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

(11) EP 2 857 144 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.04.2015 Bulletin 2015/15

(21) Application number: **14185788.8**

(22) Date of filing: **22.09.2014**

(51) Int Cl.:
B24B 31/00 *(2006.01)* ***B24B 31/02*** *(2006.01)*
B24B 31/12 *(2006.01)* ***B24B 41/06*** *(2012.01)*

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **01.10.2013 IT MI20131616**

(71) Applicant: **Redaelli, Paolo**
20853 Biassono (MB) (IT)

(72) Inventor: **Redaelli, Paolo**
20853 Biassono (MB) (IT)

(74) Representative: **Parisi, Luigi**
Viale Beatrice d'Este, 20
20122 Milano (IT)

(54) A machine for drag finishing of mechanical parts

(57) A machine (10) for drag finishing of mechanical parts (50) comprising a frame (12) and a rotating tub (14) for containing finishing media and a movement group (18,24,26,27,28) for a rotating part-carrying element (22), where the movement group comprises at least a motor group (18) that can act to set in rotation a shaft (21) able to support the rotating part-carrying element (22), where the movement group (24,26,27,28) can move the motor group (18) and the rotating part-carrying element (22) along a first vertical axis (Y) and along a second horizontal axis (X) and wherein the movement group (18,24,26,27,28) can carry the part-carrying element (22), along the first vertical axis (Y), internally to the finishing media in the rotating tub (14) and can successively move the rotating part-carrying element (22), along the second horizontal axis (X), towards an offset position with respect to the centre of the rotating tub (14).

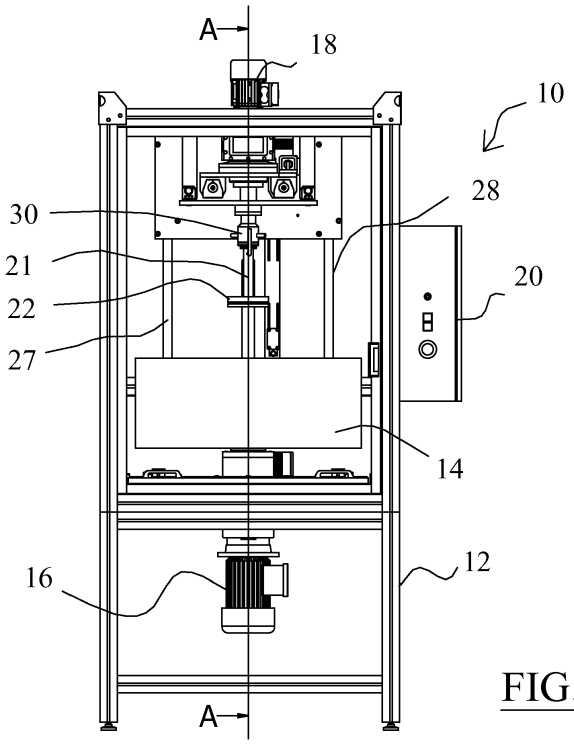


FIG.1

EP 2 857 144 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a machine for drag-finishing mechanical parts.

BACKGROUND ART

[0002] As is known, the mass finishing of metal surfaces (and not metal too) is based on the dynamics relating to the way in which the mass constituted by the finishing media and the parts is set in relative motion.

[0003] In particular, in drag-finishing, the parts to be worked are fixed to appropriate support devices such as part-carrying chucks.

[0004] The parts are circularly drawn, at a high speed, internally of a treatment tub in which a finishing media is present, which can be constituted by components such as, for example, abrasive granules having an appropriate shape, made of polymer, ceramic, plastic, synthetic materials or materials of natural origin. The working is generally done at high speed, giving rise to a certain contact pressure between the part to be worked and the working means which leads to the desired result.

[0005] In more detail, in some known machines, the parts are mounted on a rotating head which exhibits a plurality of part-carrying groups, each constituted by a chuck which is able, in turn, to house a plurality of parts positioned along a circumference thereof.

[0006] By way of example, a machine of the described type can comprise a rotating head provided with three part-carrying chucks, each of which is able to support 12 parts.

[0007] The machine can be set in motion, by rotating the rotating head in a rotation direction, while the part-carrying chucks can be rotated in an opposite direction.

[0008] A control panel enables setting various functioning parameters of the machine.

[0009] Machines of this type, though enabling carrying the parts in an offset position with respect to the centre of the tub, are obviously hampered by a high degree of constructional complexity, as among other things it is necessary to mount gearings able to give the above-described complex planetary motion to the parts being worked in the tub.

[0010] This complexity is, naturally, reflected also in the costs of the machine.

[0011] A further not insignificant functional aspect of this type of machine is correlated to the loading operation in the rotating tub and the unloading operation in the finishing media (granulates or the like).

[0012] In particular, this operation can be necessary when a different working operation is to be carried out, for example passing from titanium parts to stainless steel parts, and the media used in the preceding work operations is not to be used again.

[0013] In cases like these, while the loading of the media in the tub is done by an operate who takes the 25 kg sacks of media one at a time and tips them into the tub, a relatively rapid operation, the emptying of the tub is more laborious and unpleasant, as the granular media has to be shoveled out using a spade or the like, from the tubs to the empty bags for disposal, which among other things causes relevant machine down times.

[0014] Document EP 0 073 536 discloses a finishing machine for pieces immersed in tub containing finishing media. Means are provided to transport the pieces to be finished from a loading and unloading station to a working position where the pieces are immersed in the tub and contacting the finishing media. The transport means comprise a first piston-cylinder group capable of moving along a vertical axis, for example in order to immerse a piece in the tub and a second piston-cylinder group capable of moving along a horizontal axis. The pieces to be finished are carried by a part-carrying element, from a loading station, then are lifted along the vertical by the first piston-cylinder group up to an height higher than the border of the tub. They are then transferred in a horizontal direction by the second piston-cylinder in order to pass over the tub border until they reach a position on the vertical of the immersion point of the pieces in the tub. Finally, the first piston-cylinder group immerses the pieces in the tub by means of a movement along the vertical direction and, when the pieces are immersed in the tub, a motor group sets into rotation the part carrying element. Opposite movements with respect to those described are used at the end of processing to bring the workpiece to an unloading station.

SUMMARY OF THE INVENTION

[0015] An aim of the present invention is to create a machine for drag-finishing of mechanical parts which enables bringing the parts being worked from a central position also into an offset position with respect to the centre of the working tub, though with a considerable constructional simplicity of the machine.

[0016] A further aim of the invention is that it enables the loading and unloading of the parts being worked simply and rapidly and that it can be automated for use in robotized areas.

[0017] A further aim of the invention is to enable automatic unloading of working media from the rotating tub.

[0018] Said aims are attained by a machine for drag finishing of mechanical parts comprising a finishing frame and a rotating tub for containing finishing media and a movement group for a rotating part-carrying element, where the movement group comprises at least a motor group that can act to set in rotation a shaft able to support the rotating part-carrying element, where the movement group can move the motor group and the rotating part-carrying element along a first vertical axis and along a second horizontal axis, wherein the movement group can carry the part-carrying element, along the first vertical axis, internally to the finishing media in the rotating tub

and can successively move the rotating part-carrying element, along the second horizontal axis, towards an offset position with respect to the centre of the rotating tub.

[0019] Among the advantages of the present invention is the fact that it enables carrying the part to be worked in an offset position as desired with respect to the centre of the working tube with the aim of benefiting from the forces which are created on the part according to the distance thereof from the centre of the rotating tub.

[0020] In particular, the density of the media increases according to the rotation velocity of the media, internally of the rotating tub, so that a greater density thereof is obtained at a greater distance from the centre thereof.

[0021] The machine of the invention enables regulating the position of the shaft in order to carry out the most suitable working for each type of part.

