each rest against the control adapter and the housing in such a way that the restoring means generate a restoring force when the control adapter is relatively pivoted.

[0014] By "substantially cylindrical" the invention understands the bearing seat has an outer partly cylindrical surface, which is interrupted by the lever adapter in its middle along a longitudinal axis of the sliding sleeve. Further, the inner shape of the bearing seat may provide at least one stop for mounting a bearing. Further, the invention understands by "substantially cylindrical" a cylindrical shape, which might have some deviations from the mathematical definition of cylindrical. Such deviations appear especially during the manufacturing process. The control adapter is preferably in direct contact with the bearings only to generate less friction during a motion of the control adapter in use. The sliding sleeve comprises especially two substantially cylindrical sleeve portions, wherein the sleeve portions are arranged to adapt the restoring means thereto. Each sleeve portion comprises one receiving region. If equal restoring means are rested against the receiving regions, equal sleeve portions are used. If different restoring means are rested, especially with different basic dimensions, different sleeve portions are used, wherein a first axial end of the sleeve portions by which they are connected to each other remain the same in every of these embodiments. The sliding sleeve receives the friction by a relative motion between the sliding sleeve and the restoring means. The restoring means have especially a substantially hollow cylindrical shape, wherein an inner diameter of the restoring means is smaller than an outer diameter of a second axial end of the sliding sleeve. The inner diameter of the restoring means is larger than an outer diameter of the receiving region of the sliding sleeve, wherein the receiving region is adjacent to the second axial end to generate a stop of the restoring means along a longitudinal axis of the sliding sleeve by the second axial end. The housing can be closed by a housing cap to bound an inside of the housing, wherein at least the sliding sleeve is completely accommodated in the inside of the housing. The housing provides a lever insertion part, wherein the lever adapter of the control adapter is inserted to the lever insertion part. The lever insertion part is especially formed as an elongated hole, wherein the housing does not disturb the motion of the control adapter.

[0015] According to the invention the bearing seat is at least partially hollow cylindrical and is orientated axisymmetric, perpendicular to the lever adapter, wherein bearings are mounted to an inner surface of the bearing seat for mounting a control shaft pivotable relative to the control adapter, wherein the control shaft is fixedly mounted in the housing. The control shaft has especially a screw-like shape and is inserted in the housing by two openings of the housing, wherein the openings of the housing have such dimensions, that the control shaft is guided and fixedly positioned therein, wherein a shaft head positioned on one end of the control shaft provides a stop on an outer surface of the housing and a thread positioned on another end of the control shaft is connectable with a nut for a fixed bearing of the control shaft. The control shaft has further on its circumferential surface at least partly regions for receiving bearings, especially rolling bearings. The regions of the control shaft for receiving bearings are positioned on a same position as regions of the bearing seat of the control adapter along the longitudinal axis of the sliding sleeve. The control shaft and the control adapter are indirectly mounted through at least two bearings and are spaced apart from each other.

[0016] A further development of the invention provides that the restoring means are at least two torsion springs and/or the restoring means are orientated axisymmetric, perpendicular to the lever adapter. Torsion springs are able to receive a generated force during a rotational motion. The control adapter is mounted to an operating lever on its lever adapter, wherein a longitudinal axis of the lever adapter is perpendicular to the longitudinal axis

of the sliding sleeve, wherein the substantially cylindrical bearing seat of the control adapter is positioned concentrically to the sliding sleeve. Therefore, the restoring means are especially orientated concentrically to the bearing seat and/or a receiving region of the sliding sleeve. Furthermore, the sliding sleeve provides two receiving regions, wherein at least one restoring means are mounted on each of the receiving regions.

[0017] An embodiment of the invention further provides that the restoring means have different restoring constants, especially the at least two torsion springs have different spring rates. With respect to the individual use of the operating unit, the restoring constants and especially the spring rates are chosen due to providing enough resistance to get the user a clear feedback and to restore the control adapter towards a starting position reliably. While different restoring means interact with the control adapter during different motions, the choice of the restoring constants can also depend on the fact, if a user needs to push or pull the operating lever and thus the control adapter. The torsion spring has two ends, wherein one end rest against the control adapter and the other end rest against the housing. The torsion spring absorbs a relative motion between the control adapter and the housing.

