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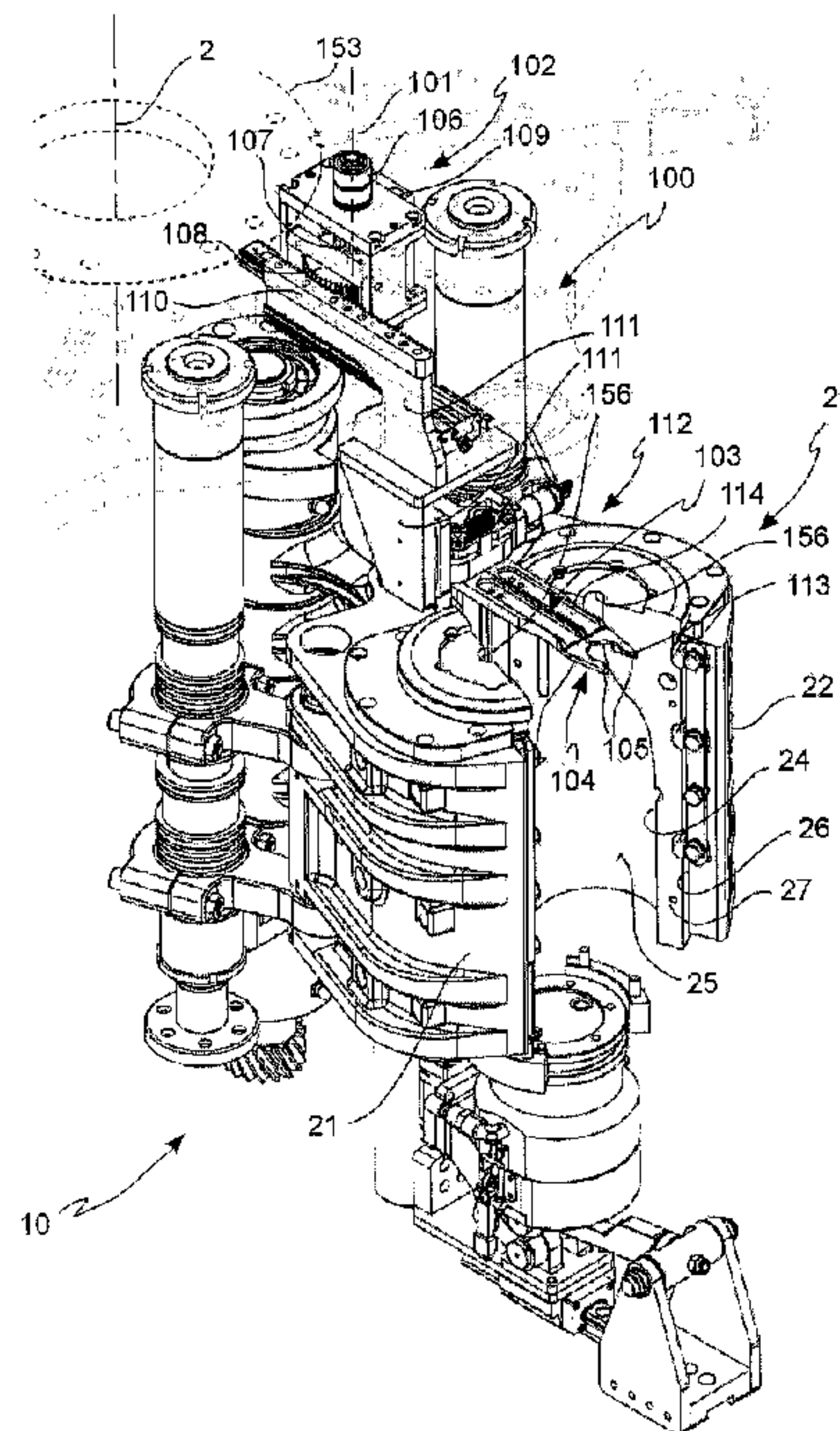
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(57) **Abrégé/Abstract:**

The invention relates to a handling system (100) of objects (133) between a transferring star (130) and a rotary machine (1) comprising a plurality of processing units (10), wherein said transferring star (130) comprises along its perimeter (136) a plurality of seats (134) for housing said objects, said processing units (10) being spaced apart by a first pitch (150) along a first circumference (155) and said seats (134) being spaced apart by a second pitch (131) along a second circumference (136), wherein said second pitch (131) is different from said first pitch (150) and wherein said circumferences (155, 136) are not tangent, said handling system (100) comprising a gripping unit (112) for each processing unit (10), said gripping unit (112) comprising a gripping nipper (103) suitable for gripping said object (133); means of moving (102, 202) said gripping nipper (103) suitable for alternatively moving said nipper (103) between a first radial position, at the processing unit (10) and a second radial position at a seat (134) of the transferring star (130).



SYSTEM FOR HANDLING OBJECTS IN ROTARY MACHINES

Abstract

The invention relates to a handling system (100) of objects (133) between a transferring star (130) and a rotary machine (1) comprising a plurality of processing units (10), wherein said transferring star (130) comprises along its perimeter (136) a plurality of seats (134) for housing said objects, said processing units (10) being spaced apart by a first pitch (150) along a first circumference (155) and said seats (134) being spaced apart by a second pitch (131) along a second circumference (136), wherein said second pitch (131) is different from said first pitch (150) and wherein said circumferences (155, 136) are not tangent, said handling system (100) comprising a gripping unit (112) for each processing unit (10), said gripping unit (112) comprising a gripping nipper (103) suitable for gripping said object (133); means of moving (102, 202) said gripping nipper (103) suitable for alternatively moving said nipper (103) between a first radial position, at the processing unit (10) and a second radial position at a seat (134) of the transferring star (130).

[FIGURE 5]

SYSTEM FOR HANDLING OBJECTS IN ROTARY MACHINES

Description

The present invention relates to a system for handling objects in rotary machines, in particular it relates to a system for handling preforms in blowing machines, able to pick up a pre-heated preform from a pick-up position of the preform, take it to a stretch-blow moulding position in the blowing machine, in which the preform is blown to obtain a bottle, picking up the bottle thus obtained from the stretch-blow moulding position and transferring it to an unloading position of the bottle.

The invention also relates to a stretch-blow moulding machine having at least one such automatic handling system. The invention relates, in addition, to a stretch-blow moulding system comprising at least one stretch-blow moulding machine having at least one such automatic handling system.

In production of bottles made of polymer material a method is known for making plastic bottles starting from a preform in plastic or polymer material comprising a pre-heating step of the preform at a predefined process temperature, a transfer step of the

preheated preform to a mould and insertion therein, and
a blowing step inside the preform positioned in the
mould in a closed position, of air at a predetermined
pressure so that the preform is inflated inside a
5 cavity made in the mould, shaped like the bottle to be
obtained, until the preform, inflated by said
pressurised air, adheres to the walls of the cavity,
cooling upon contact and stiffening, thereby acquiring
the definitive shape of the bottle to be obtained. As
10 well as the blowing step described, there may also be a
step of stretching the preform when softened, suitable
for elongating or mechanically extending the preform
being prepared and simultaneously with the blowing.
Such combined method is called stretch-blowing.

15 The above method is performed by automatic
machines which, to ensure a greatly reduced unit cost,
must implement a very high hourly production rate.

To maximise efficiency, the preforms need to be
moved at high speed along a circuit between the output
20 of a preheating furnace and the mould, passing through
one or more movement devices comprising the aforesaid

feed device suitable for positioning one preform at a time in the mould.

Such circuit is generally formed of straight and curved sections having different curvatures and therefore speed variations of modulus and direction at the point of changes in direction, thereby causing damaging accelerations for the preheated preform.

The problem of acceleration is particularly felt in the passage of the preform from the feed device to the mould on account of the oscillatory movements which are triggered on the preheated, therefore softened preform, as a result of the aforesaid acceleration.

To better describe the aforesaid drawback of the prior art, the preform and its behaviour along the aforesaid circuit must be described in more detail.

The preform has generally an elongated tubular shape having a first open end having a mouth and a second opposite closed end. The preform is transported hanging vertically, gripped at the mouth.

In the pre-heating furnace the preform is brought to the softening point, so as to be subsequently inflated inside the cavity in the mould.

It is evident that the preform, in the above conditions, being softened, reacts to the accelerations it is subjected to by gently swinging like a pendulum and deforming in relation to its mouth. The oscillation
5 caused by an acceleration can be summed to a previous acceleration not yet damped producing an uncontrolled oscillation movement of the preheated preform. Such uncontrolled movement of the preform may persist even when the preform is inserted in the mould, with the
10 risk of brushing against the mould in some points before the stretch-blowing step cooling and solidifying irregularly in that point and thereby giving rise to a bottle or container with moulding defects.