[0022] In a further embodiment, the rotating part-carrying element exhibits a support shaft, the support shaft being connected to the motor group thereof by means of a connection enabling an inserting movement from below in an upwards direction.

[0023] This solution enables carrying out the parts loading and unloading simply and rapidly and also automatically, for example internally of a robotized area.

[0024] In a further embodiment, a brush is connectable to the support shaft which, during the rotation of the tub, can move along a first vertical axis and along a second horizontal axis so as to bring the brush to involve a whole volume of the tub.

[0025] An advantage of this solution is given by the fact of using the same means which cause the movement of the support shaft during the working of the parts so as to convey the media towards special evacuating holes by means of the brush.

[0026] In a further embodiment, a gutter is associated to the rotating tub, at a perimeter portion thereof, and the bottom of the rotating tub is provided with evacuating holes of the finishing media, the holes being openable by switches at the gutter so as to convey the finishing media thereto.

[0027] An advantage of this solution consists in enabling conveying the media to be evacuated towards a perforated gutter to which a container for collecting the finishing media can be associated.

[0028] Further advantages of the invention can be deduced from the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Further characteristics and advantages of the invention will emerge from a reading of the following description, provided by way of non- limiting example, with the aid of the figures of the appended tables, in which:

- figure 1 is a lateral view of an embodiment of the machine of the invention;
- figure 2 is a view from above of the machine of figure 1;
- figures 3-5 are sectioned views along plane A-A of figure 1, illustrating various operating positions of the machine of figures 1-2;
- figure 6 is a section view of a connection for the rotating shaft of the machine of figures 1-5;
- figure 7 is a robot island provided with a plurality of machine as in figures 1-5;
- figures 8-9 illustrate an engaging system of a rotary plate of the machine of figures 1-5;
- figures 10-13 illustrate various configurations of the rotary plate of the machine of figures 1-5;
- figures 14-22 illustrate various configurations of an automatic evacuation system of the tub, according to an aspect of the present invention; and
- figures 23-25 illustrate various configurations of an operating element of the system of figures 14-22.

[0030] In particular the machine of the present invention is denoted in its entirety by reference numeral 10 of figures 1-5.

[0031] Figure 1 illustrates the machine 10 provided with a frame 12 housing a tub 14 that can contain finishing media.

[0032] The tub 14 can be rotated by a motor 16 located below the tub 14.

[0033] A motor group 18 is also connected to the frame 12, which motor group 18 can rotate a rotary plate 22 provided with a shaft 21 connected to the motor group 18 by means of a connection 30, more fully described in the following. The motor group and the rotary plate 22 can move along guides 27,28 along a vertical axis Y (figure 4), for example by means of piston-cylinder group or other known technical means, in such a way as to bring the rotary plate 22, and the part 50 present thereon, from a raised position to a working position internally of the tank 14 containing the finishing media.

[0034] The motor group 18, and consequently also the rotary plate 22, can also move along a horizontal axis X (figure 5) sliding over guides 24,26, visible in particular in figure 2, for example by means of piston-cylinder group or other known technical means, in order to bring the rotary plate 22 internally of the rotating tub 14, but in an offset position to the centre of the rotating tub 14. Therefore, the machine 10 described is able to perform offset finishing operations i.e. a new type of finishing which bases its dynamics on the synergy of the rotating tub 14, containing the finishing media, and on the rotary plate 22 which, initially centred with respect the rotation axis of the rotating tub, can remain in an elevated position with respect to the rotating tub 14 so as to enable loading and unloading (figure 3).

[0035] In other words, the machine 10 comprises a movement group for a rotating part-carrying element 12, where the movement group comprises the motor group 18 to set in rotation the shaft 21 able to support the rotating part-carrying element 12, and comprises the guides 27,28 along the vertical axis Y, the guides 24,26 and along the horizontal axis X, and furthermore the cor-

responding movement means to carry the motor group and the part-carrying element along said guides.

[0036] The movement group can carry the part-carrying element 22, along the first vertical axis Y, internally to the finishing media in the rotating tub 14 and can successively move the rotating part-carrying element 22, along the second horizontal axis X, towards an offset position with respect to the centre of the rotating tub 14.

[0037] The movement of the part-carrying element 22 along the second horizontal axis X inside the finishing media can suitably regulated in order to reach eccentrical positions as desired with respect to the centre of the rotating tub 14 and can be performed with the part-carrying element 22 in rotation or not. On commencement of the work cycle, the rotary plate 22 in the rotating tub 14 descends along the vertical axis Y (figure 4), while beginning to rotate, by centrifuging the media toward the perimeter, thus freeing up space to allow the plate 22 to descend.

[0038] Once the correct depth of descent from the vertical axis Y has been reached, the plate is translated towards the external edge of the rotating tub 14 along a horizontal axis X (figure 5).

[0039] Following these movements, as visible in plan view in figure 5, the tub 14 rotates clockwise, while the rotary plate 22 is located in an offset finishing position, close to the edge of the tub 14. In the finishing phase the rotary plate 22 rotates anti-clockwise, or in the opposite direction to the rotation of the tub 14.

[0040] The support shaft 21 of the rotary plate 22 can be applied by inserting a male coupling 32 connected to the support shaft 21 into a female coupling 30, by simple insertion from below in an upwards direction, as can be seen in figure 6.

[0041] This arrangement enables having a rotating head of a simple type and not indexed, as it is thus possible to halt the head in an approximate position, for example with a simple microswitch.

[0042] This can be achieved, for example, with the solution illustrated in figures 8-9. In this solution, the coupling comprises a first group of orientating pins 60 and the support shaft 21 includes a second group of orientating pins 62, where the blocking of the support shaft 21 inside the connection can occur when the first and the second group of orientating pins are in a predetermined orientation position e.g. arranged more or less at 180° to one another.

[0043] The robot tasked with inserting the shaft 21 in the connection simply has to centre the hole and push the shaft 21 upwards (figure 8-9).

[0044] Obviously, the same operation done manually is possible in simplified configurations.

[0045] An economical machine is therefore realized, which carries out the offset finishing, while it is also possible, alternatively, to set up a robotized area 40, where a plurality of machines 10 is served by a robot 45 for loading and unloading parts (figure 7), according to the natural development of workloads destined for the finishing department.

[0046] A robotized area 40 can easily be configured with a plurality of groups of the machine of the invention, up to five in number but even more, in relation to the model of the base unit, the type of robot and other factors.

[0047] The productivity of a like area can thus reach very high levels with very rapid loading and unloading of the technological tubs which in this case might be the same plates with the pre-assembled parts.

[0048] By mounting the robot on the floor or ceiling, using small, medium or large units of the machine 10, the possible combinations can be many and lend themselves to very heterogeneous configurations.

[0049] With reference to figures 10-13, it is observed that the rotary plate 22 can be assimilable to a frame element or workpiece carrier, such as to give many possibilities of positioning of the parts in function of the desired machining process.

[0050] In particular, in a first embodiment of the invention, the parts 50 can be placed in the upper position with respect to the rotary plate 22 (figure 8), while in a second embodiment of the invention, the parts 50 may be placed in a lower position than the rotary plate 22 (figure 9).

[0051] In another embodiment (figure 10) the parts 50 can be positioned externally with respect to the circumference of the rotating plate 12, for example, by portions 22' orientated at 90° relative to the plane in which the rotary plate 22 rotates, or the parts 50 can be positioned on portions 22' orientated at 45° relative to the plane in which the rotary plate rotates 22.

[0052] Other angles are possible for these positionings, using portions 22' hinged to the rotary plate 22.

[0053] Figures 14-22 illustrate different configurations of a system for automatic emptying of the tub according to an aspect of the present invention.

[0054] In particular, in place of the part-carrying element, a brush 110 with a plurality of bristles, for example metal, can be mounted.

