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(72) Inventors:
• **Varetto, Ener**
10057 Sant'Ambrogio
Torino (IT)
• **Piccolo, Lio**
10095 Grugliasco
Torino (IT)

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(71) Applicant: **VEP Automation S.r.l.**
10092 Beinasco (Torino) (IT)

(74) Representative: **Cian, Paolo**
Saconney & Cian
Corso Vittorio Emanuele II, 14
10123 Torino (IT)

(54) **Device for locking workpieces**

(57) device for locking workpieces comprises a body (12) to which a fluid operated actuator (14) including a slidable rod (20) is associated, as well as a pair of arms (26, 28) articulated about respective stationary pins of rotation (42, 44). The oscillation of the arms (26, 28) is controlled by a mechanism comprising a control member (56) that is axially movable together with the rod (20), which has two slots (58) inclined and symmetrical with respect to the axis of the rod (20). Each slot (58) is slidably engaged by a movable transverse pin (60) crossing also a through opening (68) of a respective arm (26, 28). The opposite ends of each movable transverse pin (60) are slidably engaged in shaped guide formations (64) of a pair of side members (34, 36) of the body (12).

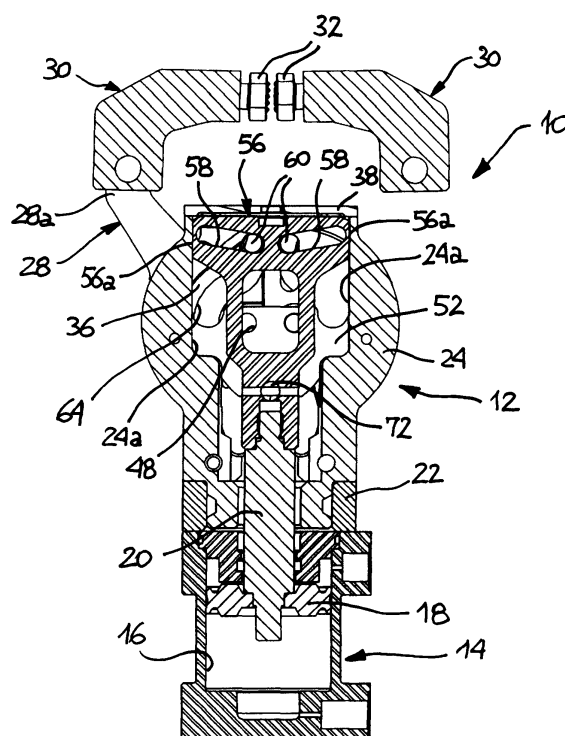


Fig. 4

Description

[0001] The present invention relates to a device for locking workpieces, of the type defined in the preamble of appended claim 1.

[0002] A device of the type defined above is known from EP-A-928 663. This known device comprises a pair of swingable arms, articulated about respective stationary pins of rotation, the movement of which is controlled by the rod of a fluid operated actuator. A transverse pin is associated to the rod of the actuator, and engages respective arched slits formed in a base portion of the arms. The opposite ends of the transverse pin are slidably mounted in a pair of axial grooves of the body of the device, so that, when the rod of the actuator is in its extended position, the arms of the device assume their open releasing configuration, while, when the rod of the actuator is in its retracted position, the arms of the device assume their closed clamping configuration.

[0003] The main object of the invention is to propose a device of the type defined at the beginning of the description, having a mechanism for driving the oscillation of the arms that is highly reliable and effective in operation and that is adapted to develop a relatively high force of clamping.

[0004] This object is reached by a device provided with the features mentioned in the appended claims.

[0005] Further characteristics and advantages of the invention will be made clearer from the following detailed description, provided only as a non-limitative example and referred to the appended drawings in which:

figure 1 is a perspective view of a device according to the invention, with its arms in the closed configuration for clamping a workpiece,

figure 2 is an exploded perspective view from arrow II of figure 1, showing the main elements of the device,

figure 3 is a side elevational view from arrow III of figure 1, sectioned along a median plane,

figure 4 is a front elevational view sectioned along line IV-IV of figure 3,

figure 5 is a perspective view of the device of figure 1 from arrow V, from which a front cover of the body has been removed,

figure 6 is a front elevational view from arrow VI of figure 5,

figure 7 is a view similar to figure 5, from which a first arm of the device has been also removed,

figure 8 is a view similar to figure 7, from which a second arm and a back cover have been also removed, in order to make an intermediate portion of the body of the device more evident,

figure 9 is a view similar to figure 7, from which the front cover, both the arms and the intermediate portion of the body have been removed, in order to make a back cover of the body evident,

figure 10 is a front elevational view from arrow X of

figure 9, in which the intermediate portion of the body is also present, and from which a control member of the device has been removed,

figures 11 and 12 are views similar to figure 6, showing respectively two subsequent steps of the movement of the control mechanism, which mechanism controls the movement of the arms to the releasing configuration of a workpiece,

figure 13 is a view similar to figure 9, showing the device in its configuration corresponding to the partially open position of its arms shown in figure 12,

figure 14 is a view similar to figure 12 in which the arms are in their fully open releasing configuration of a workpiece,

figure 15 is a view similar to figure 14, from which both the arms of the device and an auxiliary plate fixed to the intermediate portion of the body have been removed, and

figure 16 is a view similar to figure 13, corresponding to the releasing configuration of the arms of the device.

[0006] With reference to the figures, a device for locking workpieces according to the invention is indicated 10.

The device 10 comprises a body 12 to which a fluid operated actuator 14, typically a pneumatic cylinder of the double- or single-acting type, is associated at the bottom, according to the figures.

[0007] The actuator 14, as shown more clearly in figures 3 and 4, comprises, in a manner known per-se, a cylindrical chamber 16 in which a piston 18 is sealingly and slidably mounted, which piston is rigidly connected to a rod 20 that extends inside the body 12 along a main axis of the device 10. The rod 20 can assume an extended position or a retracted position with respect to the actuator 14, as a result of the selective feeding of a pressurised fluid from opposite sides of the piston 18.

[0008] A fastening plate 22 extends transversely to the axis of the actuator 14 between the body 12 and the actuator 14, which plate projects cantilever with respect to an upper head of actuator 14, and has holes or other coupling formations for allowing the device 10 to be secured to a fixed or a movable support element (not shown).

[0009] The body 12, supported by the plate 22, comprises an intermediate portion 24 having a flat and substantially circular shape, fixed to the plate 22.

[0010] A first and a second arm 26 and 28 are arranged at opposite sides of the intermediate portion 24. In particular, each arm 26 and 28 includes a base portion 26a, 28a having a flat and substantially semicircular shape, from which a generally elbow free end 26b, 28b extends cantilever. A clamping unit 30 is fixed to the free end 26b, 28b of each arm 26 and 28, usually by means of a screw (not shown) that engages respective holes of the arm and of the clamping unit.

[0011] Each clamping unit 30 includes a pair of screw shaped shoulder members 32, so that position of the

heads of the members 32 can be adjusted with respect to the respective unit 30, in order to allow their position to be precisely adjusted according to the specific shape of a workpiece to be locked.

[0012] The body 12 is closed sideways at the side opposite to each base portion 26a, 28a of the arms 26, 28, by means of a respective arched guard sheet 29, the opposite ends of which being connected to adjacent zones of the body 12 by means of shape coupling.

[0013] A pair of covers 34, 36, front and back, respectively, are fixed to the opposite flanks of the body 12, in such a manner that each base portion 26a, 28a of an arm 26, 28 is interposed between a respective cover 34, 36 and the intermediate portion 24.