[0018] According to the invention, the sliding sleeve comprises position means, wherein the sliding sleeve is positively and/or non-positively connected to the housing via the position means. The position means are preferably part of the sliding sleeve especially they are formed to positively connect them to the housing without the need of any further components. More preferably the position means are positioned on the axial first end and/or the axial second end of the sleeve portions in order to provide a save mounting of the sliding sleeve within the housing without disturbing the usage of the receiving region. The position means are especially formed by a dovetail connection, wherein the housing has respective dovetail connections for mounting the sliding sleeve. The position means are further capable to guide the sliding sleeve in the housing and therefore to roughly position the control adapter, which is preferable to insert the control shaft easier. The position means itself can be formed to generate a non-positively connection, since the position means of the sliding sleeve and/or the position means of the housing have an excess of dimension to generate interference fits. Clearance fits are possible as well between the position means of the sliding sleeve and the housing.

[0019] The problem to be solved is further achieved by a method for manufacturing an operating unit, especially an operating unit according to the invention, comprising the following steps:

- Sliding at least one restoring means onto a sleeve portion,
- Sliding two sleeve portions onto a control adapter, wherein the two sleeve portions are slid onto the control adapter coaxially towards each other,
- Connecting the two sleeve portions to form a sliding sleeve on the control adapter,
- Attaching the restoring means to the control adapter,
- Inserting of the assembly consisting of the control adapter, the sliding sleeve and the restoring means into a housing, wherein the sliding sleeve is guided on the housing via position means,
- Inserting of a control shaft through the control adapter, according to which the control adapter is pivotally mounted relative to the housing.
- Resting of the restoring means against the housing and preloading of the restoring means.

[0020] According to the method of the invention, a very easy manufacturing of the operating unit is provided. Further, by manufacturing the operating unit according to the invention the components of the operating unit are reversible fixed to each other, especially in case of a damage of one or more components of the operating unit, it can be easily disassembled and the damaged parts can be replaced. Further, all parts except the sliding sleeve can be produced as standard parts independent of the restoring means mounted on the sliding sleeve. Additionally, the first axial ends of the sleeve portions are equal to connect the sleeve portions to each other independent to the characteristics of the second axial end and the receiving region. Therefore, the costs and complexity of the manufacturing process are highly reduced. Since the sliding sleeve is formed out of the two sleeve portions, which are slided onto the control adapter, the sliding sleeve provides a protection of a cylindrical bearing seat of the control adapter.

[0021] The invention is explained in more detail below with reference to two embodiments with reference to the figures of the drawings.

Fig. 1 shows an exploded view of a sliding sleeve in a first embodiment,

Fig. 2 shows an exploded view of a sliding sleeve in a second embodiment,

Fig. 3 shows a sectional perspective view of an operating unit in first embodiment,

[0022] **Fig. 1** shows an exploded view of a sliding sleeve 1 in a first embodiment, wherein the sliding sleeve 1 includes two equal sleeve portions 2, which are substantially cylindrical. Each sleeve portion 2 has a first axial end 3 and a second axial end 4, wherein a receiving region 5 with a constant outer diameter is accommodated

in between the first and the second axial end 3, 4. The first axial ends 3 of the two sleeve portions 2 each include two elongated webs 21 and are connected to each other through connections means 6. One elongated web 21 of each first axial end 3 of each sleeve portion 2 has one pin 7 as connection means 6 and the other elongated web 21 of each first axial end of each sleeve portion has on socket 8 as connection means 6. The connection means 6 are extended along a longitudinal axis 22 of the sliding sleeve 1. To connect the sleeve portions 2 to each other the pins 7 are inserted in the sockets 8 to provide a positive connection. The first axial end 3 further comprises on each of the two elongated webs 21 on their outer circumferential surface one position means 9. The position means of each elongated web 21 is a groove of a dovetail connection. The second axial ends 4 include on each of their front surfaces two ridges of a dovetail connection as position means 9. Due to the dovetail connection itself and the position of the position means 9 in the circumferential surface and the front surfaces of the sliding sleeve 1, the sliding sleeve 1 is guided and can be fixedly positioned in multiple directions excluding a guiding direction g within a not shown housing 11 of an operating unit 1 in use. The longitudinal axes of all position means 9 are parallel to each other and to the guiding direction g. One surface of the second axial end 3 is perpendicular to the receiving region 5 to generate a stop for a not shown restoring means 12 in use. While the sleeve portions 2 are mounted to build a sliding sleeve 1, the first axial end 3 and the receiving region 5 bound two lever openings 23, which are positioned opposite to each other.