[0055] The movement of the brush 110 is illustrated in figures 14-22, i.e. it can be translated towards the external edge of the rotating tub 14 along the direction of the arrow F, i.e. so as to move from a central position (figure 14) to a significantly offset position (figure 22) internally of the tank 14, all in the context of the above-described movements, because the brush 110 is mounted on the same support shaft as the chuck element and can therefore be subject to the same movements that the support shaft makes.

[0056] Further, the rotating tub 14 can be provided, on a bottom thereof, with a plurality of holes, in turn provided with means for opening and closing thereof.

[0057] The rotating tub 14 is also associated, at a peripheral portion thereof, with a gutter 112, in turn exhibiting at least a hole 114.

[0058] The holes in the bottom of the rotating tub are represented in figures 14-22 by reference numeral 120 when they are fully closed, with reference numeral 120' when partially open and with reference numeral

120" when fully open. The holes 120" completely or partially open 120' are in this configuration when they are positioned, during the rotation of the tank 14, above the gutter 114.

[0059] As shown in figures 23-25 the holes 120,120', 120" can be opened by means of intervention of a respective switch 170.

[0060] Each switch 170 exhibits a substantially circular portion 155, able to cover the respective hole and an elongate portion 145.

[0061] The circular part of the switch 170 is also associated with a projecting portion 160 which houses a point of attachment for a spring 130 also fixed to a second point of attachment 135 on the bottom of the tub 14.

[0062] The elongate portion 145 is able to engage with a pawl 140 that can be brought, for example by pneumatic means, from a first lowered position to a second raised position that engages with the elongate portion 145 of the switch 170.

[0063] The switch 170 can then be rotated (in the direction of figures 23-25) around a fulcrum 150 from a first position in which the respective hole is closed to a second position in which the hole is open.

[0064] Once having passed beyond the pawl 140, the spring 130 quickly returns the switch 170 into the closed position of the hole.

[0065] The described embodiment of the switches 170 is purely exemplary and not limiting; what is important is that the spring 130 is sufficiently powerful to enable the re-closing, by overcoming the forces of the granular media which attempts to escape, thus preventing the switch 170 from becoming stuck in the attempt thereof to close.

[0066] In the functioning of the described emptying device, while the tub rotates in slow counter-rotation (arrow R), the rotary brush 110 (according to the direction of the arrow W) advances slowly on the horizontal axis (arrow F), towards the external perimeter of the rotating tub 14 up to brushing the specially-applied switches 170 to perform the emptying process in the best possible way.

[0067] Each time that the evacuation holes media pass close to the unloading area or the gutter 112, the switches 170 interfere with the pawl 140 enabling the opening of the holes enabling the granular media, gradually accumulated, to exit.

[0068] It is stressed that the switches 170 open only when they pass over the gutter 112 and then close in the remaining perimeter portion. The gutter 112, inclined funnel-fashion towards the central connector, enables all the content to converge in a collecting container through the hole 114.

[0069] A motorized vibrator can be associated so as to shake the gutter 112 during unloading.

[0070] The cooperation of the movements of the brush 110 synchronized with the opening of the holes thus enables automatic emptying of the tank 14. Obviously modifications or improvements can be made to the invention as described herein, dictated by contingent motives or details, without its forsaking the scope of the invention as claimed below.

Claims

1. A machine (10) for drag finishing of mechanical parts (50) comprising a frame (12) and a rotating tub (14) for containing finishing media and a movement group (16,24,26,27,28) for a rotating part-carrying element (18), where the movement group comprises at least a motor group (16) that can act to set in rotation a shaft (21) able to support the rotating part-carrying element (18), where the movement group (16,24,26,27,28) can move the motor group (16) and the rotating part-carrying element (18) along a first vertical axis (Y) and along a second horizontal axis (X), **characterized in that** the movement group (16,24,26,27,28) can carry the part-carrying element (18), along the first vertical axis (Y), internally to the finishing media in the rotating tub and can successively move the rotating part-carrying element (18), along the second horizontal axis (X), towards an offset position with respect to the centre of the rotating tub (14).

2. The machine (10) of claim 1, wherein a motor (16) is provided, able to set the tub (14) in rotation in an opposite direction with respect to the rotation direction of the rotating part-carrying element (18).

3. The machine (10) of claim 1, wherein the support shaft (21) of the rotating part-carrying element (18) is connected to the motor group (16) thereof by means of a connection (30) enabling an inserting movement from below in an upwards direction.

4. The machine (10) of claim 3, wherein the connection (30) comprises a first group of orientating pins (60) and the support shaft (21) comprises a second group of orientating pins (62), where the blocking of the support shaft (21) internally of the connection (60) can take place when the first and the second group of orientating pins (60,62) are in a predetermined reciprocal orientating position.

5. The machine (10) of the preceding claims, wherein the part-carrying element comprises a rotating plate (22) which exhibits means (22') for arranging the parts being worked in different working positions with respect to a dimension of the rotating plate.

6. The machine (10) of claim 5, wherein the rotating plate exhibits means (22') for arranging the parts being worked externally with respect to a circumference of the rotating plate.

7. The machine (10) of claim 5, wherein the rotating plate exhibits means for arranging the parts being

worked in an upper or lower position with respect to the circumference of the rotating plate.

8. The machine (10) of claim 1, wherein a brush (110) is connectable to the support shaft (21) which, during the rotation of the tub (14), can move along a first vertical axis (Y) and along a second horizontal axis (X) so as to bring the brush (110) to involve a whole volume of the tub (14).

9. The machine (10) of claim 1, wherein a gutter (112) is associated to the rotating tub (14), at a perimeter portion thereof, and the bottom of the rotating tub (14) is provided with evacuating holes (114) of the finishing media, the holes being openable by switches (170) at the gutter (112) so as to convey the finishing media thereto.

10. A group comprising a plurality of machines (10) as in the preceding claims, and a robot (45) able to load and unload the parts being worked.