Returning to the known stretch-blowing systems, a
15 widely used method is to use a stretch-blowing machine of the type rotating around to a vertical axis. Such machine generally comprises a plurality of moulds positioned radially in relation to the axis of the machine and provided with opening/closing means of the
20 moulds, operable in a manner synchronised with the corresponding movement devices of the preform.

Sometimes such movement devices comprise a transferring star. A transferring star is taken to mean for example a support having a plurality of seats for receiving a preform positioned spaced tangentially
5 around a rotation axis, in particular along a circumference with its centre in the rotation axis. Such transferring star is suitable for sequentially supplying the preforms to the mould of the blowing machine.

10 In the conventional machines, in the passage from the transferring star to the mould of the rotary machine, the preform may be subject to brusque speed variations back and forth, and thus an acceleration, with the drawbacks mentioned above.

15 The acceleration to which the preform is subjected is formed by a tangential component along the direction of advancement and a radial component orthogonal thereto.

While the known systems are generally able to keep
20 the radial component of the acceleration at a low value, the value of the tangential component has often an high value, to the order of hundreds of m/s^2 .

The need is therefore felt to provide a handling system of a preform able to pick it up from a feed device and rapidly transfer it to a stretch-blow moulding position by movements entailing reduced
5 acceleration values, in particular of the tangential acceleration component, so as to prevent uncontrolled oscillatory movements of the softened preform from being triggered.

The problem addressed by the present invention is
10 to provide a system for handling objects between a transferring star and a rotary machine comprising a plurality of processing units which overcomes the drawbacks described above.

A further purpose of the present invention is to
15 make available a handling system of preforms in blowing or stretch-blowing machines able to pick up a preheated preform from a transferring star of the preform and take it to a mould of a stretch-blowing machine, which makes it possible to overcome the drawbacks described
20 above.

Such problem is solved by a handling system in rotary machines according to some embodiments of the present invention.

Further features and advantages of the present invention will be more clearly comprehensible from the description given below of some of its embodiments, made by way of a non-limiting example, with reference to the following drawings:

figures 1 to 4 schematically show a partial view from above of the functioning of a stretch-blowing machine comprising a handling system according to the invention, respectively in four different subsequent positions during a processing cycle of the machine;

figures 5 and 6 show a handling system in a perspective view together with a moulding unit of the stretch-moulding machine, respectively in a forward and in a retracted position;

figures 7 and 8 show a side view of a handling system together with a moulding unit of the stretch-moulding machine, respectively in a forward and in a retracted position;

figures 9 and 10 show a view from above of a handling system together with a moulding unit of the stretch-moulding machine, respectively in a forward and in a retracted position;

5 figure 11 shows a view from above of a handling system together with a moulding unit of the stretch-moulding machine, in which the nipper is in a retracted position lying on a first circumference of the machine;

10 figures 12 and 13 respectively show a perspective and cross-section view with a plane orthogonal to the radial direction of the machine, in a second embodiment of the movement means;

figure 14 schematically shows a view from above of equipment for making containers from preforms according to a particular aspect of the invention.

The term "blow-moulding machine" or "blowing machine" is understood to mean any type of machine having at least one mould which can be opened defining a cavity therein, in which a preform is made to expand by blowing air at a predetermined pressure inside it.

The term "stretch blow-moulding machine" or "stretching-blowing machine" is understood to mean a

blowing machine further comprising stretching means,
comprising for example an element which penetrates
inside the preform through the mouth and pushes the end
of the preform opposite the mouth from the inside
5 elongating the preform so as to prepare it for blowing
or simultaneously.

With reference to the figures, reference numeral
100 globally indicates a system according to the
invention, for handling objects 133 between a
10 transferring star schematically indicated by reference
numeral 130 and a rotary machine schematically indicate
by reference numeral 1.

The rotary machine comprises, for example, a
plurality of processing units 10, and the transferring
15 star 130 comprises along its perimeter 136 a plurality
of seats 134, 134' to house said objects 133.

Said processing units 10, 10', 10'', are spaced
apart at a first pitch 150 along a first circumference
155 and the seats 134, 134' are spaced apart at a
20 second pitch 131 along a second circumference 136,
wherein the second pitch 131 is different from the

first pitch 150 and wherein the circumferences 155 and 136 are not tangent.

The aforesaid handling system 100 comprises a gripping unit 112 for each processing unit 10, and the
5 gripping unit 112 comprises a gripping nipper 103 able to grip the object 133.

Such system further comprises mean of moving 102,
202 the gripping nipper 103 suitable for alternately moving the nipper 103 between a first radial position,
10 at the processing unit 10 and a second radial position at a seat 134, 134' of the transferring star 130.

More specifically, the first radial position lies on the first circumference 155 and the second radial position lies on the second circumference 136.

15 According to one embodiment, the aforesaid objects 133 are preforms made of polymer material for making bottle or containers 141, the aforesaid rotary machine 1 is a stretch-blowing machine for preforms and the aforesaid processing units 10 are stretch-blowing
20 moulding units.

In a possible embodiment, for example the aforesaid processing units 10 are of the type shown in

United States Patent No. 8,905,750. However, other embodiments of the moulding unit for stretch-blowing machines may also be used.

The aforesaid rotary machine 1 may alternatively,
5 be a blowing machine for preforms in the cases in which the moulding does not provide for the preventive or simultaneous stretching of the preform with the blowing.

According to one embodiment said movement means
10 102, 202 of the gripping nipper 103 are configured to make the nipper translate in a radial direction in relation to the rotation axis 2 of the rotary machine 1 alternately between an extended position lying on said second circumference 136 and a retracted position lying
15 on said first circumference 155.

According to one embodiment said movement means
102, 202 of the gripping nipper 103 are configured to make the nipper 103 translate in a radial direction in relation to the rotation axis 2 of the rotary machine 1
20 alternately between an extended position lying on said second circumference 136 and a retracted uncoupled position lying on an uncoupling circumference 159

concentric with said first circumference 155 and having a radius R_3 less than the radius R_2 of said first circumference 155.

In one embodiment said movement means 102, 202 of the gripping nipper 103 act contemporarily with the rotation of the rotary machine 1, conducting the gripping nipper 103 along a curved section 161 of trajectory tangent to said first circumference 155 in a first point of tangency 162 and tangent to said second circumference 136 in a second point of tangency 163.

In one embodiment said movement means 102, 202 of the gripping nipper 103 act contemporarily with the rotation of the rotary machine, conducting the gripping nipper 103 along a curved section 161 of trajectory having its centre of curvature on the rotation axis 2 of the rotary machine and having a radius varying from a first value corresponding to the radius of the first circumference 155 and a second value corresponding to the radius of the second circumference 136.

According to one embodiment said variable radius varies in a linear manner in relation to time.

According to one embodiment the trajectory of the nipper 103 between the second point 163 and the first point 162 is such that the tangential acceleration of the nipper 103 is negligible.

5 According to one embodiment said movement means 102, 202 of the gripping nipper 103 act contemporarily with the rotation of the rotary machine, conducting the nipper 103 along a predefined trajectory 161 between a point 163 lying on said second circumference 136 and a
10 point 162 lying on said first circumference 155, wherein at least in said points on said first and second circumference 155, 136 the tangential acceleration of the nipper 103 is negligible.

In other words, the combination of the rotation
15 movement of the nipper 103 around the rotation axis 2 of the machine 1 and the translation movement of the nipper 103 in a radial direction in relation to the rotation axis 2 of the machine, produces a resulting movement of the nipper 103 between the second
20 circumference 136 of the transferring star and the first circumference 155 of the machine, wherein such movement is homokinetic.

This produces the advantage that the preform has reduced values of accelerations along its path between the transferring star 130 and the rotary machine 1, thereby preventing the triggering of dangerous
5 uncontrolled oscillatory movements of the preform which would risk making the heated preform come into contact with the inner walls of the cold mould before blowing, leading to a moulding defect.

In one embodiment, said movement means 102
10 comprise a gear transmission configured to transmit a first alternate shift in a radial direction of a motion input element 106 into a second alternate shift in a radial direction of an output element 111 to which the gripping nipper 103 is attached, wherein the second
15 alternate shift is greater than the first alternate shift.

According to one embodiment the gear transmission comprises:

- a ratchet having a rotation axis 101, a first
20 wheel 107 and a second wheel 108 of greater diameter, said first wheel 107 and said second wheel 108 being coaxial and integral with each other and with the

rotation axis 101 of the ratchet, said ratchet ending with said motion input element 106;

- a first rack 109 fixed in relation to the machine, said first wheel 107 meshing with said fixed
5 rack 109 so that a radial translation of the input element 106 corresponds to a rotation of the ratchet;

- a second rack 110 sliding in a radial direction in relation to the machine, said second wheel 108 meshing with said sliding rack 110, so that a rotation
10 of the second wheel 108 corresponds to a translation of said second rack 110; said second rack being rigidly connected to the output element 111.