[0023] **Fig. 2** shows an exploded view of the sliding sleeve 1 in a second embodiment, wherein the sliding sleeve 1 on the second embodiment differs from the first embodiment in the length of the second axial end 4 and the receiving portion 5 along the longitudinal axis 22 of the sliding sleeve 1 especially to receive a larger restoring means 12 not shown here (see **Fig. 3**) than the restoring means 12 of the first embodiment. All other parts of the sliding sleeve 1 are identical to the first embodiment and hence are not explained once again.

[0024] **Fig. 3** shows a sectional perspective view of an operating unit 10 in first embodiment, wherein a control shaft 19 is inserted through openings 24 in an inside 26 of a housing 11 of the operating unit 1 and control shaft 19 is fixedly mounted on the housing 11 by a nut 25. The control shaft 19 has on its part, which is mounted in the inside 26, two different diameters, wherein one bearing 18, built as rolling bearing is mounted on any of the two different diameters. The control shaft 19 is indirectly connected to a control adapter 13 by the two bearings 18. The control adapter 13 comprises a lever adapter 14 and a substantially hollow cylindrical bearing seat 15, wherein the two bearings 18 lay on a circumferential inner surface 17 of the bearing seat 15. The control adapter 13 extends perpendicular to the longitudinal axis 22 of the sliding sleeve 1 and is positioned in the middle of the bearing seat 15 along the longitudinal axis 22 of the sliding sleeve 1. The sliding sleeve 1 covers a lateral surface 16 of the bearing seat 15 radially. The sliding sleeve 1 and the control adapter 13 are spaced apart from each other. The lever adapter 14 is inserted through the lever opening 23 of the sliding sleeve 1, wherein the lever opening 23 does not limit a motion of the control adapter 13 during use. On each of the two receiving regions 5 one restoring means 12 in form of a torsion spring 20 is attached. The second axial ends 4 generate an axial stop to the restoring means 12. The sliding sleeve 1 is completely mounted within the housing 11. Each of the torsion springs 20 have one end, which rests on the control adapter 13 and another end, which rests on the housing 11 to transfer a relative motion between the control adapter 13 and the housing to at least one of the torsion springs 20. The lever adapter 14 is further inserted through a lever insertion part 27 of the housing.

LIST OF REFERENCES

[0025]

1	sliding sleeve
2	sleeve portion
3	first axial end
4	second axial end
5	receiving region
6	connection means
7	pin
8	socket
9	position means
10	operating unit
11	housing
12	restoring means
13	control adapter
14	lever adapter
15	bearing seat
16	lateral surface
17	inner surface
18	bearing
19	control shaft
20	torsion spring
21	elongated web
22	longitudinal axis
23	lever opening
24	opening
25	nut
26	inside
27	lever insertion part
g	guiding direction

Claims

1. Sliding sleeve (1) comprising two substantially cylindrical sleeve portions (2), wherein the two sleeve portions (2) each have a first axial end (3), a second axial end (4) and an outwardly directed receiving

region (5) between the first axial end (3) and the second axial end (4), wherein the second axial end (4) or the first and the second axial ends (3, 4) have a larger outer diameter than the receiving region (5), wherein an axial extension of the receiving region (5) is limited at least on one side by at least the second axial end (4), wherein connection means (6) are formed at the first axial ends (3) to connect the two sleeve portions (2) coaxially and such that they are rotationally fixed to one another.

2. Sliding sleeve (1) according to claim 1, **characterized in that** the connection means (6) are formed by at least one pin (7) and at least one socket (8).

3. Sliding sleeve (1) according to claim 1 or 2, **characterized in that** an outer diameter of the receiving region (5) is axially constant.

4. Sliding sleeve (1) according to claim 1, 2 or 3, **characterized in that** the two sleeve portions (2) each have position means (9) for positioning the sliding sleeve (1) on an operating unit (10), especially on a housing (11) of the operating unit (10), wherein the position means (9) are formed at the first axial end (3) and/or at the second axial end (4) and/or are especially formed as a part of a dovetail connection.

5. Sliding sleeve (1) according to any of the preceding claims, **characterized in that** restoring means (12), especially at least one torsion spring (12) rest against the receiving region (5) when in use, wherein the second axial end (4) or the first and second axial ends (3, 4) form an axial stop for the restoring means (12) when in use.