[0014] A generally square guard plate 38 is connected above the covers 34, 36, which plate is provided with members that project towards the bottom in order to allow the two arched sheets 29 to be connected to the body 12. Moreover, through holes intended to be engaged by respective screws (not shown), are provided close to the corners of the guard plate 38, each screw crossing also one of a pair of longitudinal through holes of each cover 34, 36, the free end of such screws engaging a corresponding threaded hole of the fastening plate 22, with the aim of locking the plate 38 and the covers 34 and 36 with respect to the plate 22.

[0015] Each cover 34, 36 has also a pair of parallel through holes 40, transverse to the axis of the device 10, one of which, for each cover 34, 36, is engaged by a stationary pin of rotation 42, 44 defining the axis of oscillation of a respective arm 26 or 28, and engaging, to such a purpose, a hole 45 formed centrally in the base portion 26a, 28a of the respective arm 26, 28.

[0016] Each pin 42, 44 comprises an enlarged head 42a, 44a having a pair of diametrically opposite flattenings intended to rest on the flanks of an elongated seat 46 formed in each cover 34 and 36, perpendicularly to the axis of the device 10. The free end 42b, 44b of each pin 42, 44, which has a narrower diameter, is force fitted in a hole 48 of a respective auxiliary plate 52. In particular, each auxiliary plate 52 is fixed to a respective side of the intermediate portion 24 of the body 12, so that it is interposed between the intermediate portion 24 and the base portion 26a, 28a of the respective arm 26, 28. Each arm 26, 28, as a result of its articulation about a respective pin 42, 44, can swing with respect to the body 12 between a closed clamping configuration (figures 1 to 7) and an open releasing configuration of a workpiece (figures 14 and 15).

[0017] The corresponding and simultaneous oscillation of the two arms 26 and 28 is controlled by a mechanism described in the following.

[0018] A control member 56 is fixed to the end of the rod 20 opposite to the actuator 14, in order to be axially movable with respect to the body 12, together with the rod 20. The member 56 has a pair of opposite surfaces 56a parallel to the axis of the rod 20, which rest on opposed rectilinear guide surfaces 24a of the intermediate

portion 24, so that the axial movement of the member 56 is guided as a result of the sliding of the surfaces 56a on the surfaces 24a.

[0019] Moreover, two slots 58 are formed in the member 56, which are inclined and symmetrical with respect to the axis of the rod 20 and converge towards such an axis according to a general V configuration. In particular, each slot 58 has a pair of opposite ends, spaced and close to the axis of the rod 20, respectively.

[0020] A movable transverse pin 60 is inserted in each slots 58, which can slide in a direction transverse to its own axis. The ends of each pin 60, which are conveniently provided with respective bearings, for example of the plain or of the rolling type, slidably engage respective guide formations consisting of substantially S shaped grooves 64, which are formed on the inner surface of both the covers 34 and 36. In particular, each groove 64 has a first generally rectilinear upper section 64a extending up to the upper edge of the respective cover 34, 36, to which a curvilinear section 64b, concentric with one of the pins of rotation 42, 44 and ending at a lower end section 64c, is joined below.

[0021] Each transverse pin 60 crosses also a through opening formed in the base portion 26b, 28b of a respective arm 26, 28. Conveniently, each through opening consists of an elongated slit 68 extending along a direction parallel to the radial direction of the respective pin of rotation 42, 44.

[0022] A downwardly open seat 70 is formed in each base portion 26b, 28b in a position adjacent to the slit 68, in which seat, in the clamping position of the two arms 26, 28, the transverse pin 60 not engaging the slit 68 of the base portion 26b, 28b, is received.

[0023] In order to guide more effectively the axial movement of the control member 56 as a result of the movement of the rod 20, the control member 56 is provided with a transverse pin 72 at its portion adjacent to the rod 20, the opposite ends of which, projecting from the member 56, engage a pair of respective axial slits formed in the two covers 34 and 36.

[0024] Moreover, a micro-switch 73 (figures 5 and 7), of a type known per-se, usually of the inductive type, is associated to the body 12, for example on the side of the cover 36, in order to detect the opening and closing positions of the arms 26 and 28.

[0025] The operating mechanism described above allows the arms 26 and 28 to be driven with a movement according to which, when the rod 20 is in its extended position, the transverse pins 60 are adjacent to the ends of the slots 58 of the control member 56 that are closer to the axis of the rod 20, and the arms 26 and 28 are in their mutually approached clamping configuration, while when the rod 20 is in its retracted position, the transverse pins 60 are adjacent to the ends of the slots 58 that are more spaced from the axis of the rod 20, and the arms 26 and 28 are in their spaced releasing configuration of a workpiece.

[0026] In operation of the device, starting from the

clamping configuration of the arms 26 and 28 shown in figures 1 to 10, in which the transverse pins 60 are arranged adjacent to the ends of the slots 58 that are closer to the axis of the device 10, each pin 60 is arranged at the end of a respective slit 68 that is more spaced from the pins of rotation 42, 44, or in a seat 70 of the base portions 26a, 28a of the arms 26, 28. Moreover, the axial ends of the pins 60 engage the rectilinear upper section 64a of the grooves 64 formed in the covers 34 and 36, while the ends of the transverse pin 72 are adjacent to the upper end of the rectilinear guide grooves 74.

[0027] At the beginning of the stroke of retraction of the rod 20 (figure 11), owing to a small movement of the control member 56 towards the actuator 14, the transverse pins 60 begin to slide along the slots 68 of the base portions 24a, 26a towards the respective pins of rotation 42, 44, and disengage from the seats 70, while the opposite ends of the pin 72 begin to slide along the guide grooves 74 towards the actuator 14.

[0028] A further movement of the rod 20 towards the actuator 14 (figures 12 and 13) causes a corresponding movement of the control member 56 and, together with it, a further movement of the pins 60 along the slits 68 and of the pin 72 in the grooves 74. Moreover, the transverse pins 60 begin to slide along the slots 58 towards their ends more spaced from the axis of the rod 20, and the ends of the pins 60 engage the curvilinear sections 64b of the grooves 64 (figure 13).

[0029] At the end of the stroke of retraction of the rod 20 (figures 14 and 16), the arms 26 and 28 reach their open releasing configuration. In this configuration, the transverse pins 60 are arranged adjacent to the ends of the slots 58 that are more spaced from the axis of the rod 20, and engage the end of the slit 68 of the base portion 24a, 26a of the arms 26, 28, which is closer to the pins of rotation 42, 44. Moreover, the ends of the pins 60 are arranged at the lower end sections 64c of the grooves 64, and the ends of the transverse pin 72 are arranged at the ends of the guide grooves 74 that are closer to the actuator 14.

Claims

1. Device for locking workpieces, comprising a body (12) to which a fluid actuator (14) is associated, said actuator (14) including a rod (20) slidably mounted between an extended position and a retracted position with respect to the actuator (14), and a pair of arms (26, 28) articulated about respective stationary pins of rotation (42, 44), so that they can oscillate with respect to the body (12) between respective clamping and releasing configurations of a workpiece as a result of the axial movement of said rod (20), the oscillation of the arms (26, 28) being controlled by a mechanism comprising a control member (56) which is axially movable with respect to the body (12) together with the rod (20), and to which at least

a transverse pin (60) is associated,

characterized in that the control member (56) has a pair of slots (58) symmetrically inclined with respect to the axis of the rod (20), which slots (58) comprise a closer end and a more spaced end with respect to the axis of the rod (20), each slot (58) being slidably engaged by a respective movable transverse pin (60) crossing also a through opening (68) of a respective arm (26, 28), the opposite ends of each movable transverse pin (60) being slidably engaged in shaped guide formations (64) of a pair of side members (34, 36) of the body (12), whereby, when the rod (20) is in its extended position, both the transverse movable pins (60) are arranged adjacent to the ends of the slots (58) closer to the axis of the rod (20), and the arms (26, 28) are in their clamping configuration, while, when the rod (20) is in its retracted position, both the movable transverse pins (60) are arranged adjacent to the ends of the slots (58) more spaced from the axis of the rod (20), and the arms (26, 28) are in their releasing configuration.