According to one embodiment of the invention, the second shift is a multiple of the first shift according
15 to a transmission ratio of 1.5 to 3, for example substantially equal to 2.5.

According to one embodiment the first wheel 107 and the second wheel 108 are wheels externally toothed, and said first rack 109 and said second rack 110 are
20 toothed racks with a linear extension.

According to one embodiment the first rack 109 and the second rack 110 are positioned substantially

parallel on opposite sides of the axis 101 of the ratchet and in a radial direction in relation the machine.

According to one embodiment the first wheel 107
5 and the second wheel 108 are positioned at different heights along the axis 101 of the ratchet.

According to one embodiment, the output element 111 has a first end rigidly connected to said second rack 110 and a second end rigidly connected to said
10 gripping nipper 103, said output element being configured to keep the gripping nipper 103 substantially parallel to the second rack 110, in particular at a lesser height than the height of the second rack 110.

15 According to one embodiment the output element 111 comprises at least one plate positioned along a substantially vertical plane.

According to one embodiment the input element 106 is a cam follower for a shaped cam, suitable for being
20 alternately translated in a radial direction to the rotation axis of the machine, following a sliding coupling along a shaped profile 12 of said cam.

According to a second embodiment of the present invention, shown in figures 12 and 13, the movement means 202 comprise a motion transmission configured to transmit a first alternate angular shift 223 of a lever
5 element 221 connected to a motion input element 206 into a second alternate linear shift 224 in a radial direction of an output element 111 to which the gripping nipper 103 is rigidly connected.

According to such embodiment, the movement means
10 202 comprises a toothed wheel 208 carried in rotation by said lever element 221 around a rotation axis 201, said wheel meshing with a second rack 210, integral with the nipper 103, so that a rotation of the lever element 221 corresponds to a translation of the rack
15 210. The rack 210 is the same rack as that indicated by reference numeral 110 in the first embodiment shown in figures 5 to 8.

The toothed wheel 208 may be fitted on a shaft 233 connected to a fixed support 229 so as to rotate.

20 The fixed support 229 may comprise a projecting shelf element 227 having at one end an abutment roller

228 suitable for constraining the rack 210 in a meshed condition with the toothed wheel 208.

Between the lever element 221 and the toothed wheel 208 an angular speed multiplier 222 may be
5 positioned, having an input 231 rigidly connected to the lever element 221 and an output 232 rigidly connected to the toothed wheel 208, for example by means of a shaft 233.

According to one embodiment the angular speed
10 multiplier 222 is of the planetary gear type.

According to one embodiment the movement means 202 are supported by a fixed, L-shaped support bracket 240 comprising an element 225 substantially parallel to the rotation axis 201 and an element 230 substantially
15 orthogonal to such rotation axis 201.

According to one embodiment said nipper 103 comprises a coupling portion 104 comprising two pincers 105 projecting from a free end of the nipper 103, said coupling pincers 105 being positioned substantially
20 parallel to each other and defining between them a retention seat 113 suitable for receiving and snap engaging the mouth of a preform.

According to one embodiment said retention seat 113 has at least partially circular shape so as to embrace the mouth and present a front aperture to permit the coupling of the mouth in the seat 134 by means of a relative drawing together of the nipper 13 and the preform and the release of the mouth by means of the relative translation away from each other of the nipper and the preform.

According to one embodiment the pincers 105 of the nipper present at the front guide profiles inclined towards the inside of the retention seat 113, suitable for facilitating the entrance of the mouth of the preform in the seat 113.

According to one embodiment the coupling portion 104 is made of an elastic material, for example but not necessarily in harmonic steel.

According to one embodiment the coupling portion 104 is formed of a U-shaped plate having an aperture positioned in a radial direction outwards in relation to a rotation axis 2 of the rotary machine 1.

According to one embodiment said coupling portion 104 extends substantially according to a horizontal plane.

According to one embodiment said nipper 103
5 comprises an elongated connection portion 114 positioned between said movement means 102 of the gripping nipper 112 and the coupling portion 104, said elongated body extending, for example but not necessarily, in a radial direction opposite the
10 rotation axis 2 of the rotary machine 1.

According to one embodiment said elongated connection body 114 is a flat shape and extends substantially along a horizontal plane.

According to one embodiment said coupling portion
15 104 and said elongated connection body 114 extend along the same plane.

According to one embodiment each processing unit
10 comprises a mould 20 having an inner cavity 24 suitable for receiving the preheated preform and
20 permitting within it the expansion thereof by blowing inside the preform. Such cavity 24 may comprise a

moulding surface 25 having a complementary shape to that of the bottle to be obtained.

In one embodiment, the mould 20 comprises a universal seat 26 for removably housing a mould element
5 27 shaped so as to comprise said moulding surface 25.

In one embodiment, each said mould 20 comprises a first half-shell 21 and a second half-shell 22 hinged around a hinge axis 23 so that they can be opened and closed by means of a rotation opening and closing the
10 same around the hinge axis. When closed, the aforementioned half-shells 21 and 22 form between them a through seat 156 which places the cavity 24 in communication with the outside suitable for housing the mouth of the preform so that such mouth remains facing
15 outwards while the remaining portion of the preform remains inside the cavity 24, to allow the introduction of pressurised air inside the preform through the mouth, to expand the preform 133 in the inner cavity 24 until it adheres to the moulding surface 25, and
20 impress upon the preform a shape complementary to that of the moulding surface 25, complementary to that of the bottle to be obtained.

In one embodiment, the moulding units comprise means of opening and closing the moulds 20, wherein such means are synchronised with the movement means 102 of the nipper 103 so that during at least a part of the translation movement of the nipper 103, the half-shells are opened so as to permit the introduction of the preform in the moulds and the extraction of the bottle moulded by the moulds.

According to one embodiment the opening/closing means of the processing unit 10 comprise a self-locking system suitable for keeping the half-shells pressed together in a closed position during the blowing operation.

In the example of the rotary machine 1 shown in the figures, which is a blowing or stretch-blowing machine in some embodiments, the processing units 10 are attached to a rotating platform 153 which rotates around the rotation axis 2 of the machine.

The blowing or stretch-blowing machine may be coupled to a second rotating star 140 unloading the moulded bottles 141, having a plurality of seats for said bottles.

After the moulding operation, and after a rotation of the machine by a predetermined angle, the nipper 103 translates outwards to transfer the moulded bottle 141, from the inside of the mould towards the bottle seat of
5 the aforesaid second rotating star 140.

According to one possible embodiment, the processing units 10 of the machine 1 are angularly equidistant from one another.

According to one embodiment the seats 134 of the
10 transferring star 130 are angularly equidistant from one another.

According to one embodiment the seats for the bottles 141 of the second rotating star 140 are angularly equidistant from one another.

15 According to one embodiment the rotation axis 135 of the transferring star 130 is placed at a distance from the rotation axis 2 of the machine, having a value greater than the sum of the radius R_1 of the second circumference and of the radius R_2 of the first
20 circumference 155, leaving a distance D between the first circumference 155 and the second circumference 136 the value of which is chosen so as to be able to

obtain a transfer movement of the nipper 103 which is homokinetic at the pick-up point of the preform.

According to one embodiment the handling system comprises transfer means of the preheated preforms from
5 the preheating furnace 300 to the aforesaid transferring star 130 (fig.14)

The functioning of the handling system of objects between a transferring star 130 and a rotary machine 1 comprising a plurality of processing units 10, is as
10 follows.

Each preheated object 133, which is a preform in some embodiments, coming out of a preheating furnace 300 is taken to a seat for preforms of the transferring star 130, which rotates around its axis 135, for
15 example in a clockwise direction in the direction of the arrow 132.

After a rotation of the transferring star according to a predetermined angle of rotation, the preform finds itself in a point of the second
20 circumference 136 in which the nipper simultaneously advances homokinetically coupling the preform. In such point, the half-shells are open to permit the

subsequent introduction of the preform in the cavity between the half-shells (fig.1).

Starting from such point the nipper 103 begins its radial translation according to a rearward movement
5 towards the machine axis 2, simultaneously with the rotation of said machine. The section of curved trajectory 161 performed by the nipper 103 from the pick-up point 163 of the transferring star on the second circumference 136, as far as the first
10 circumference 155 (fig.2) derives from the combination of such radial translation and the rotation movement of the machine.