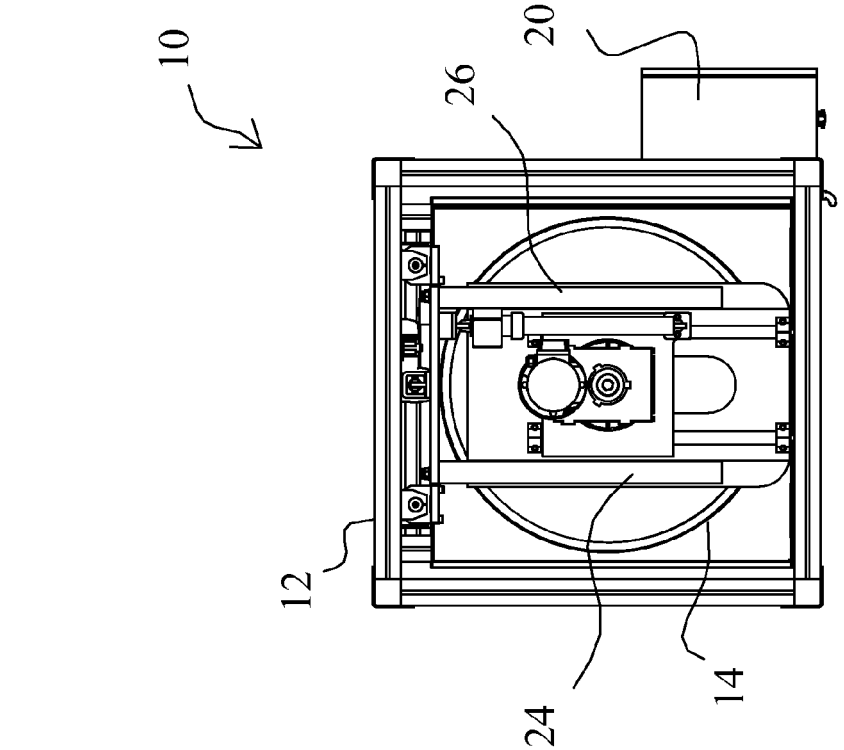


FIG.2

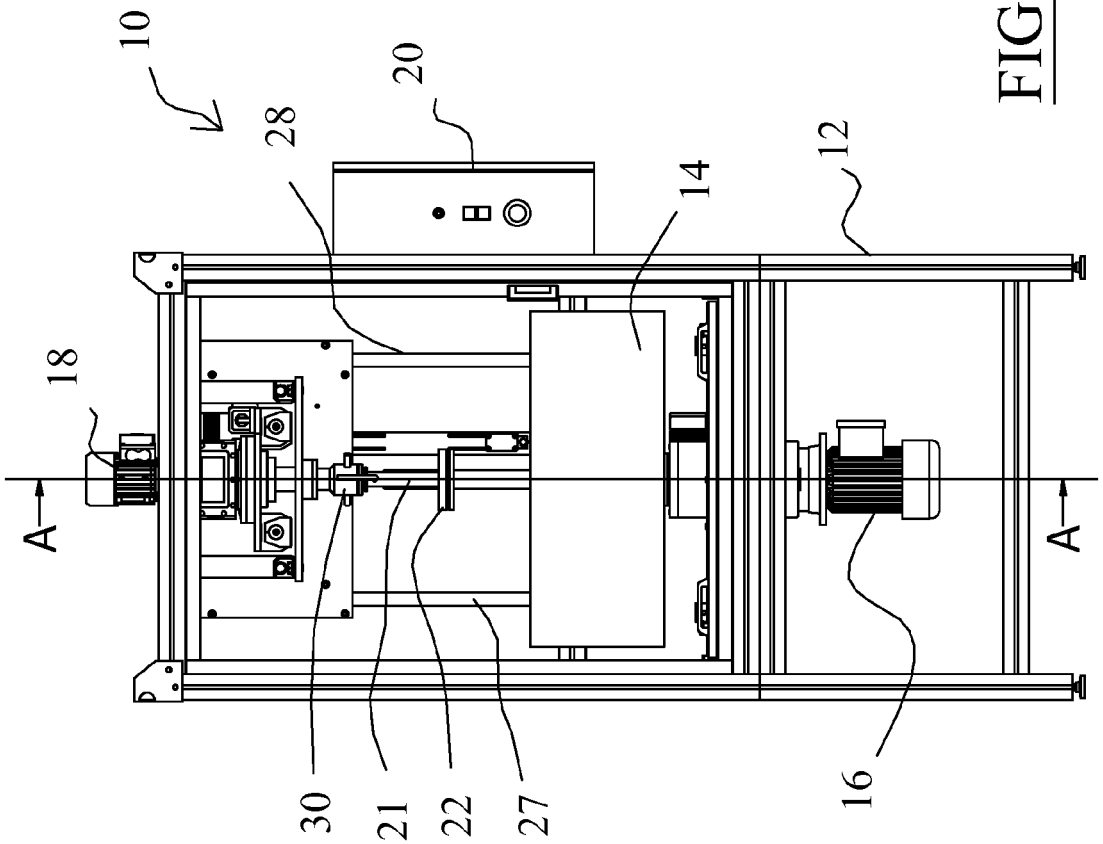
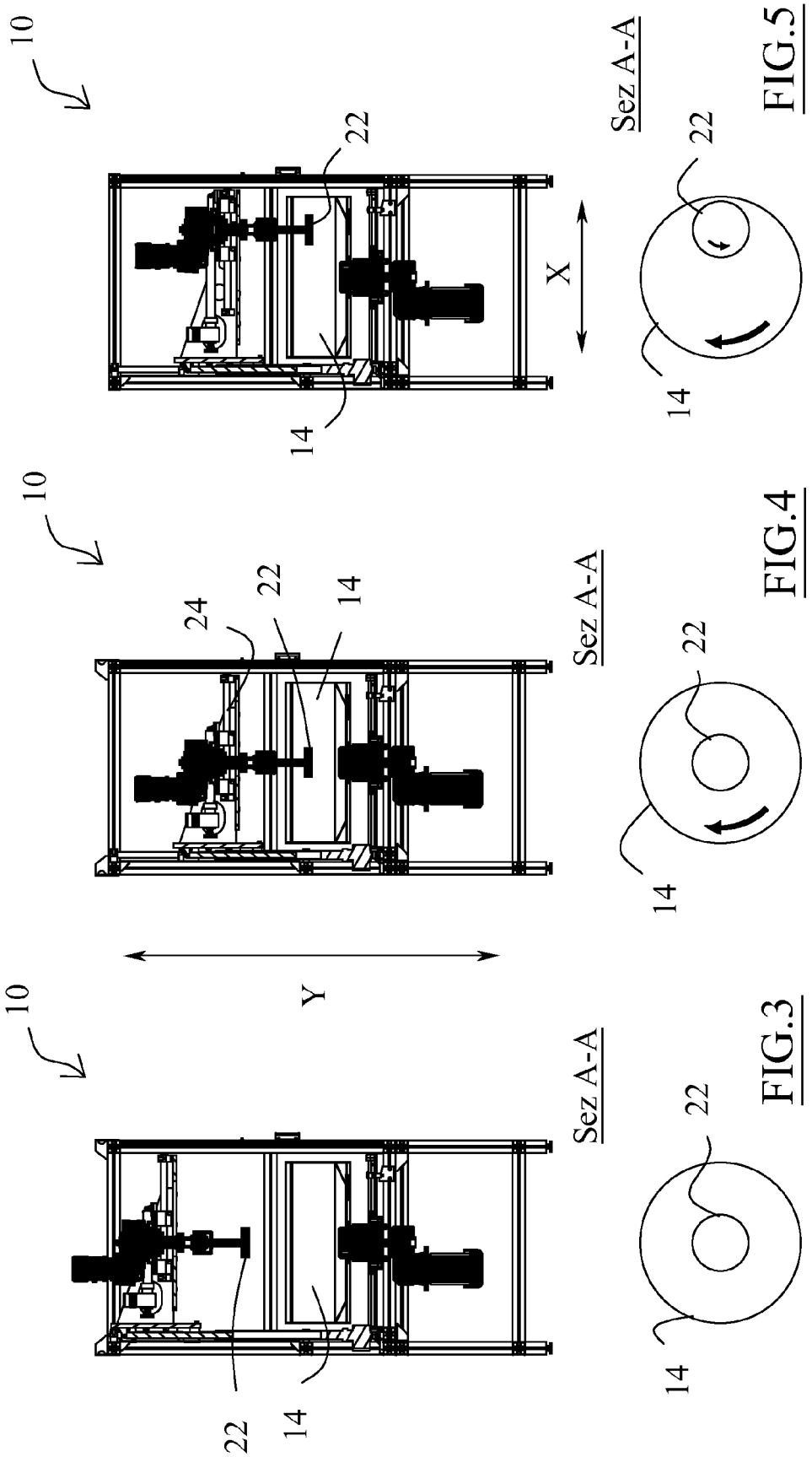


FIG.1


10
22
14
X
Sez A-A
22
14
FIG.5
10
24
22
14
Sez A-A
22
14
FIG.4
Y
10
22
14
Sez A-A
22
14
FIG.3