2. Device according to claim 1, **characterized in that** the control member (56) is slidably mounted between a pair of axial and mutually facing guide surfaces (24a) of the body (12).
3. Device according to claim 2, **characterized in that** said axial guide surfaces (24a) are formed in an intermediate portion (24) of the body (12).
4. Device according to claim 3, **characterized in that** each arm (26, 28) comprises a respective base portion (26a, 28a), the base portions (26a, 28a) of the two arms (26, 28) being arranged at opposite sides with respect to said intermediate portion (24) of the body (12).
5. Device according to claim 4, **characterized in that** said through opening of each arm (26, 28) is formed in the base portion (26a, 28a) of the respective arm (26, 28), and consists of an elongated slit (68) extending along a direction parallel to the radial direction of the respective pin of rotation (42, 44).
6. Device according to claim 4 or 5, **characterized in that** a respective auxiliary plate (52) is interposed between each base portion (26a, 28a) of an arm (26, 28) and the intermediate portion (24) of the body (12), said plate (52) being fixed to the intermediate portion (24) and being engaged by an end of the pin of rotation (42, 44) of the respective arm (26, 28).
7. Device according to any one of claims 1 to 6, **characterized in that** the guide formations in which the opposite ends of the movable transverse pins (60) are slidably engaged, consist of substantially S-shaped grooves (64).

8. Device according to claim 7, **characterized in that** said substantially S-shaped grooves (64) are formed in a pair of covers (34, 36) of the body (12).
9. Device according to claim 7 or 8, **characterized in that** the ends of each movable transverse pin (60) are provided with a respective bearing (62). 5
10. Device according to any one of claims 1 to 9, **characterized in that** the control member (56) is crossed by a pin (72) transverse to the axis of the rod, the opposite ends of which engage respective axial grooves (74) formed in the covers (34, 36) of the body (12). 10
11. Device according to any one of claims 1 to 10, **characterized in that** a fastening plate (22) of the device (10) extends between the body (12) of the device (10) and the respective actuator (14). 15
12. Device according to any one of claims 1 to 11, **characterized in that** both the arms (26, 28) are provided with respective clamping units (30) each of which includes at least a shoulder member (32) the position of which may be adjusted with respect to the respective clamping unit (30). 20
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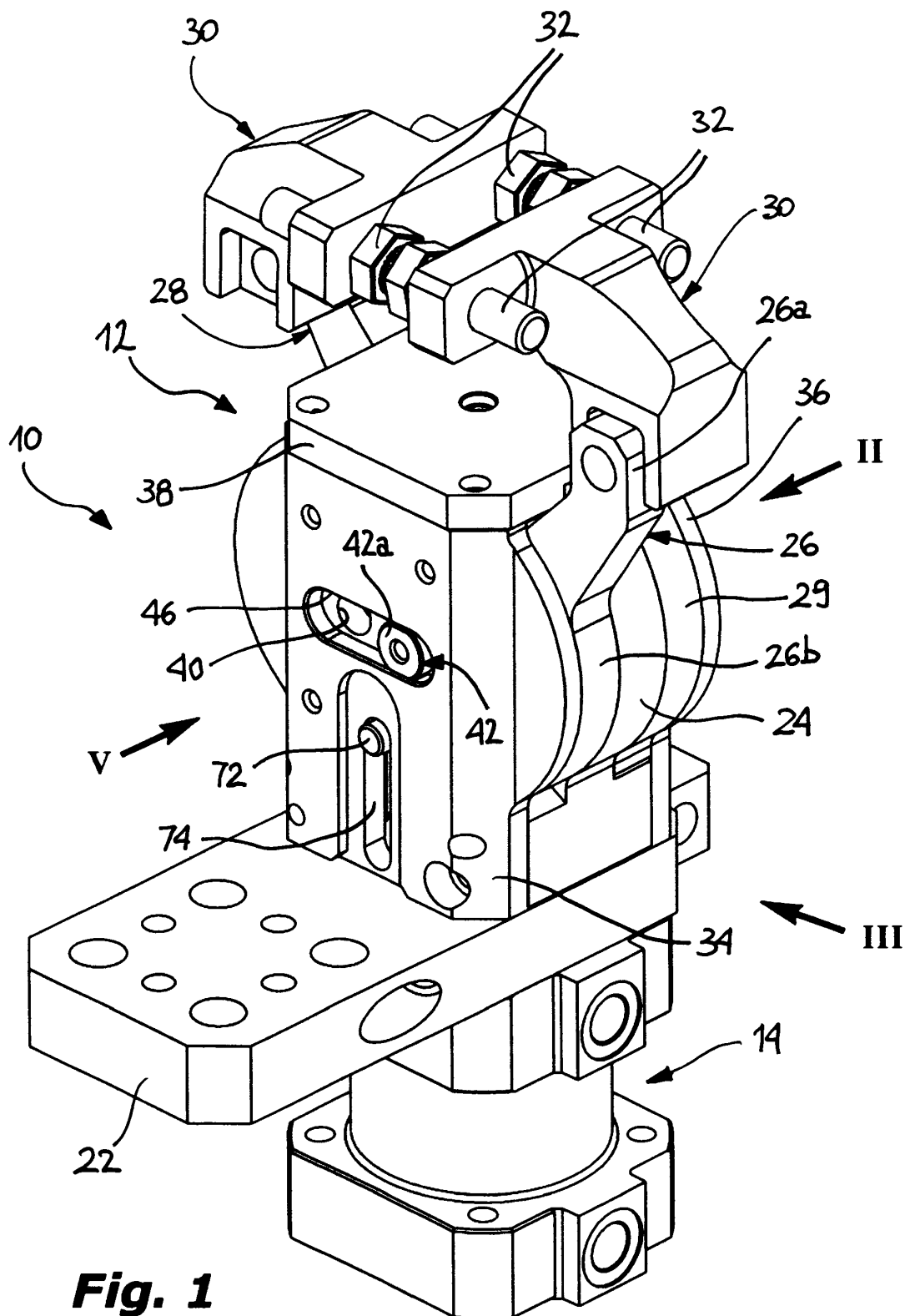