The passage of the preform, coupled to the nipper 103, from the star to the stretch-blowing machine takes
15 place homokinetically.

When the preform is transferred by the nipper 103 inside the corresponding processing unit 10 and the half-shells 21 and 22 are then closed, the preform begins its path along the first circumference 155 of
20 the machine during which blowing is performed, as far as a predetermined angular position on the opposite side, wherein the half shells 21 and 22 open to allow

the unloading of the moulded bottle 141. Unloading takes place by means of a radial translation of the nipper 103 towards the outside of the machine as far as encountering a corresponding seat 144 for bottles made
5 on the second rotating star 140, which rotating transfers the bottle obtained 141 towards a collection zone, or towards a subsequent bottling station for example of liquids.

A further purpose of the invention relates to
10 equipment for blowing or stretch-blowing bottles in plastic material, comprising a furnace 300 for heating and dealing with the heat profile of the preforms, a rotary machine 1, which may be a blowing or stretch-blowing machine in some embodiments, comprising a
15 plurality of processing units 10 as defined above, and movement means (which is transferring star 130, and second rotating star 140 in some embodiments) of the preforms going into and coming out of said furnace 300, wherein said furnace 300 comprises means of transport
20 308 for the preforms and means of heating 309 the preforms, and wherein said movement means, which is a transferring star 130 in some embodiments, for the

preforms coming out of the furnace 300, comprise a plurality of gripping means, which are seats 134 in some embodiments, for the preforms spaced apart at a fixed pitch, characterised in that said furnace 300
5 comprises movement and distancing means 344b of the heated preforms, from a minimum pitch to a pitch substantially corresponding to the pitch of the gripping means, which are seats 134 in some
embodiments, of the movement means, which is a
10 transferring star 130 in some embodiments, for the preforms coming out of the furnace 300.

A furnace having the aforementioned features is described in United States Patent No. 8,905,750.

This way a homokinetic transmission system of the
15 preforms is realised, from the furnace 300 to the single processing units 10 of the blowing or stretch blowing machine, minimising or substantially eliminating the accelerations to which said preforms are subject in the traditional machines.

20 In one embodiment, said movement and distancing means 344b of the heated preforms consist of an Archimedean screw or auger comprising a variable pitch

helical groove, wherein the greatest pitch is at the release end of the preforms to the movement means, which is transferring star 130 in some embodiments.

The advantages of this solution are various.

5 First of all, the handling system described makes it possible to transfer the preheated preform from the transferring star as far as inside the mould, homokinetically.

In other words, the system makes it possible to
10 transfer the preheated preform from the transferring star as far as inside the mould, avoiding subjecting the preform to jolting and brusque variations of speed upon passing from its circular trajectory along the second circumference of the transferring star to its
15 different circular trajectory along the first circumference of the blowing machine.

The system makes it possible to transfer the preheated preform from a first circumference having a first pitch to a second circumference having a second
20 pitch, in which the second pitch is different from the first pitch and wherein said circumferences are not

tangent, such that the aforesaid transfer takes place at reduced tangential acceleration.

Clearly only some particular embodiments of the present invention have been described, to which a
5 person skilled in the art may make all the modifications needed for its adaptation to specific applications while remaining within the scope of protection of the present invention.

CLAIMS

1. Handling system of objects between a transferring star and a rotary machine comprising a plurality of processing units, wherein said transferring star comprises along its perimeter a plurality of seats for housing said objects, said processing units being spaced apart by a first pitch along a first circumference and said seats being spaced apart by a second pitch along a second circumference, wherein said second pitch is different from said first pitch and wherein said circumferences are not tangent,

said handling system comprising a gripping unit for each of the processing units, wherein said gripping unit comprises:

15 a gripping nipper suitable for gripping said object; and

movement means of said gripping nipper suitable for alternatively moving said nipper between a first radial position, at the processing unit, and a second radial position at a seat of the transferring star, wherein said movement means comprise a gear transmission configured to transmit a first alternate shift in a radial direction of a motion input element into a second alternate shift in a radial direction of an output element to which the gripping nipper is attached, wherein the second alternate shift is greater than the first alternate shift.

2. Handling system according to claim 1, wherein said movement means of the gripping nipper comprise means of

translation in a radial direction of the nipper in relation to the rotation axis of the rotary machine alternately between an extended position lying on said second circumference and a retracted position lying on said first
5 circumference.

3. Handling system according to claim 1, wherein said movement means of the gripping nipper are configured to make the nipper translate in a radial direction of the gripping
10 nipper in relation to the rotation axis of the rotary machine alternately between an extended position lying on said second circumference and a retracted position lying on said first circumference.

15 4. Handling system according to claim 1, wherein said movement means of the gripping nipper are configured to make the nipper translate in a radial direction of the gripping nipper in relation to the rotation axis of the rotary machine alternately between an extended position lying on
20 said second circumference and a retracted uncoupled position lying on an uncoupling circumference concentric with said first circumference and having a radius R_3 less than the radius R_2 of said first circumference.

25 5. Handling system according to claim 2, wherein said movement means of the gripping nipper act contemporarily with the rotation of the rotary machine, conducting the gripping nipper along a curved section of trajectory having its centre of curvature on the rotation axis of the rotary
30 machine and having a radius varying from a second value

corresponding to the radius of the second circumference and a first value corresponding to the radius of the first circumference.

5 6. Handling system according to claim 4, wherein said movement means comprise a motion transmission configured to transmit a first alternate angular shift of a lever element connected to the motion input element into a second alternate linear shift in a radial direction of the output
10 element to which the gripping nipper is rigidly connected.

7. Handling system according to claim 1, wherein the gear transmission comprises:

15 a ratchet having a rotation axis, a first wheel and a second wheel of greater diameter, said first wheel and said second wheel being coaxial and integral with each other and with the ratchet, said ratchet ending with said motion input element;

20 a first rack fixed in relation to the rotary machine, said first wheel meshing with said fixed rack so that a radial translation of the input element corresponds to a rotation of the ratchet;

25 a second rack sliding in a radial direction in relation to the rotary machine, said second wheel meshing with said sliding rack, so that a rotation of the second wheel corresponds to a translation of the second rack said second rack being rigidly connected to the output element.

30 8. Handling system according to claim 1, wherein said objects are preforms in polymer material for making bottles

or containers, wherein the aforesaid rotary machine is also a stretch-blowing machine for the preforms and wherein the aforesaid processing units are stretch-blowing moulding units.

5

9. Handling system of objects according to claim 1, wherein said nipper comprises a coupling portion comprising two pincers projecting from a free end of the nipper, said coupling pincers being positioned substantially parallel to each other and defining between them a retention seat
10 suitable for receiving and snap engaging a mouth of a preform, and/or wherein said retention seat has an at least partially circular shape so as to embrace the mouth and present a front aperture to permit coupling of the mouth in
15 the seat by means of a relative drawing together of the nipper and the preform and to permit release of the mouth by means of the relative translation away from each other of the nipper and the preform.

20 10. Apparatus for blowing or stretch-blowing bottles made of plastic material, comprising a furnace for heating and dealing with a heat profile of preforms, a blowing or stretch-blowing machine comprising a handling system as defined in claim 1, said transferring star comprising
25 movement means of the preforms exiting said furnace, wherein said furnace comprises means of transport for the preforms and heating means of the preforms, and wherein said furnace comprises movement and spacing means of the heated preforms from a minimum pitch to a pitch substantially corresponding
30 to the second pitch.

11. Processing unit for a rotary machine, comprising a handling system of objects between said processing unit and a transferring star external to said processing unit, said
5 transferring star comprising along its perimeter a plurality of seats for housing said objects, said handling system comprising a gripping unit, said gripping unit being mounted on said processing unit, said gripping unit comprising:

a gripping nipper suitable for gripping said object;

10 and

movement means for alternatively moving said gripping nipper between a first radial retracted position at the processing unit and a second radial forward position at one of the seats of the transferring star, wherein said movement
15 means comprise a gear transmission configured to transmit a first alternate shift in a radial direction of a motion input element into a second alternate shift in a radial direction of an output element to which the gripping nipper is attached, wherein the second alternate shift is greater
20 than the first alternate shift.

12. A rotary machine comprising a plurality of processing units according to claim 11, wherein said processing units are spaced apart by a first pitch along a
25 first circumference, and said plurality of seats are spaced apart by a second pitch along a second circumference, wherein said second pitch is different from said first pitch, and wherein said circumferences are not tangent.