6. Sliding sleeve (1) according to any of the preceding claims, **characterized in that** the sliding sleeve (1) is formed from a plastic, in particular from a non-reinforced plastic.

7. Operating unit (10) comprising

a control adapter (13) comprising a lever adapter (14) and a substantially cylindrical bearing seat (15),
a sliding sleeve (1), especially according to one of the preceding claims, wherein the sliding sleeve (1) covers a lateral surface (16) of the bearing seat (15) at least partially radially and the sliding sleeve (1) is arranged at a distance from the bearing seat (15),
restoring means (12), wherein the restoring means (12) rest against a receiving region (5) of the sliding sleeve (1), and
a housing (11), wherein the control adapter (13), the sliding sleeve (1) and the restoring means (12) are at least partially accommodated in the housing (11),
wherein the control adapter (13) is pivotally mounted relative to the housing (11), wherein the sliding sleeve (1) is fixedly mounted in the housing (11), wherein the restoring means (12) each rest against the control adapter (13) and the housing (11) in such a way that the restoring means (12) generate a restoring force when the control adapter (13) is relatively pivoted.

8. Operating unit (10) according to claim 7, **characterized in that** the bearing seat (15) is at least partially hollow cylindrical and is orientated axisymmetric, perpendicular to the lever adapter (14), wherein bearings (18) are mounted to an inner surface (17) of the bearing seat (15) for mounting a control shaft (19) pivoted relative to the control adapter (13), wherein the control shaft (19) is fixedly mounted in the housing (11).

9. Operating unit (10) according to claim 7 or 8, **characterized in that** the restoring means (12) are at least two torsion springs (20) and/or the restoring means (12) are orientated axisymmetric, perpendicular to the lever adapter (14).

10. Operating unit (10) according to claim 7, 8 or 9, **characterized in that** the restoring means (12) have different restoring constants, especially the at least two torsion springs (20) have different spring rates.

11. Operating unit (10) according to any of the claims 7 to 10, **characterized in that** the sliding sleeve (1) comprises position means (9), wherein the sliding sleeve (1) is positively and/or non-positively connected to the housing (1) via the position means (9).

12. Method for manufacturing an operating unit (10), especially according to one of claims 7 to 11, comprising the following steps:

- Sliding at least one restoring means (12) onto a sleeve portion (2),
- Sliding two sleeve portions (2) onto a control adapter (13), wherein the two sleeve portions (2) are slid onto the control adapter (13) coaxially towards each other,
- Connecting the two sleeve portions (2) to form a sliding sleeve (1) on the control adapter (13),
- Attaching the restoring means (12) to the control adapter (13),
- Inserting of the assembly consisting of the control adapter (13), the sliding sleeve (1) and the restoring means (12) into a housing (11), wherein the sliding sleeve (1) is guided on the housing (11) via position means (9),
- Inserting of a control shaft (19) through the control adapter (13), according to which the

control adapter (13) is pivotally mounted relative to the housing (11).
- Resting of the restoring means (12) against the housing (11) and preloading of the restoring means (12).

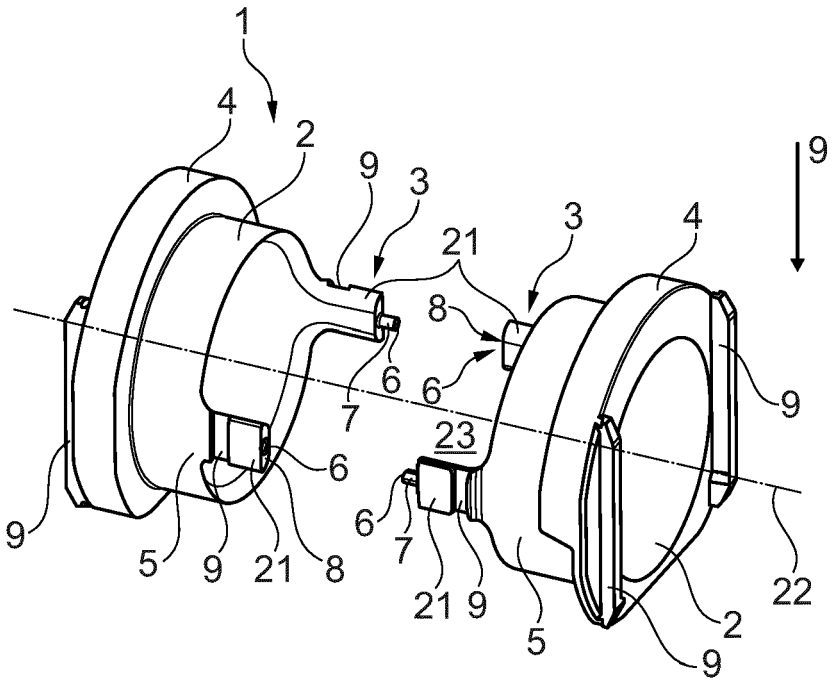
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Fig. 1