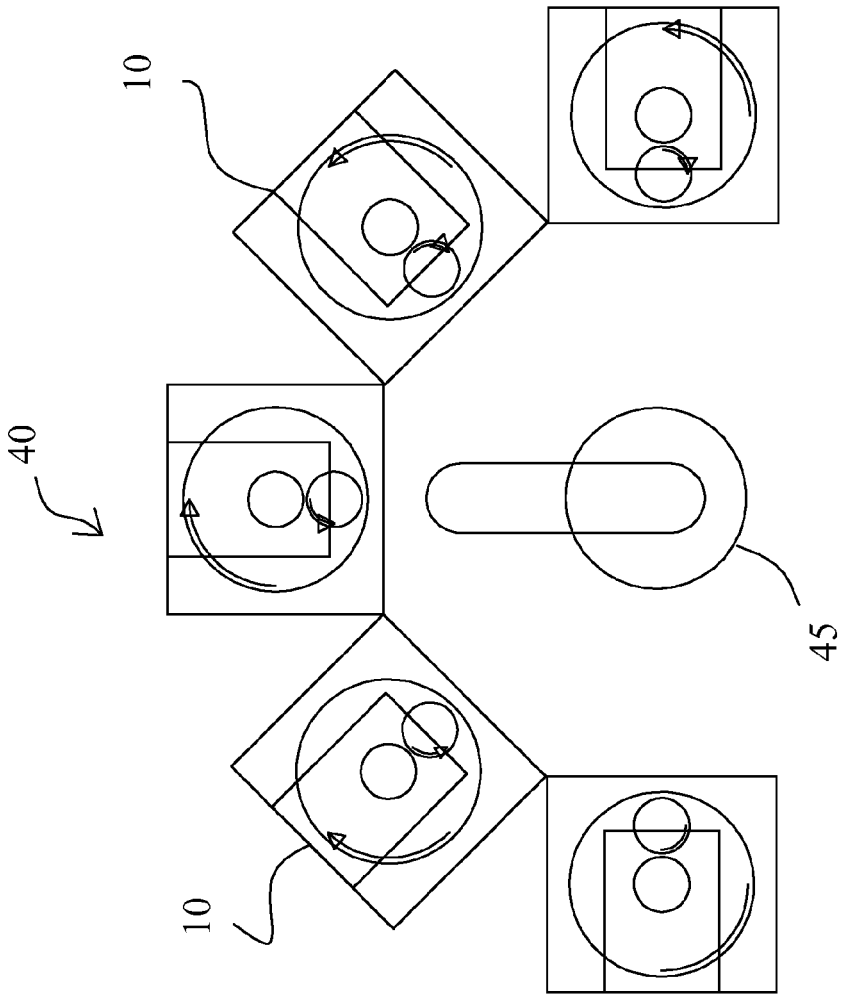


FIG.7

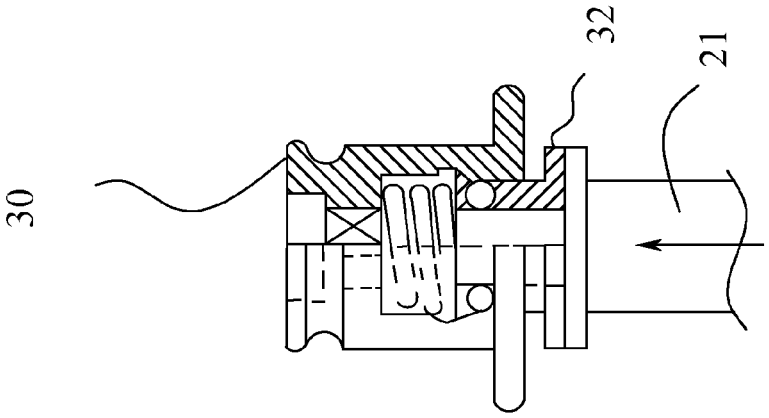


FIG.6

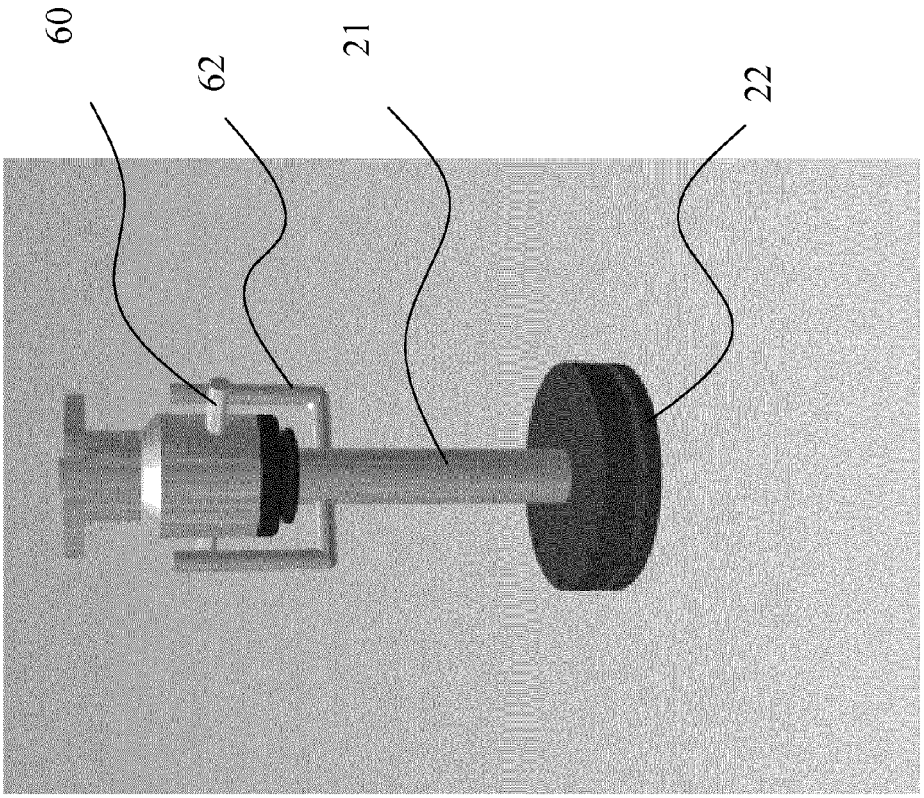


FIG.9

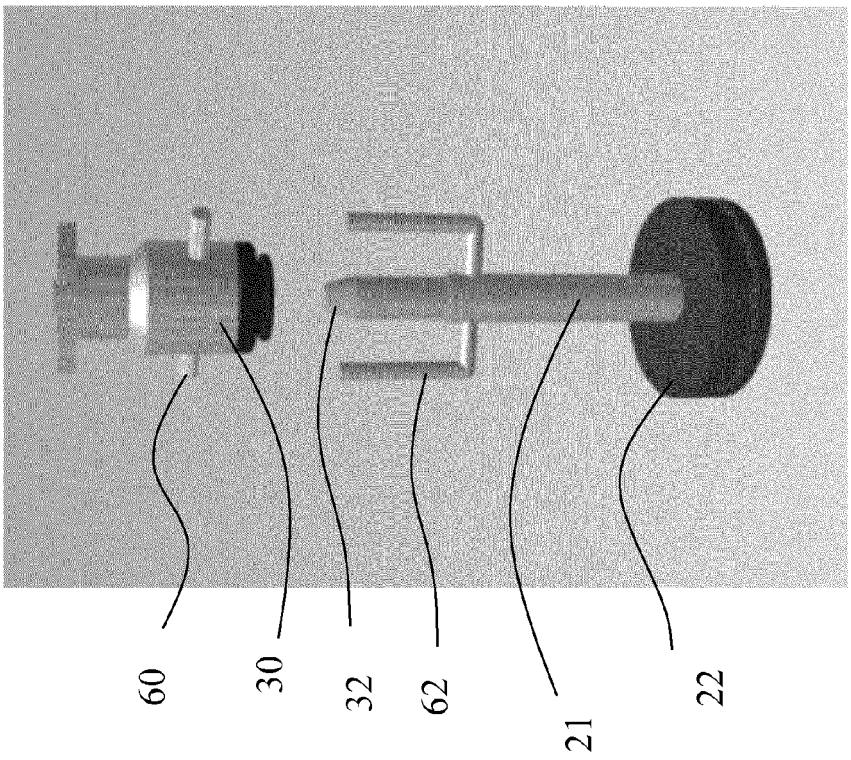


FIG.8

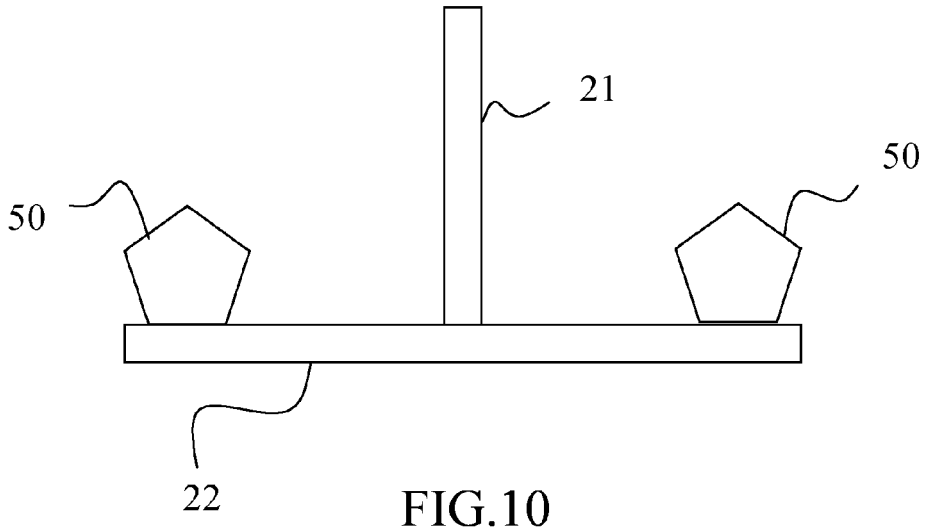


FIG.10

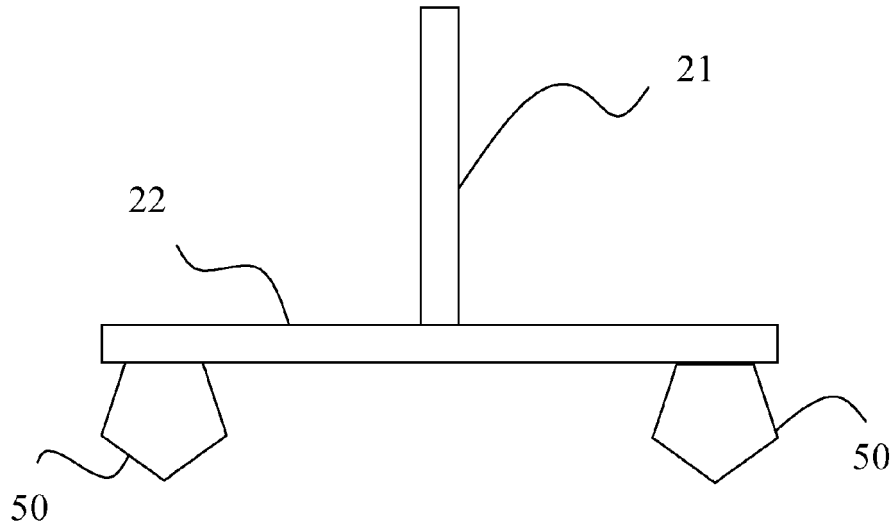


FIG.11

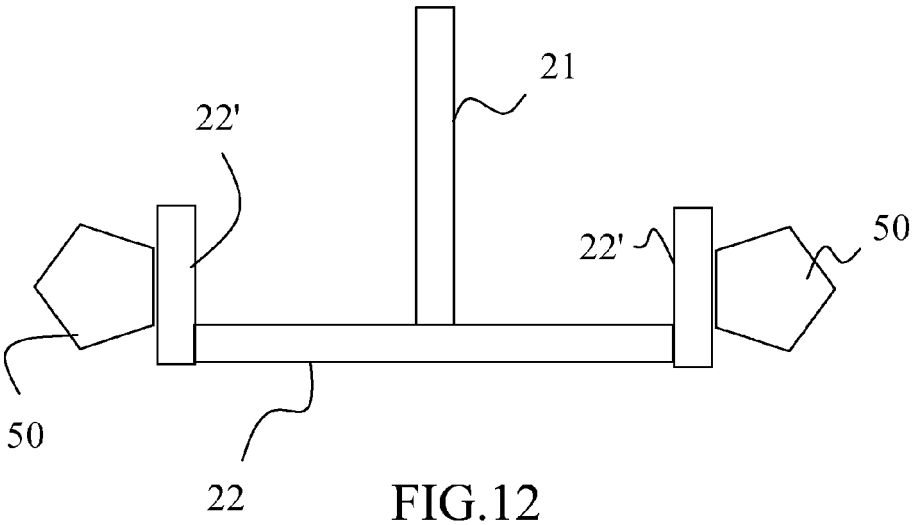


FIG.12

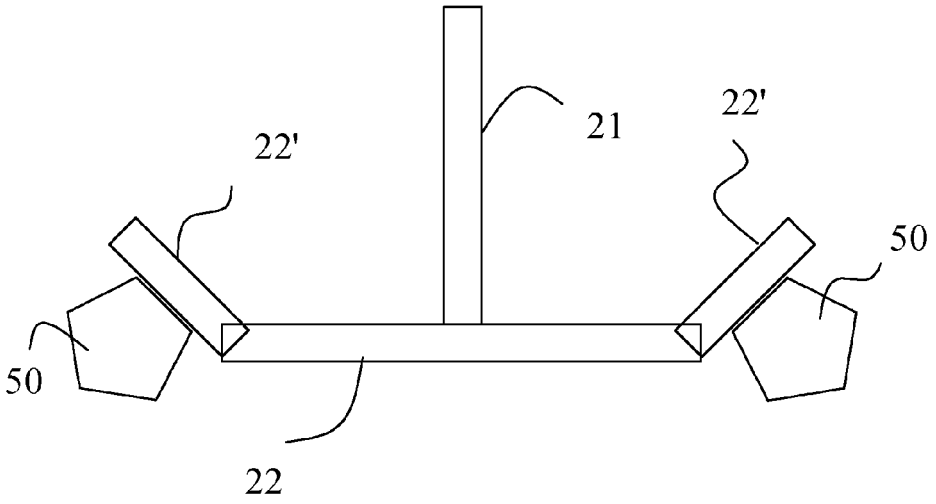


FIG13

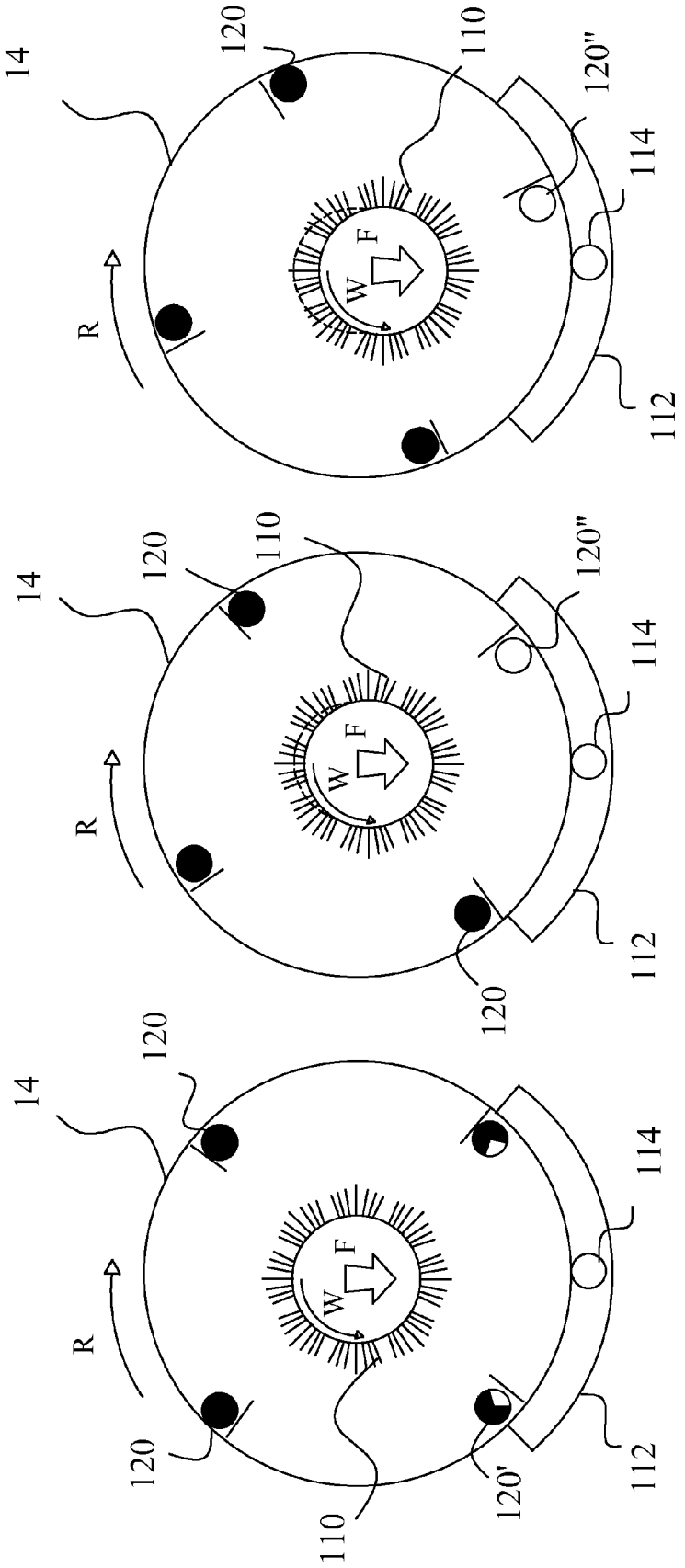


FIG16

FIG15

FIG14

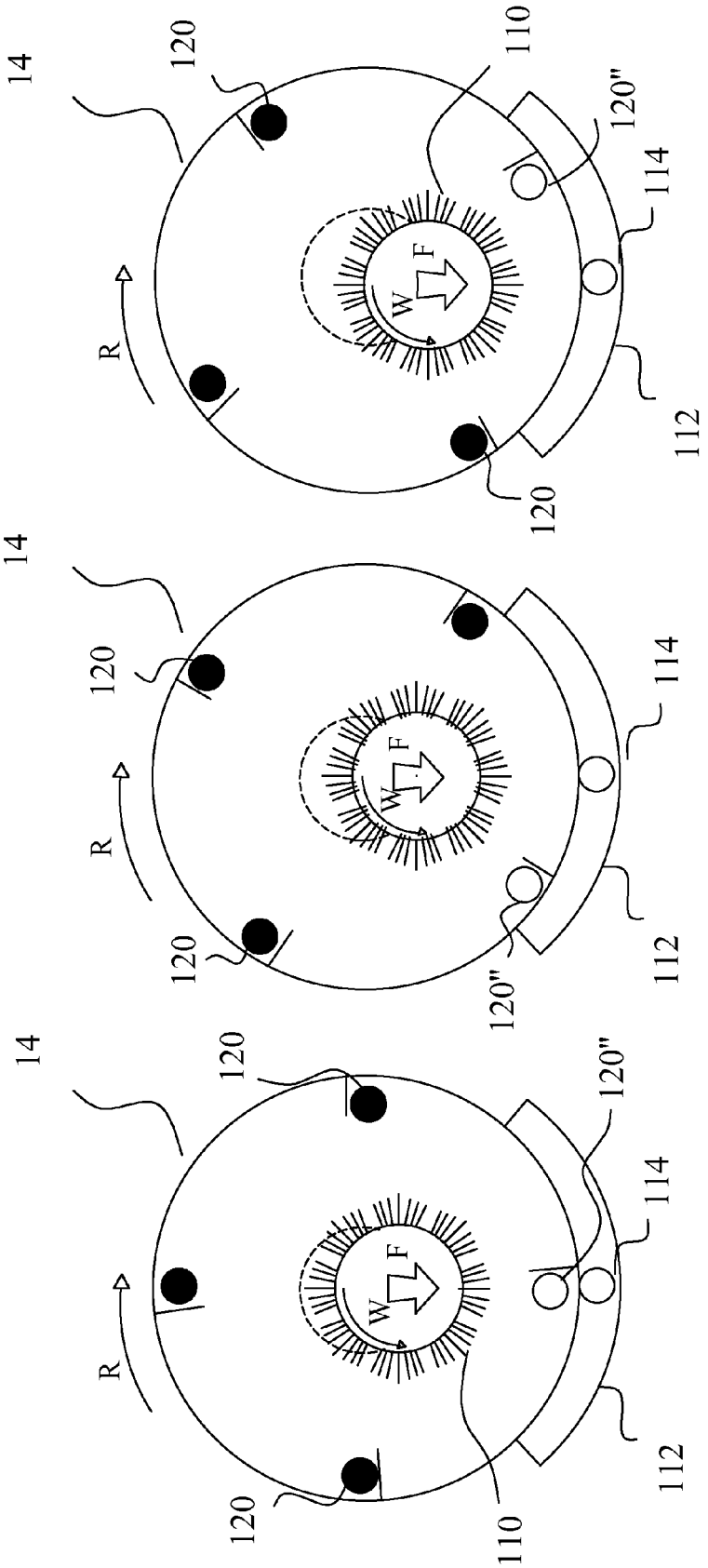


FIG19

FIG18

FIG17

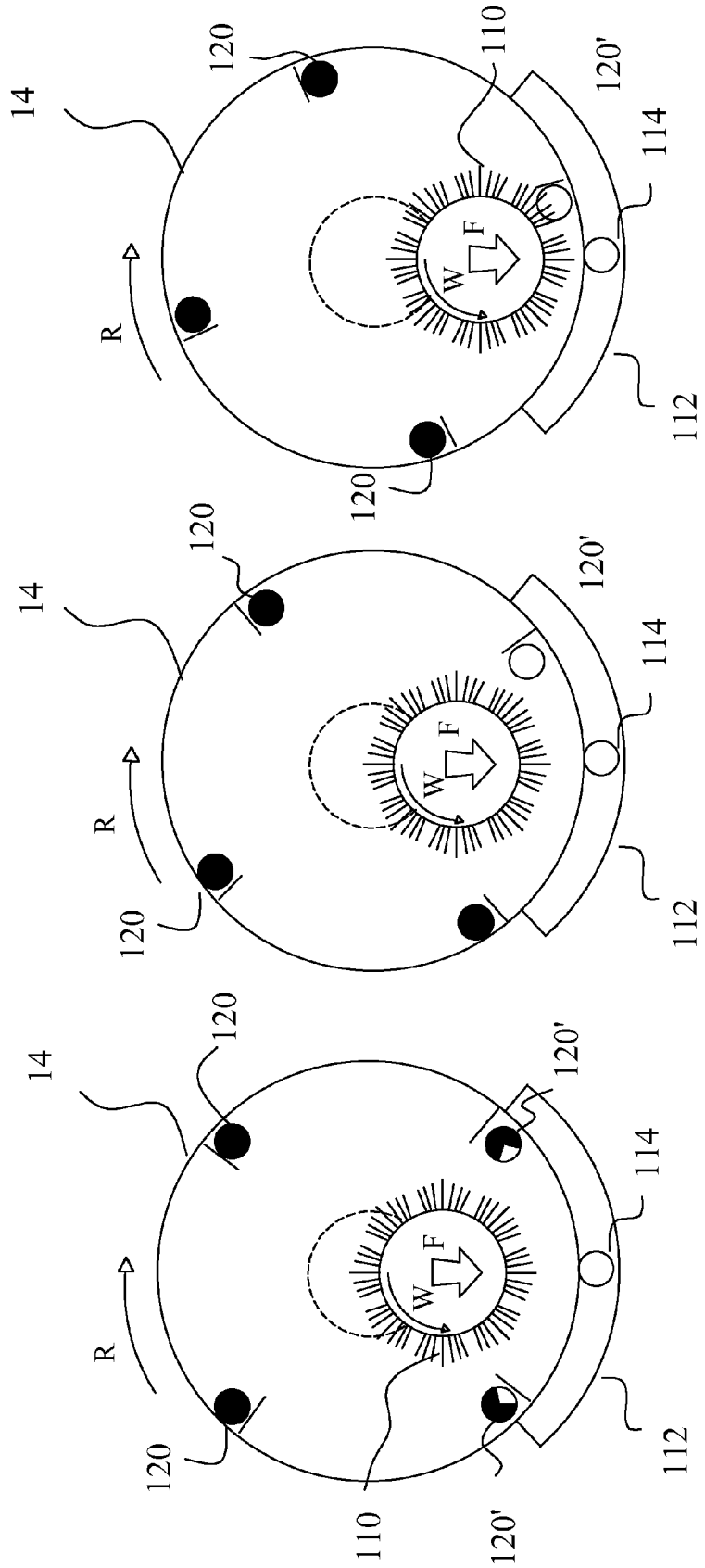


FIG 22

FIG 21

FIG 20

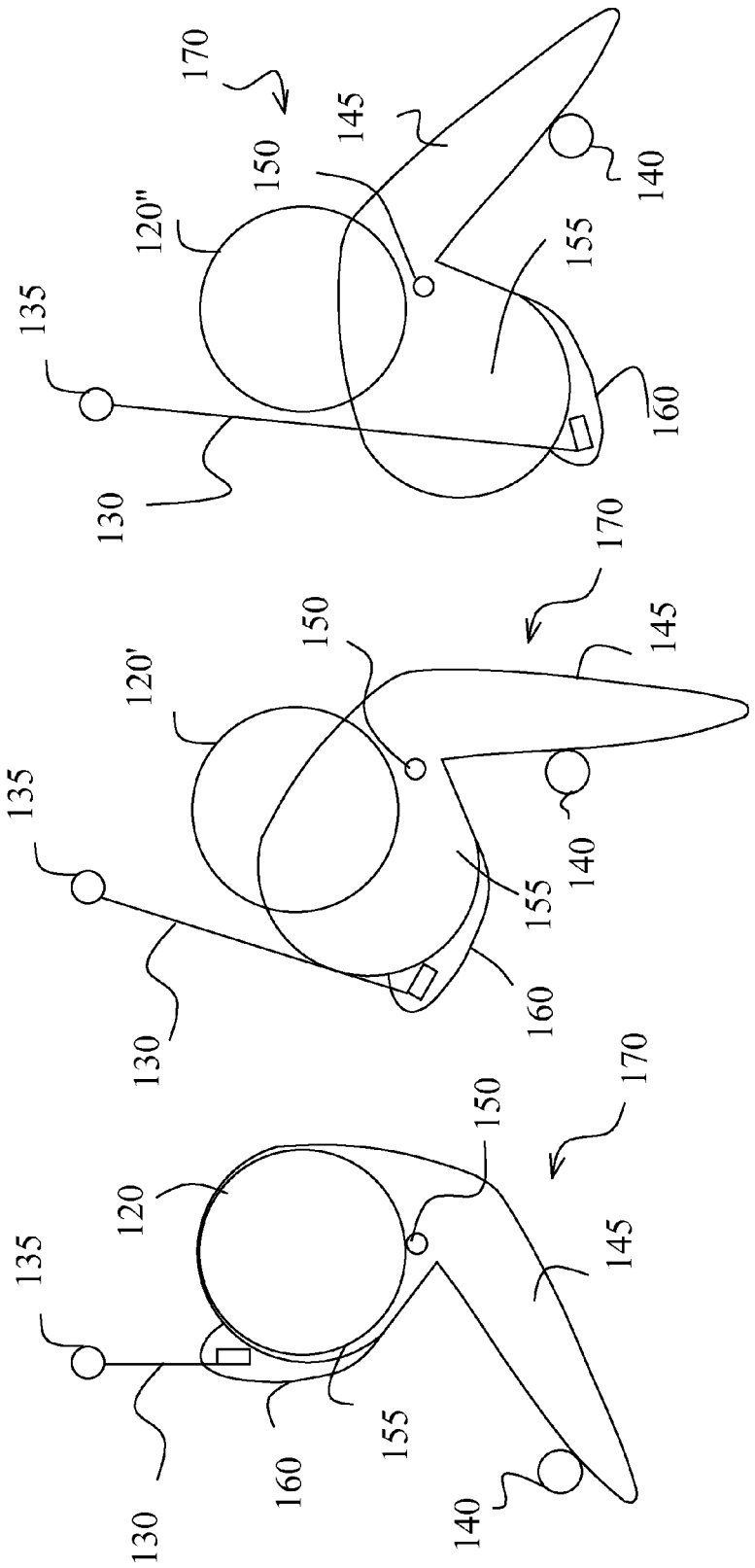


FIG 23

FIG 24

FIG 25