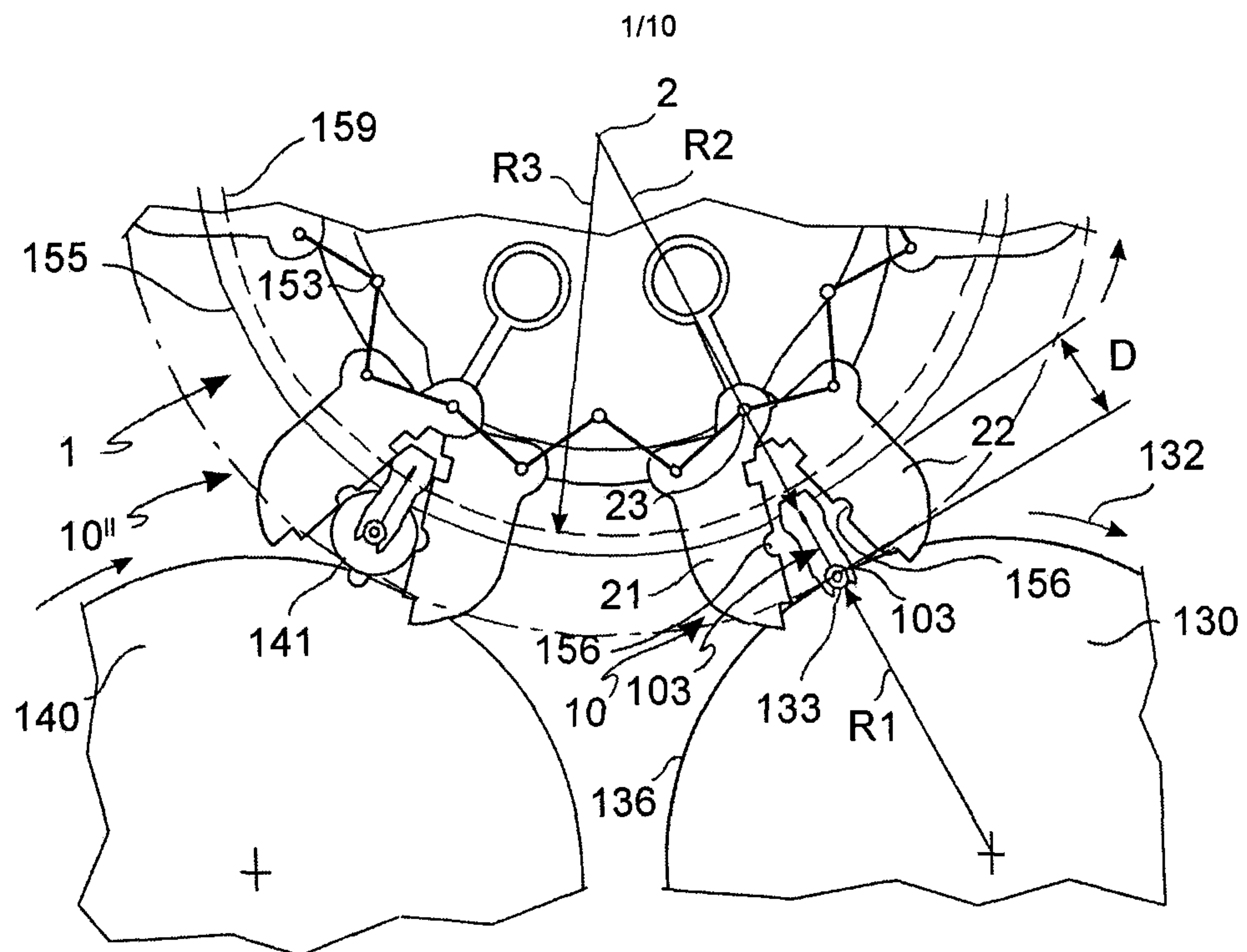


FIG. 1

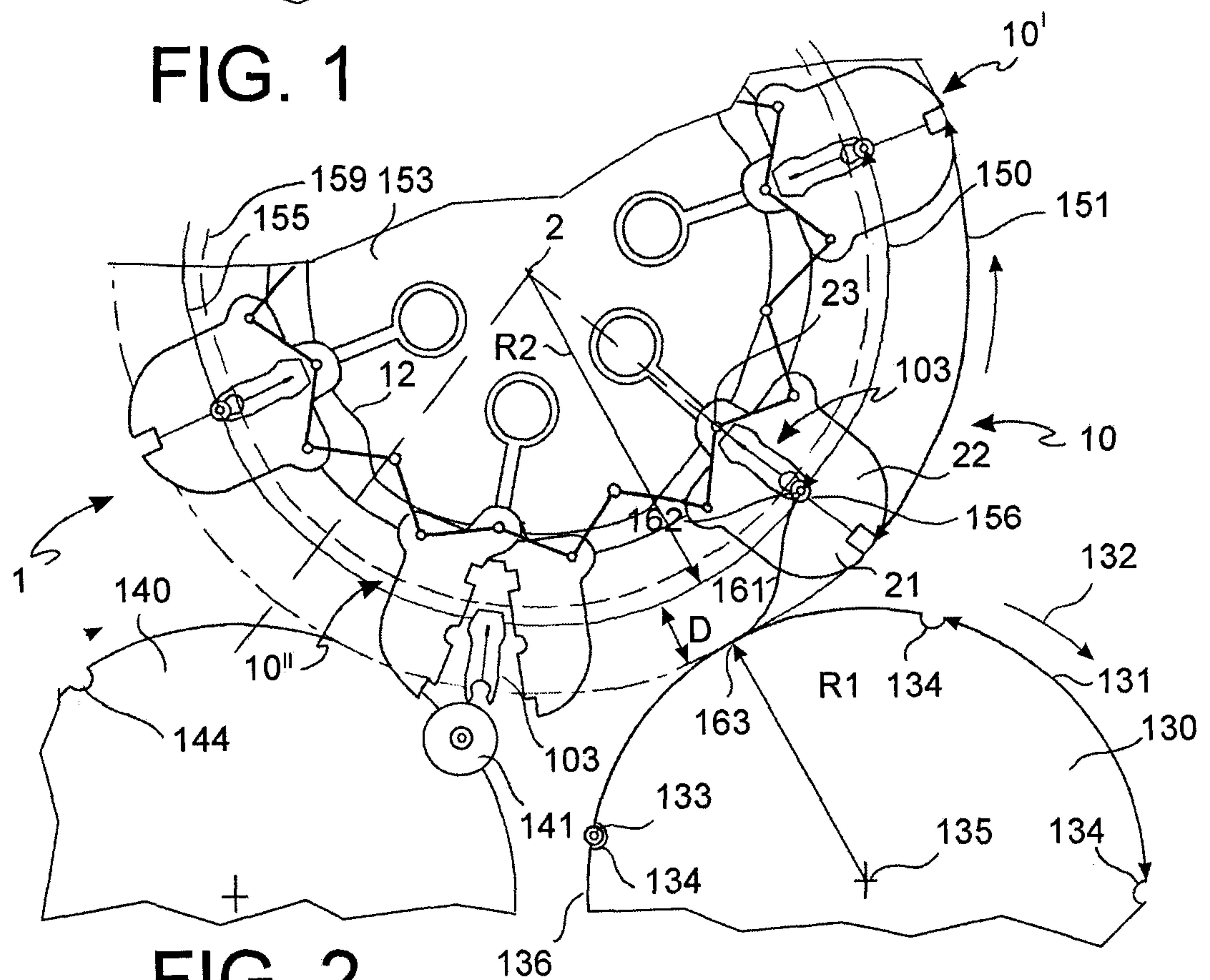


FIG. 2

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