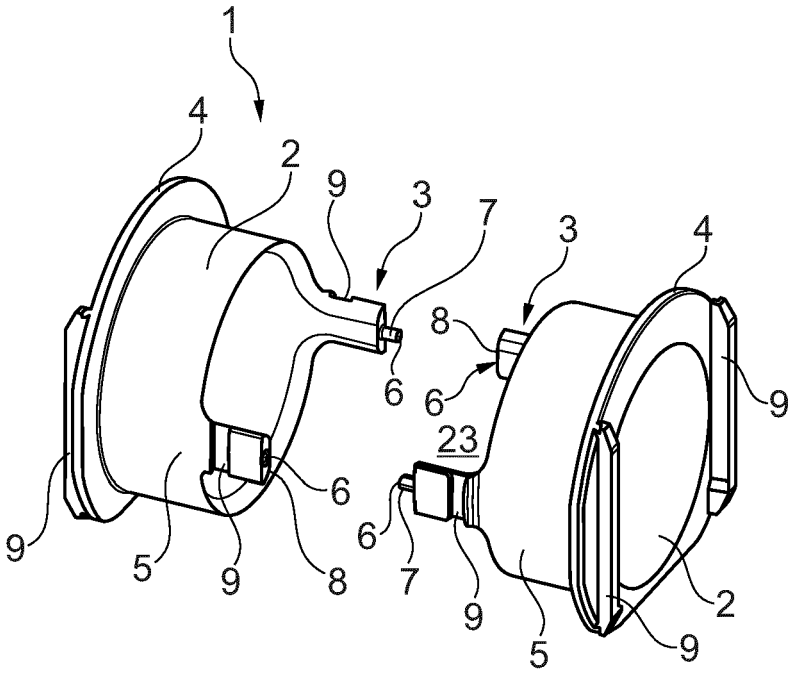
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Fig. 2