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 18 5788

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 Y	EP 0 073 536 A2 (METALLGESELLSCHAFT AG [DE]; CETEMA BV [NL]; PARKER STE CONTINENTALE [F) 9 March 1983 (1983-03-09) * page 1, paragraph 1 * * page 5, paragraphs 2,3 * * page 9, paragraph 2 * * page 10, paragraph 2 * * figures 1-4 *	1,9 2-8,10	INV. B24B31/00 B24B31/02 B24B31/12 B24B41/06
Y	IT MI20 110 851 A1 (REDAELLI PAOLO) 17 November 2012 (2012-11-17) * figures 1-3 *	2,5,7	
Y	JP S50 31594 U (NOT KNOWN) 7 April 1975 (1975-04-07) * figures 1-5 *	3-5,7	
Y	US 6 406 356 B1 (BROOKS FREDERICK E [US]) 18 June 2002 (2002-06-18) * sentences 6-12; figures 1,4,9A-C,10A-C *	5,6	
Y	JP S60 143645 U (NOT KNOWN) 24 September 1985 (1985-09-24) * figures 2,3 *	5,6	TECHNICAL FIELDS SEARCHED (IPC) B24B
Y	DE 20 2011 108951 U1 (OTEC PRAEZ SFINISH GMBH [DE]) 14 December 2012 (2012-12-14) * paragraph [0001]; figures 1,2 *	5,7,10	
Y	CH 607 757 A5 (OHNO IETATSU [JP]) 31 October 1978 (1978-10-31) * claim 1; figures 1,3 *	5,7,10	
Y	DE 195 10 900 A1 (WMF WUERTTEMBERG METALLWAREN [DE]) 2 October 1996 (1996-10-02) * abstract; figure 1 *	8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 December 2014	Endres, Mirja

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 14 18 5788

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.

18-12-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0073536 A2	09-03-1983	EP 0073536 A2	09-03-1983
		FR 2511919 A1	04-03-1983
		JP S5840262 A	09-03-1983
IT MI20110851 A1	17-11-2012	----------	
JP S5031594 U	07-04-1975	JP S541659 Y2	24-01-1979
		JP S5031594 U	07-04-1975
US 6406356 B1	18-06-2002	NONE	
JP S60143645 U	24-09-1985	JP H0141563 Y2	07-12-1989
		JP S60143645 U	24-09-1985
DE 202011108951 U1	14-12-2012	CN 203266373 U	06-11-2013
		DE 202011108951 U1	14-12-2012
		DE 202012011789 U1	15-01-2013
		IT MI20120433 U1	14-06-2013
CH 607757 A5	31-10-1978	NONE	
DE 19510900 A1	02-10-1996	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0073536 A **[0014]**