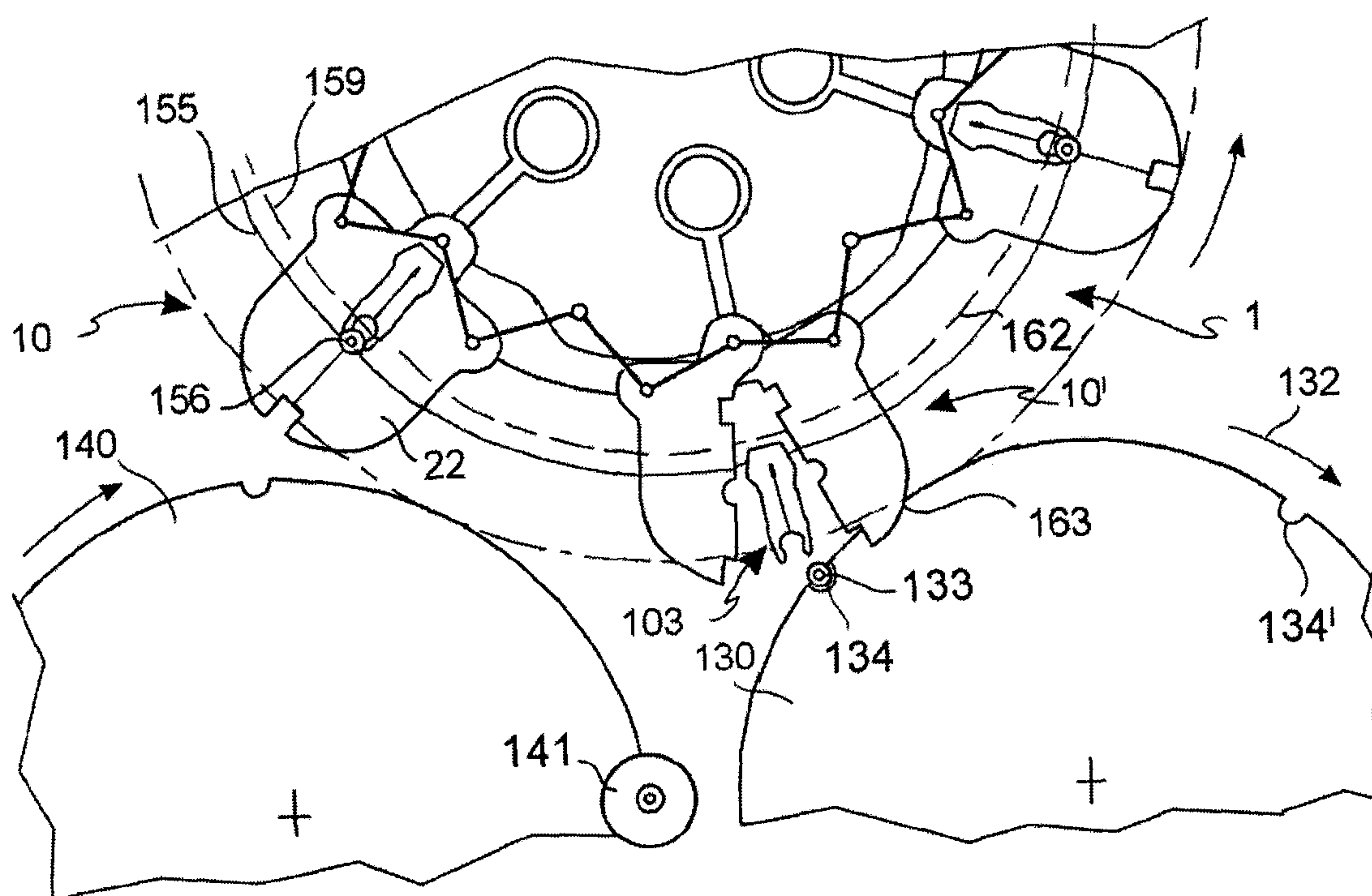


FIG. 3

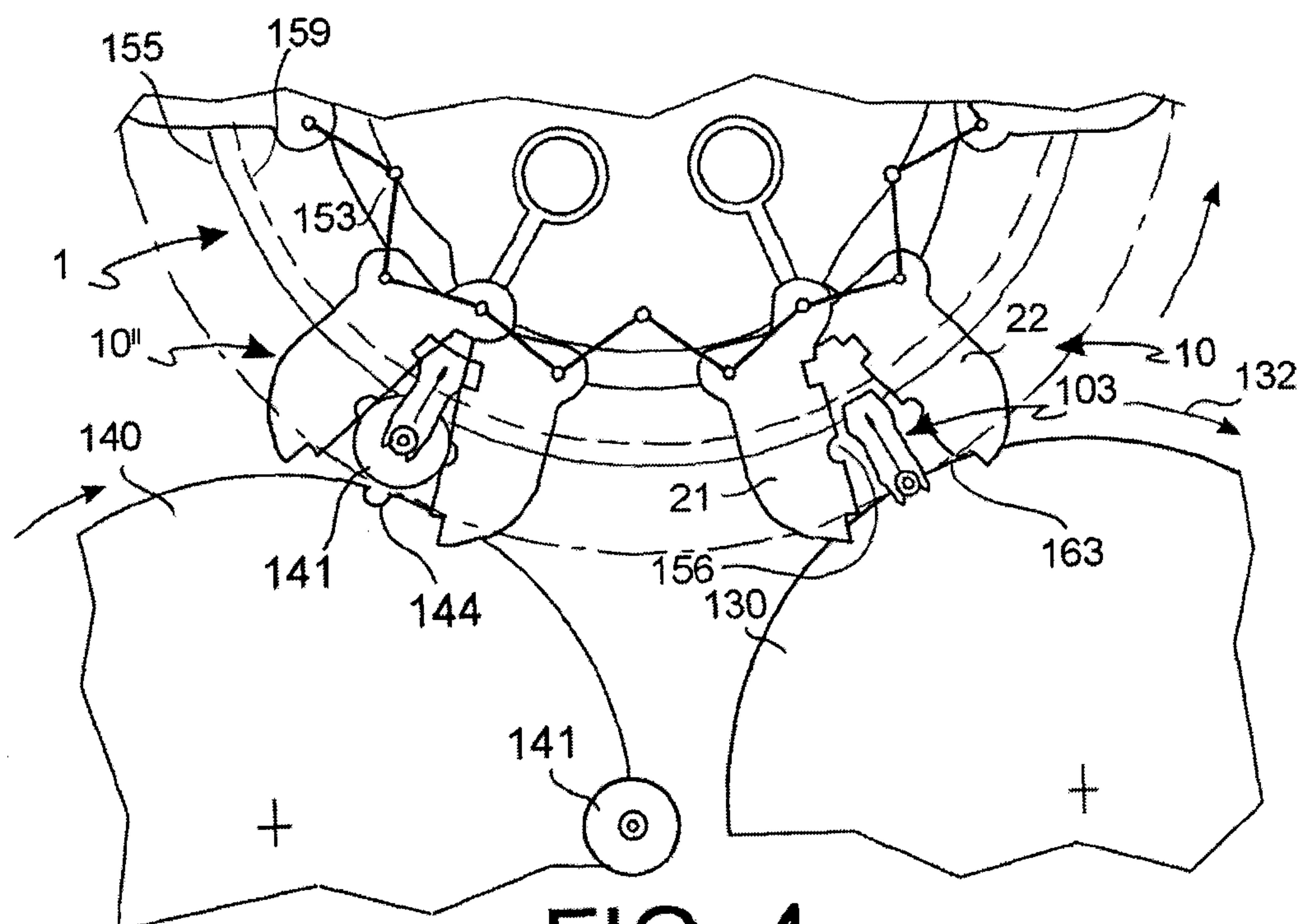
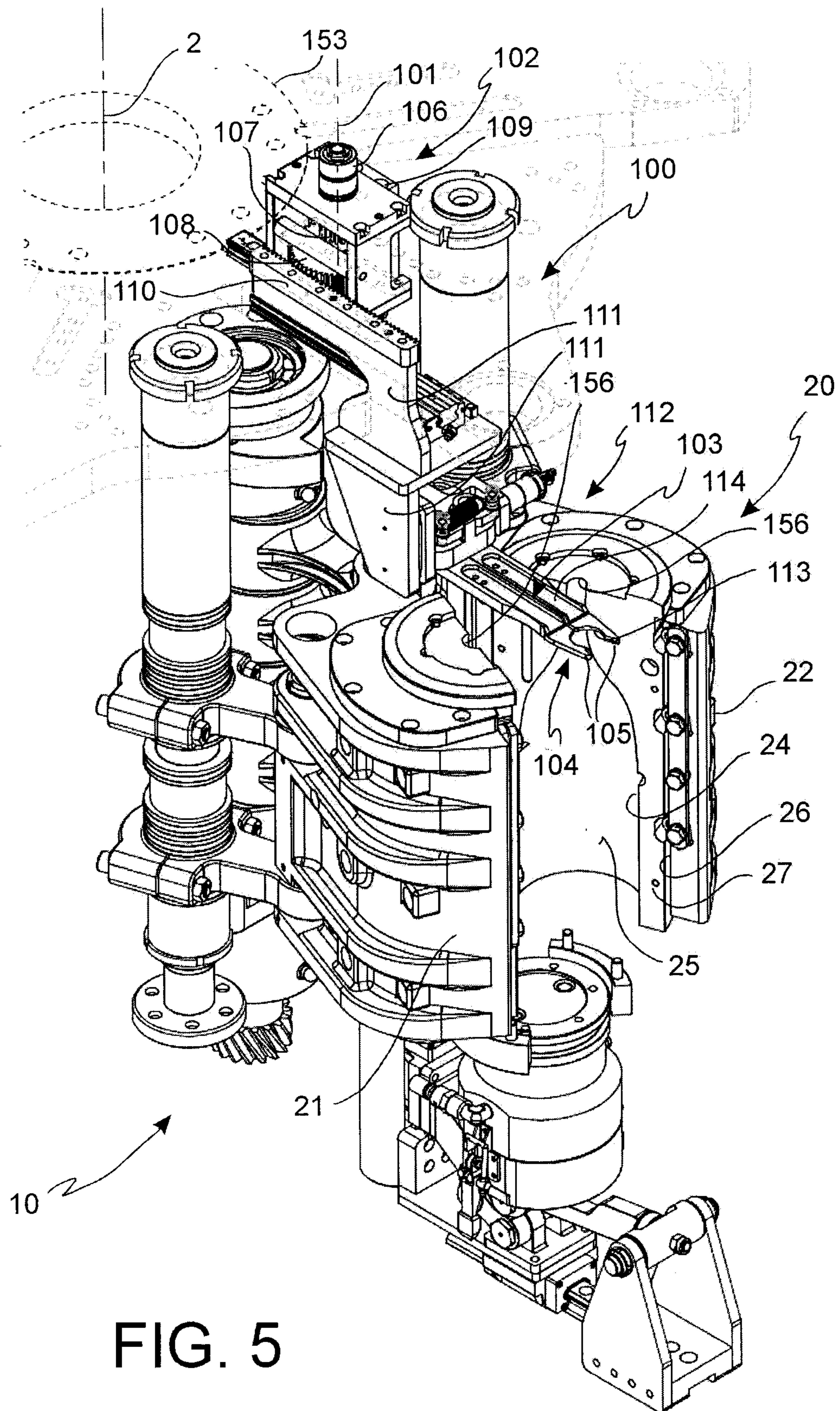