Fig. 1

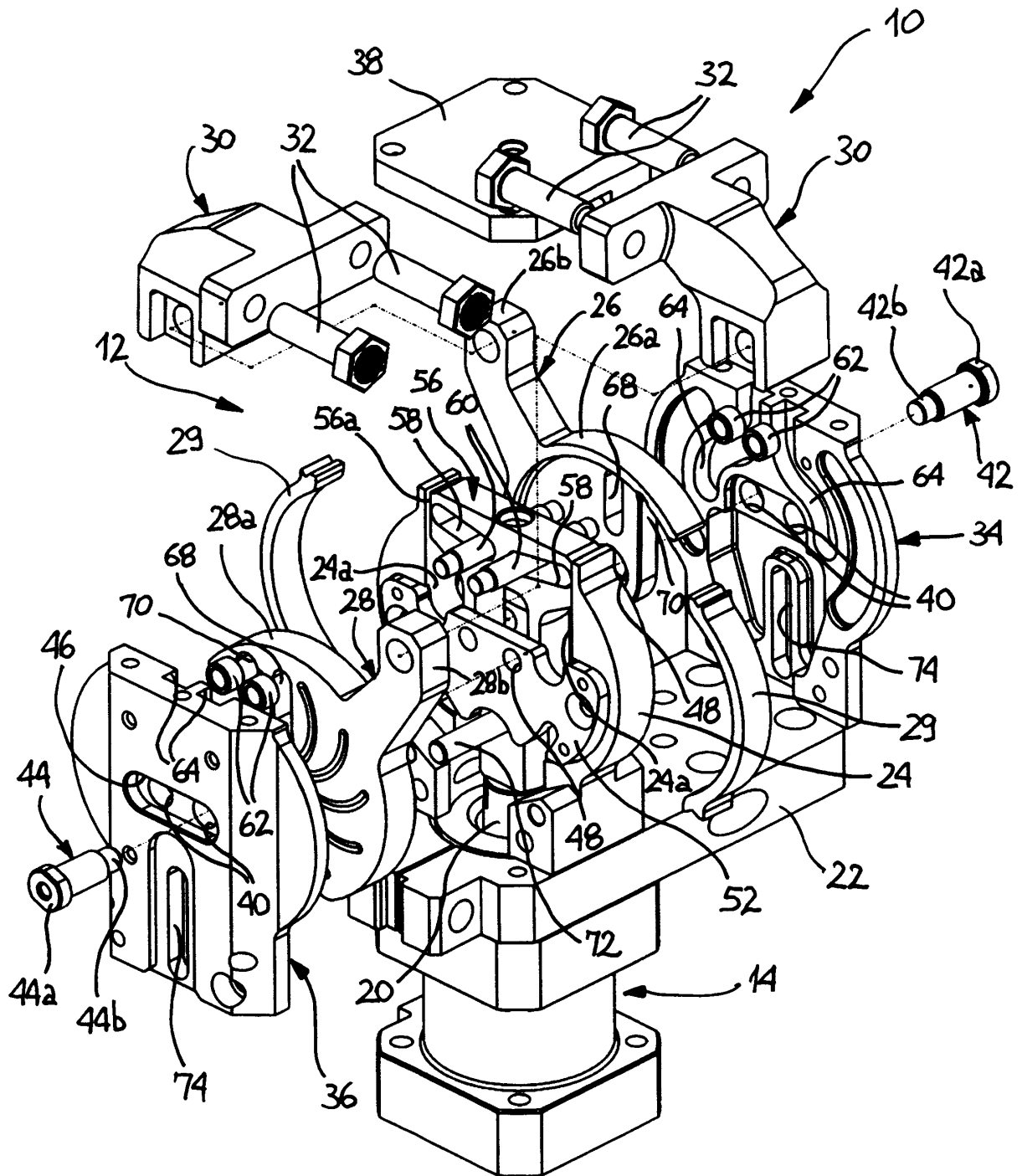
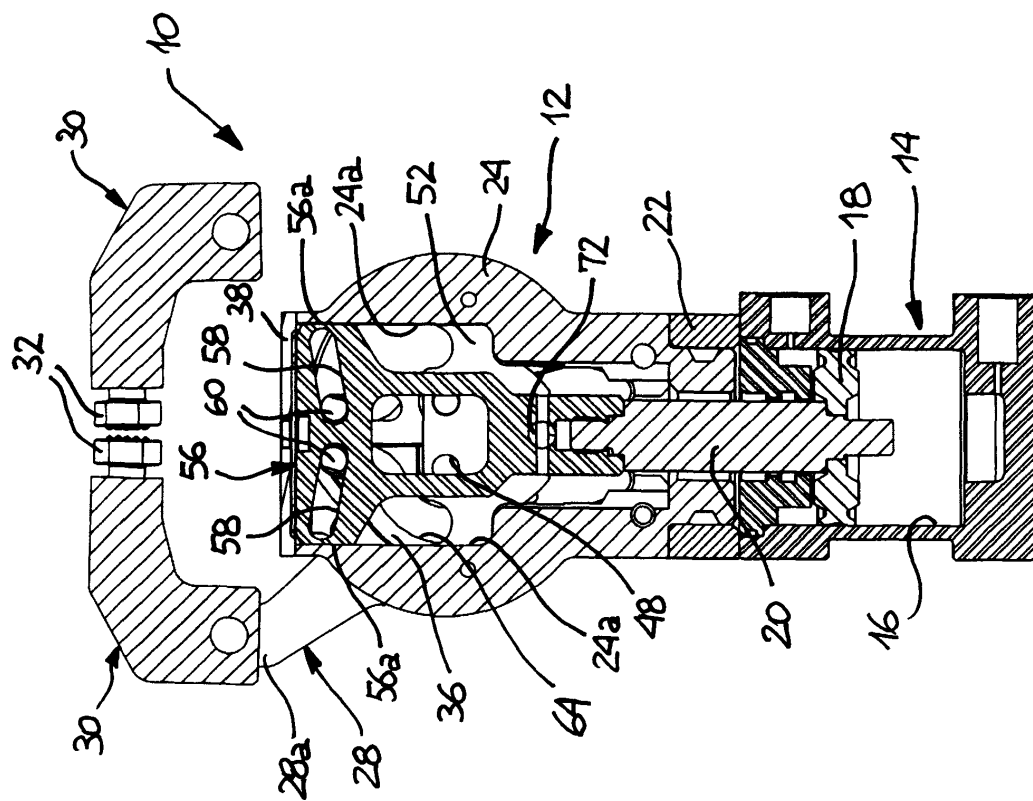
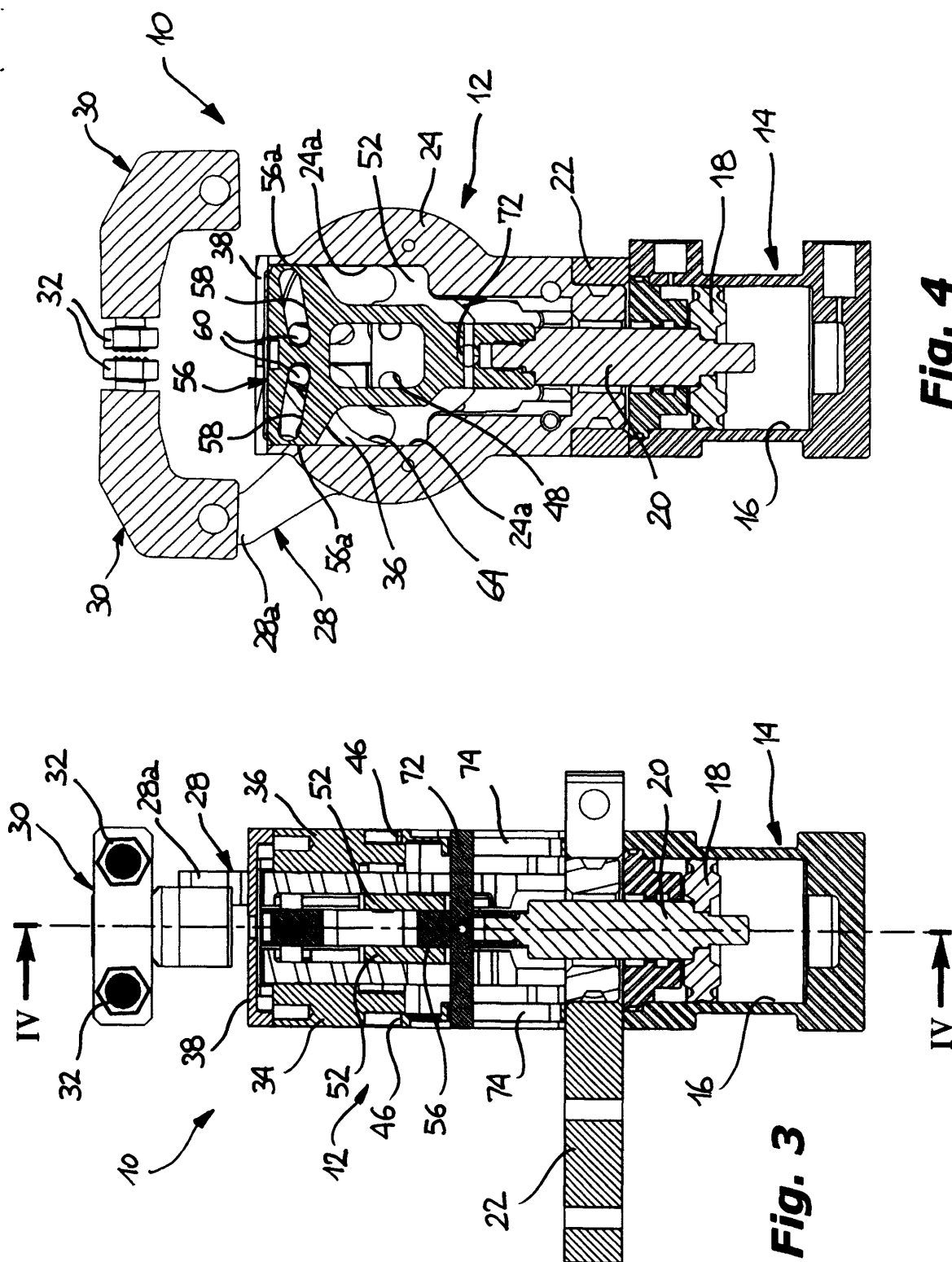