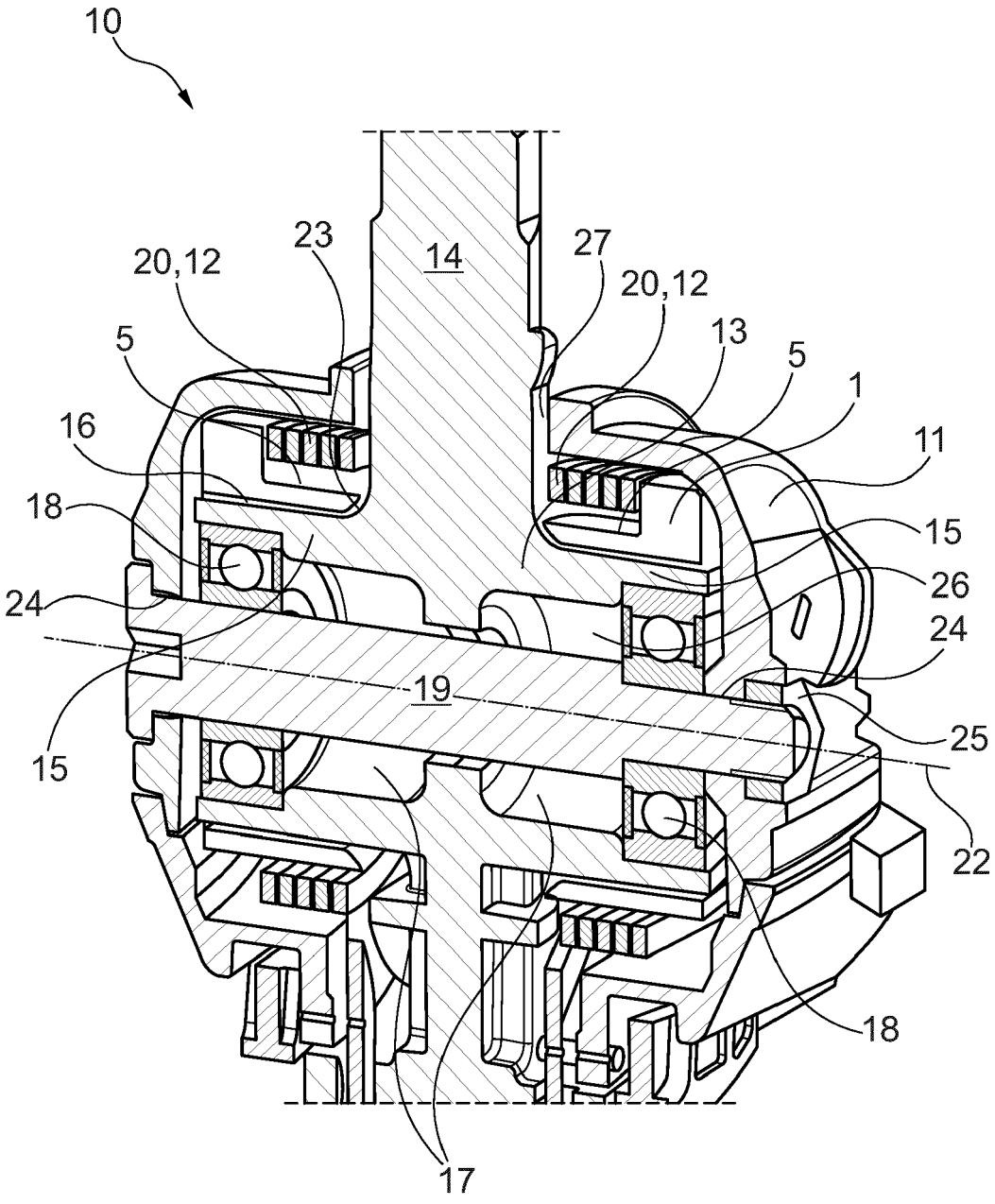

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 23 22 0478

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 624 152 A (STOTZ ERICH [DE] ET AL) 25 November 1986 (1986-11-25) * figure 2 *	1,7-12	INV. G05G5/05 ADD. G05G1/04
X	US 3 891 182 A (SCHWERIN GUNTHER) 24 June 1975 (1975-06-24) * figure 4 *	1-6	
A	JP 2020 062992 A (ASAHI DENSO CO LTD) 23 April 2020 (2020-04-23) * figures 13, 14 *	1	
A	JP 5 583464 B2 (NIPPON SEIKI CO LTD; HONDA MOTOR CO LTD) 3 September 2014 (2014-09-03) * figures *	1,4	
A	EP 3 232 295 A2 (MAKERSAN MAKINA OTOMOTIV SANAYI TICARET LTD STI [TR]) 18 October 2017 (2017-10-18) * figure 1 *	7-12	

TECHNICAL FIELDS SEARCHED (IPC)
G05G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 September 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)

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European Patent Office
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Application Number
EP 23 22 0478

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 23 22 0478

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-6

   Sliding sleeve

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2. claims: 7-12

   Operating unit

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 22 0478

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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26-09-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4624152 A	25-11-1986	DE 3417814 A1	14-11-1985
		FR 2564220 A1	15-11-1985
		GB 2159908 A	11-12-1985
		IT 1200468 B	18-01-1989
		JP S60249731 A	10-12-1985
		US 4624152 A	25-11-1986
US 3891182 A	24-06-1975	BG 24235 A3	10-01-1978
		DE 2255270 A1	22-05-1974
		FR 2213535 A1	02-08-1974
		GB 1407769 A	24-09-1975
		IT 1001645 B	30-04-1976
		JP S4978091 A	27-07-1974
		JP S5644318 B2	19-10-1981
		PL 91172 B1	28-02-1977
		RO 65457 A	15-03-1980
		SE 402022 B	12-06-1978
		US 3891182 A	24-06-1975
JP 2020062992 A	23-04-2020	JP 7203371 B2	13-01-2023
		JP 7454152 B2	22-03-2024
		JP 2020062992 A	23-04-2020
		JP 2023033297 A	10-03-2023
JP 5583464 B2	03-09-2014	JP 5583464 B2	03-09-2014
		JP 2011232842 A	17-11-2011
EP 3232295 A2	18-10-2017	EP 3232295 A2	18-10-2017
		TR 201604770 U	23-10-2017

EPO FORM P0459

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