FIG. 4

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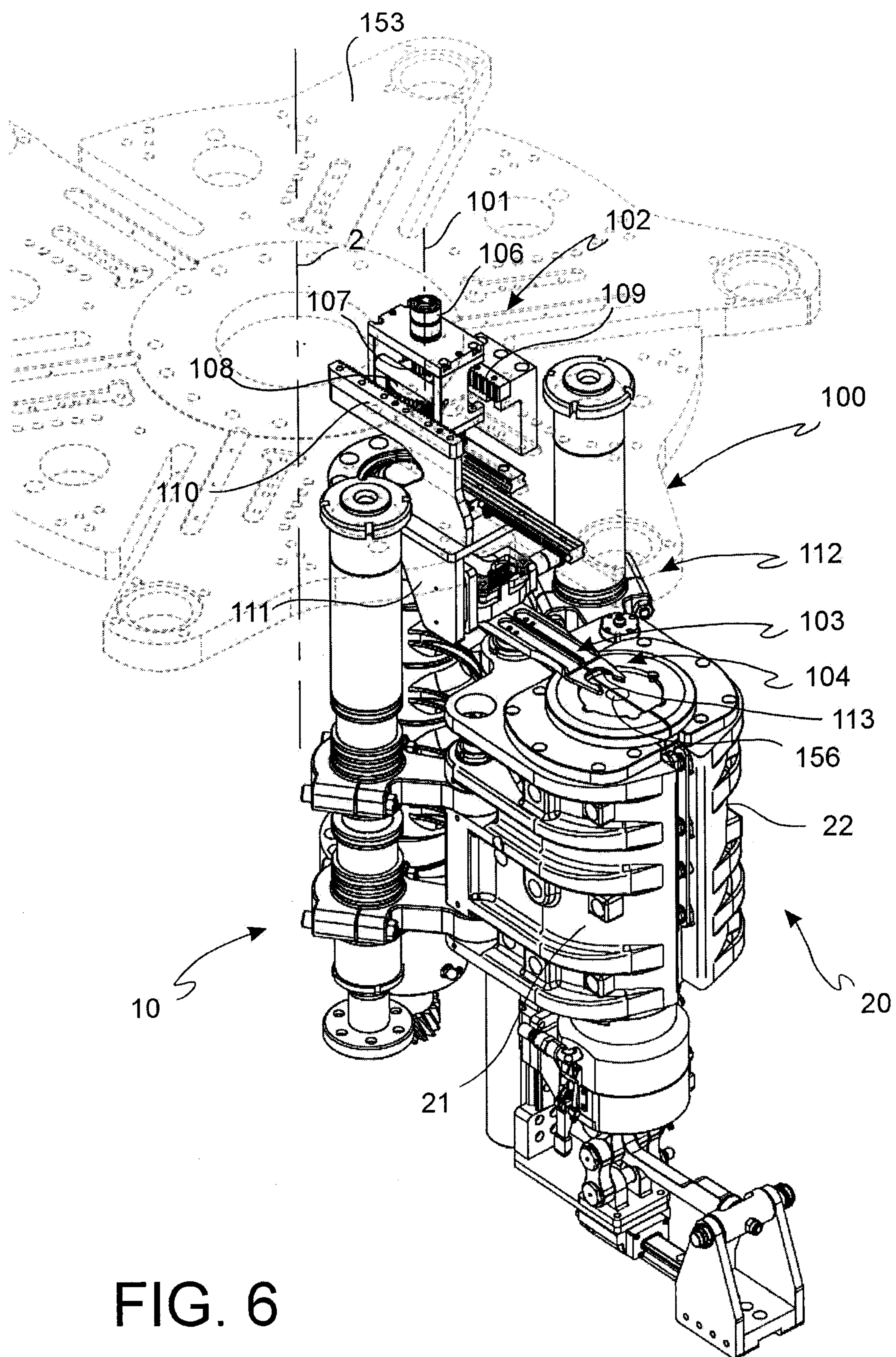