Fig. 2



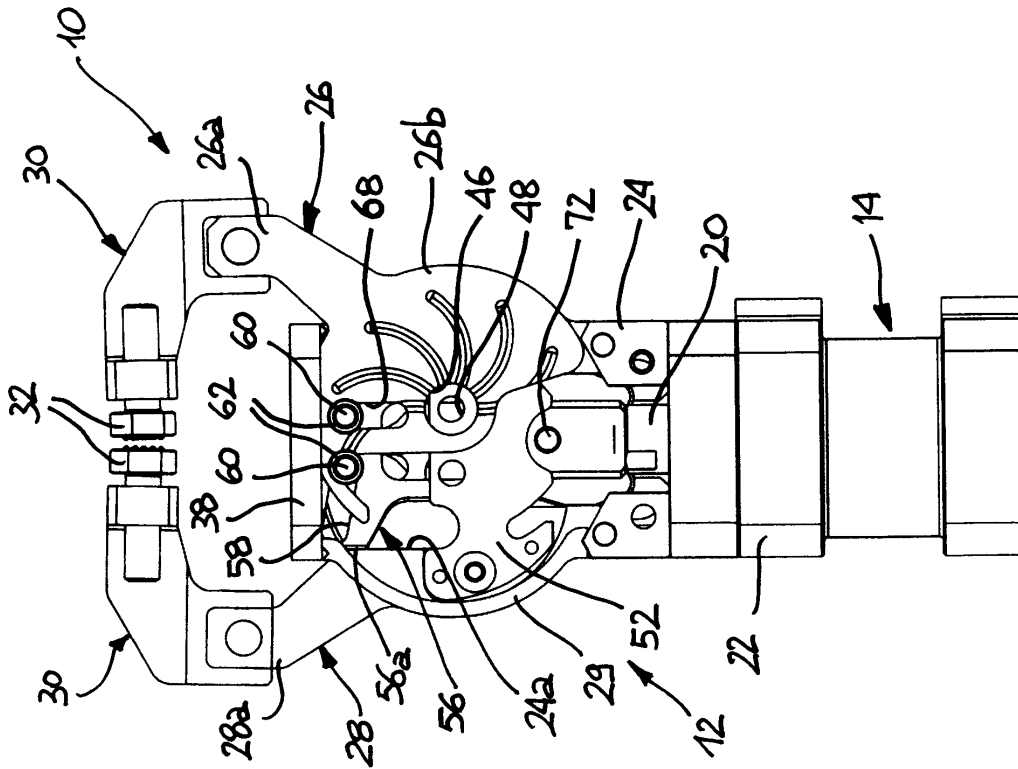


Fig. 5

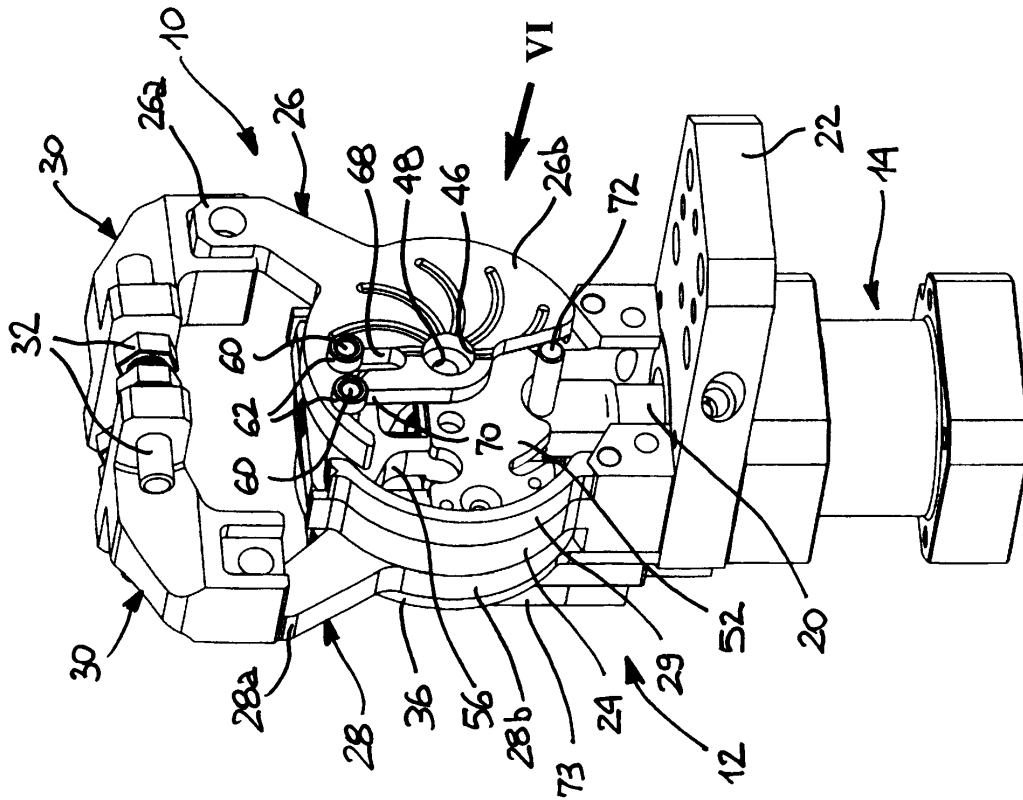


Fig. 6

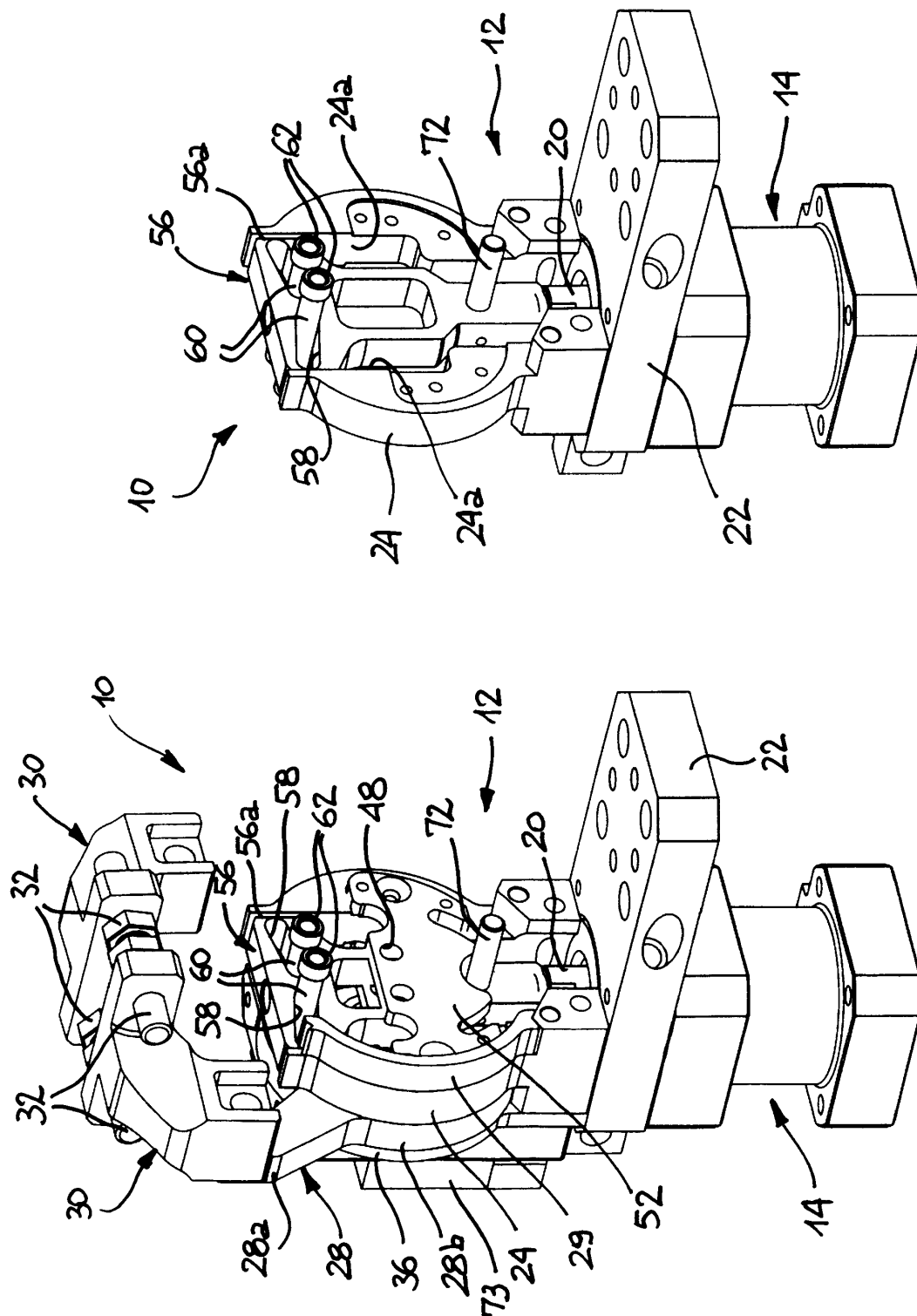


Fig. 8

Fig. 7

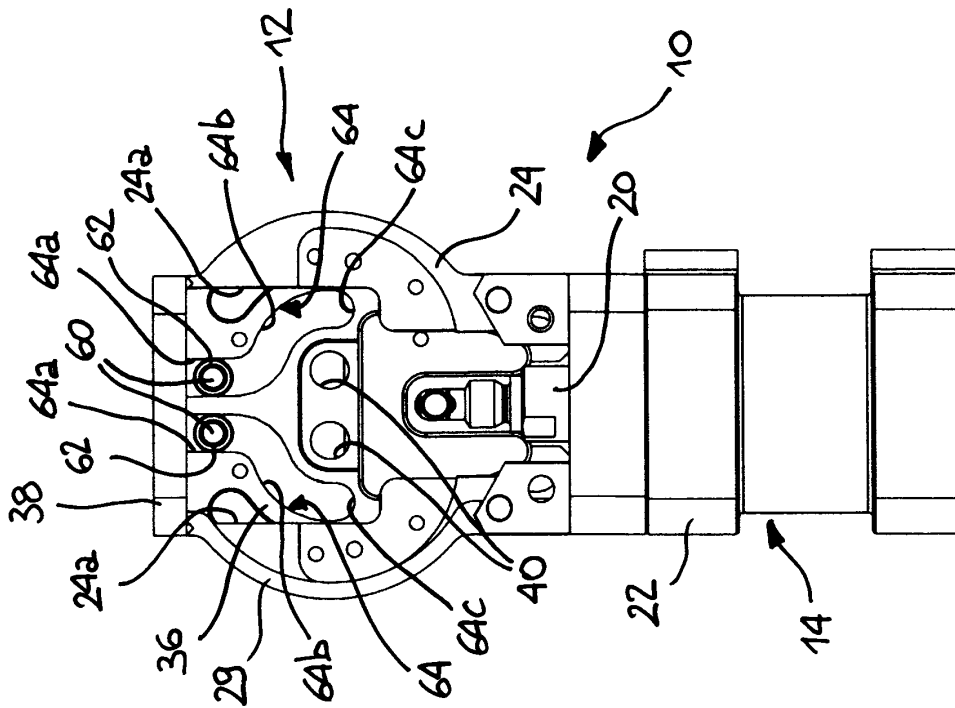


Fig. 10

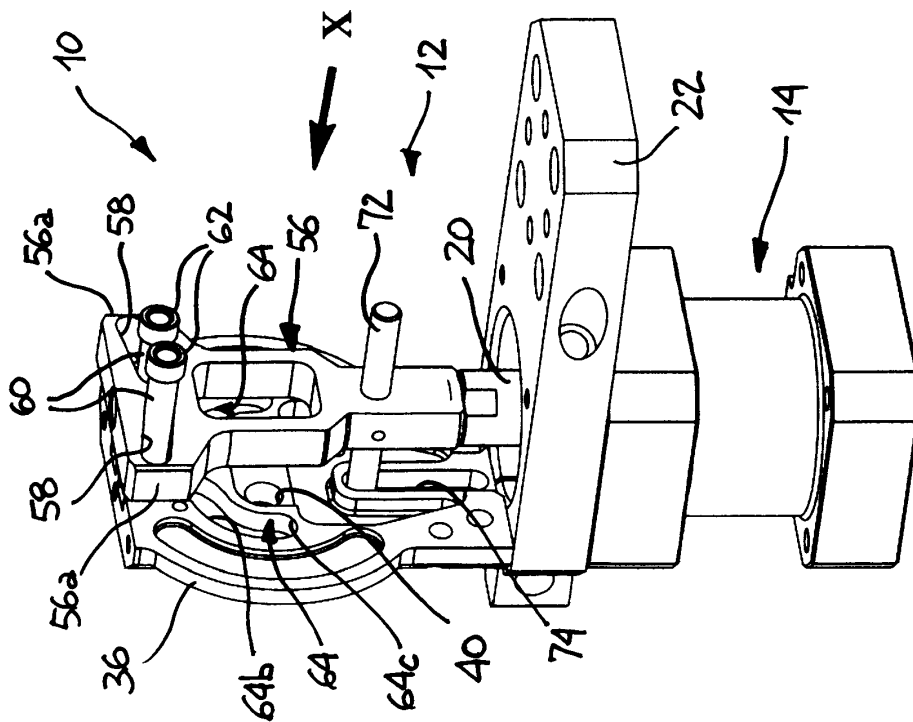


Fig. 9

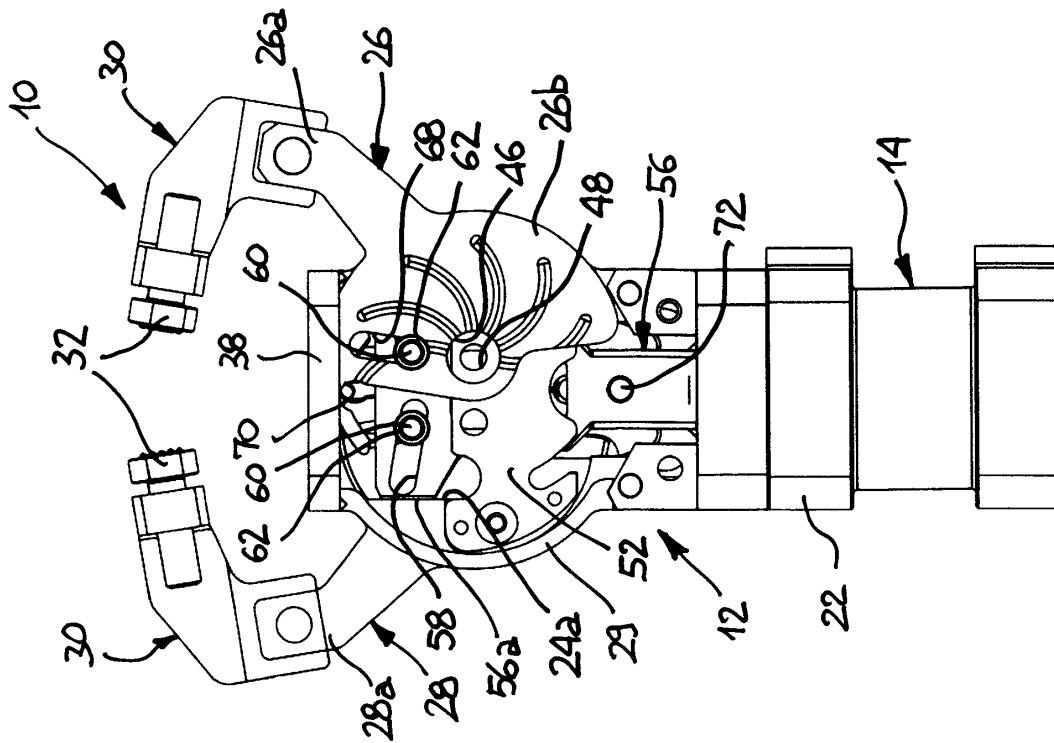


Fig. 12

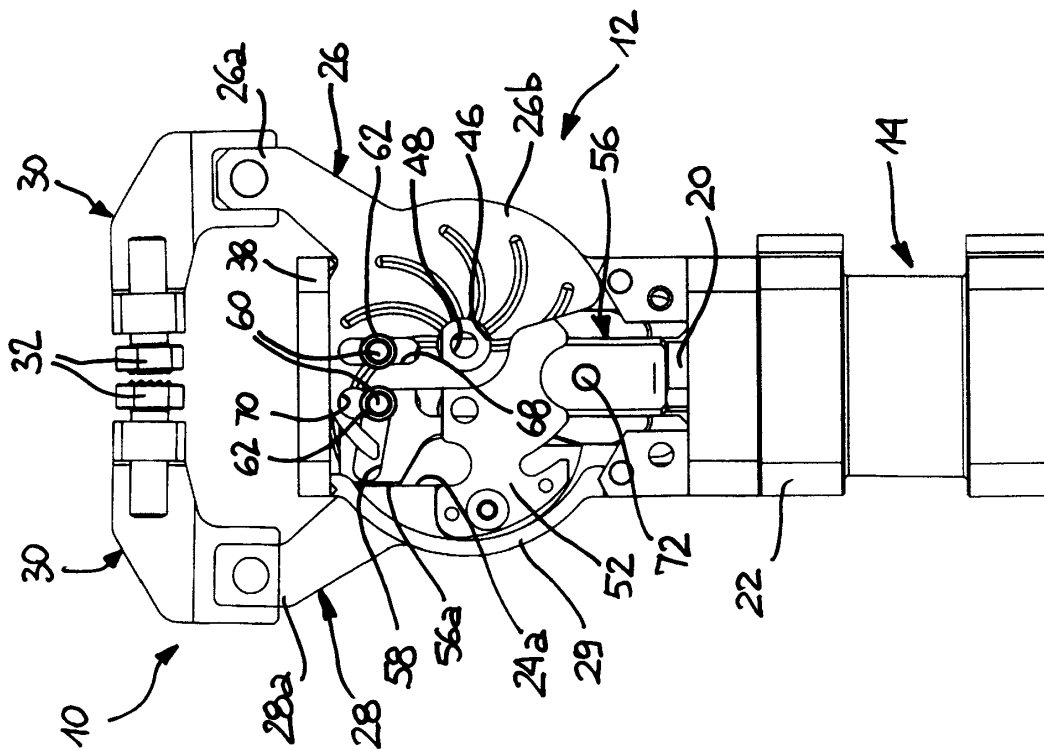


Fig. 11

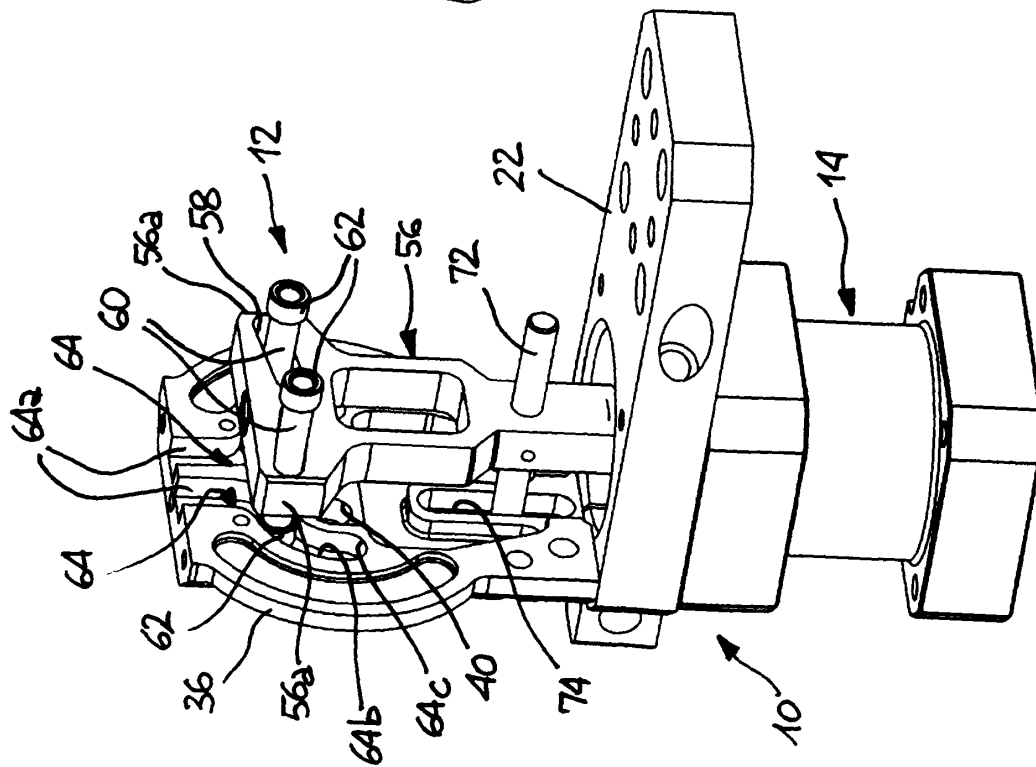


Fig. 13

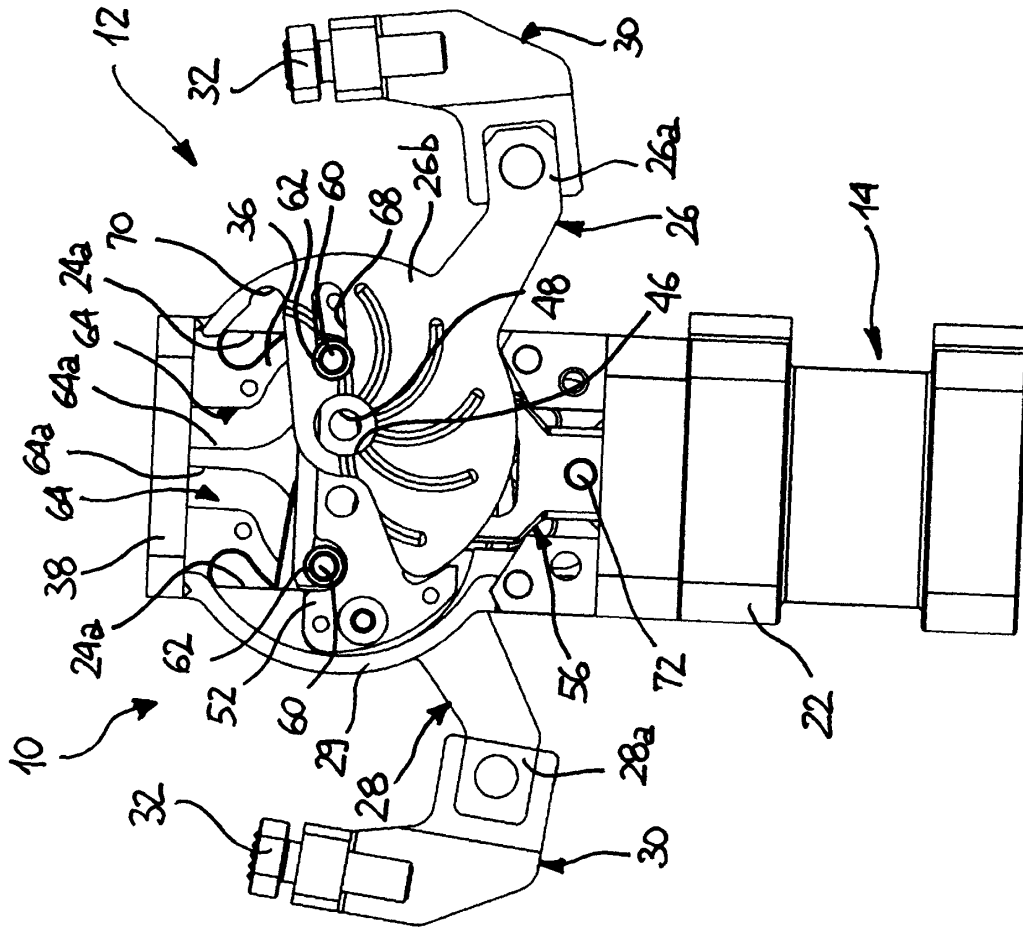


Fig. 14

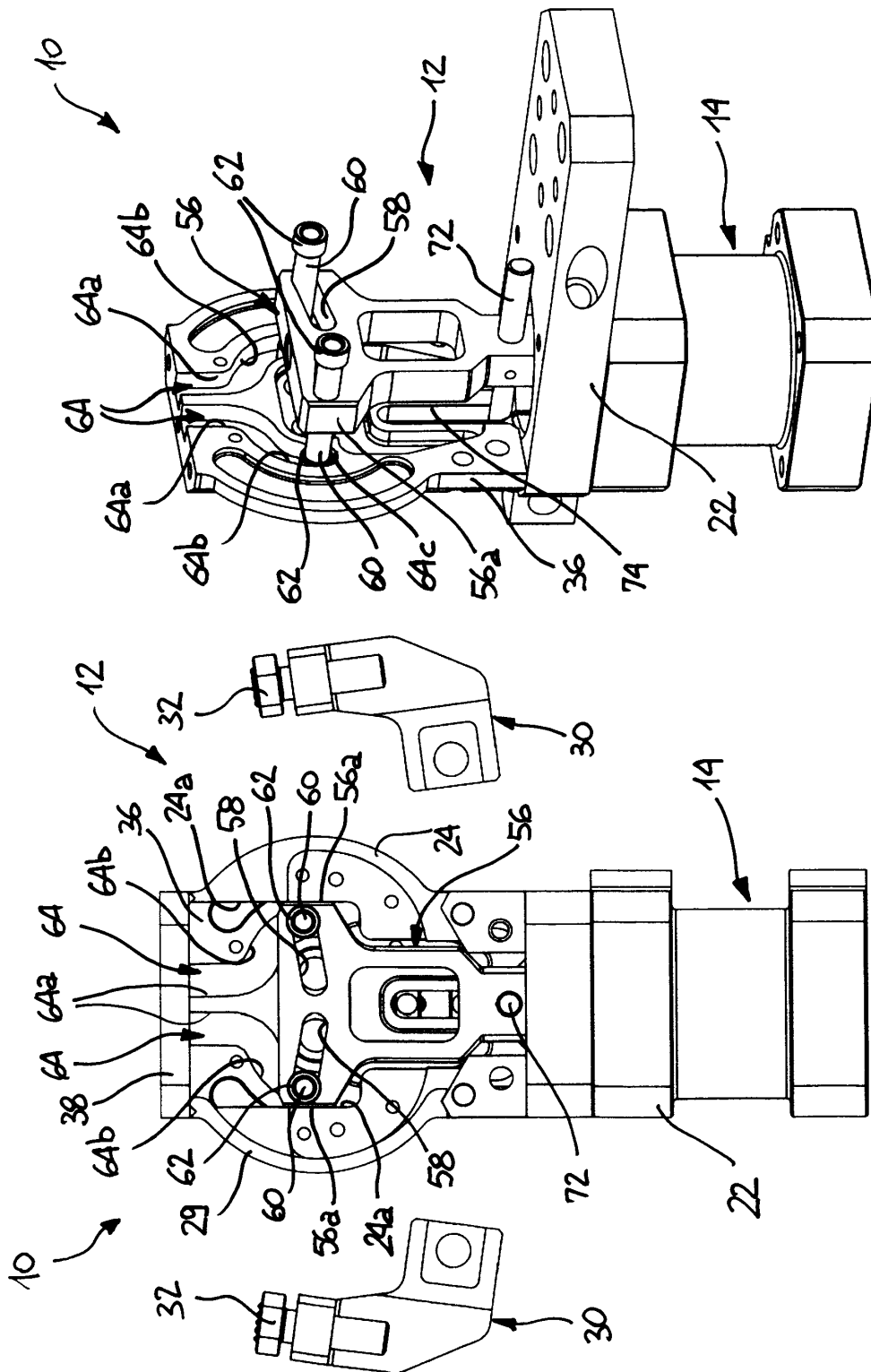


Fig. 16

Fig. 15



EUROPEAN SEARCH REPORT

Application Number
EP 10 00 3975

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 4 607 873 A (NUSBAUMER KAY T [US] ET AL) 26 August 1986 (1986-08-26) * figures 12,13 *	1-12	INV. B25B5/08 B25J15/02
A	US 6 290 210 B1 (HORN EDWARD R [US] ET AL) 18 September 2001 (2001-09-18) * figures 1-6 *	1-12	
A	JP 6 086842 U (----) 20 December 1994 (1994-12-20) * figures 1,2 *	1-12	
A	WO 98/15392 A (PHD INC [US]; MOILANEN STEVEN M [US]; MCINTOSH BRUCE D [US]) 16 April 1998 (1998-04-16) * figures 2,3 *	1-12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B25B B25J
Place of search		Date of completion of the search	Examiner
The Hague		29 June 2010	Klein, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 00 3975

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29-06-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4607873	A	26-08-1986	NONE	
US 6290210	B1	18-09-2001	US 2002084564 A1	04-07-2002
JP 6086842	U	20-12-1994	JP 2584209 Y2	30-10-1998
WO 9815392	A	16-04-1998	AU 4665697 A	05-05-1998
			DE 69727306 D1	26-02-2004
			DE 69727306 T2	25-11-2004
			EP 0935516 A1	18-08-1999
			ES 2309271 T3	16-12-2008
			ES 2213839 T3	01-09-2004

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 928663 A [0002]