FIG. 6

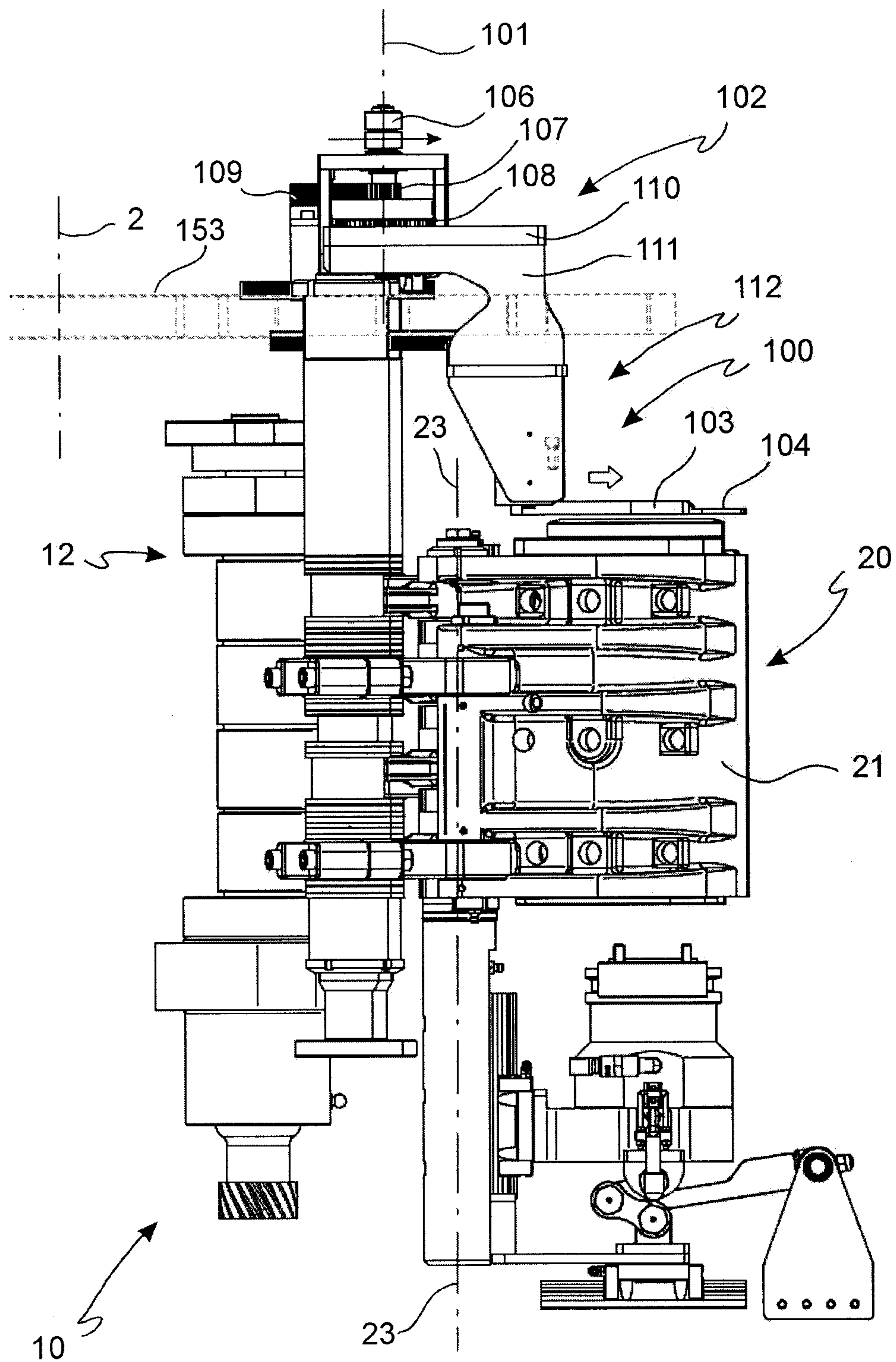


FIG. 7

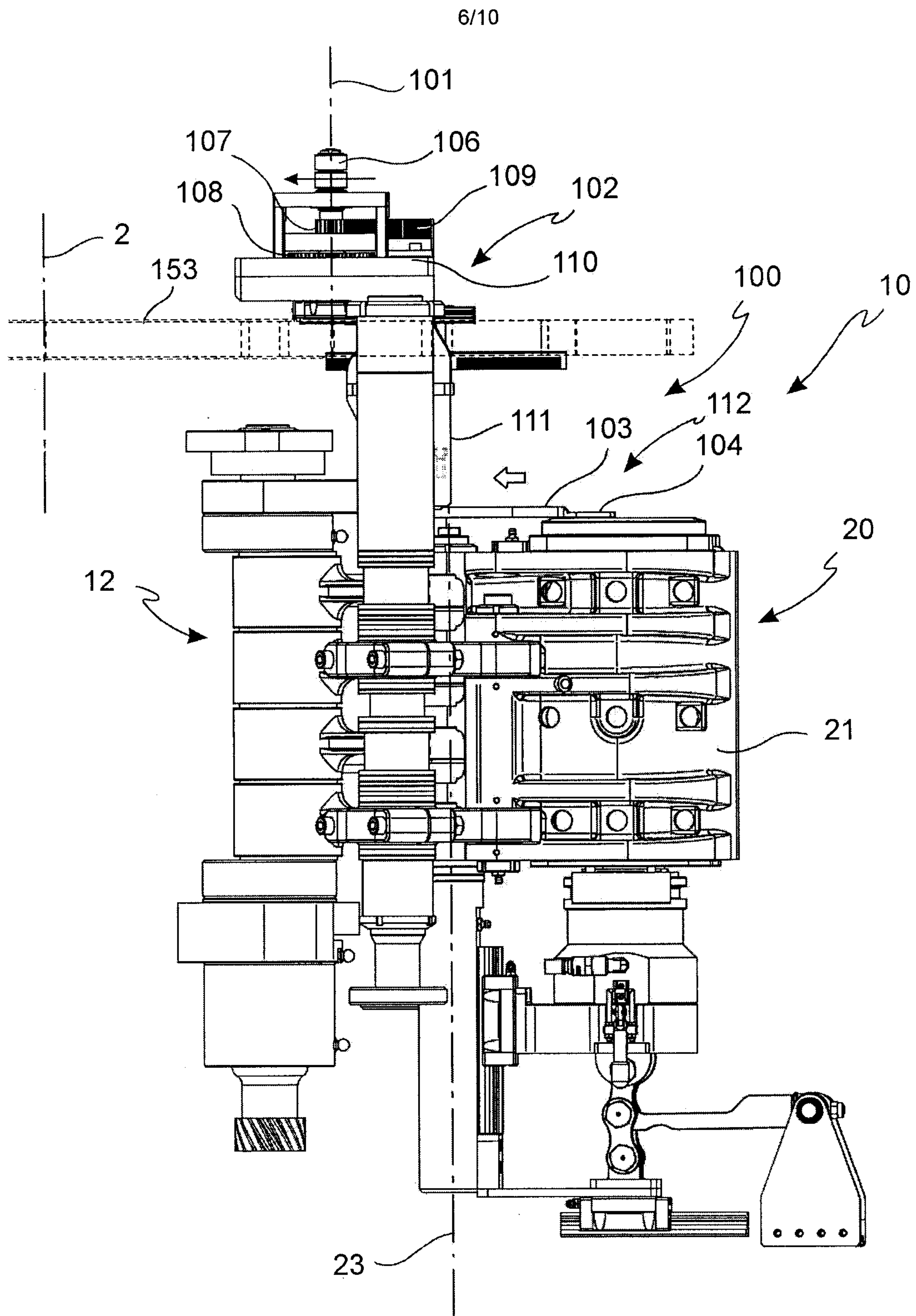


FIG. 8

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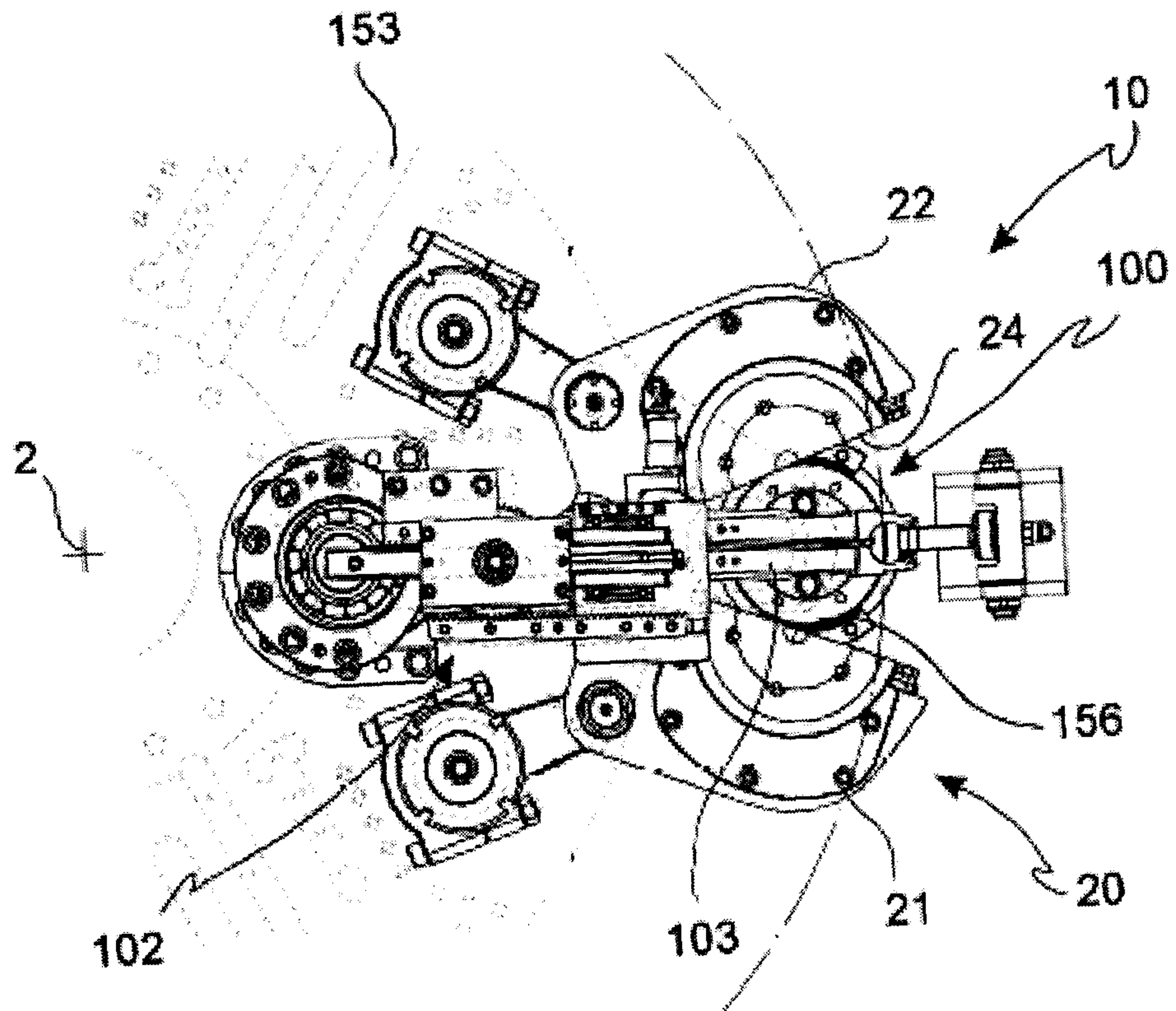


FIG. 9

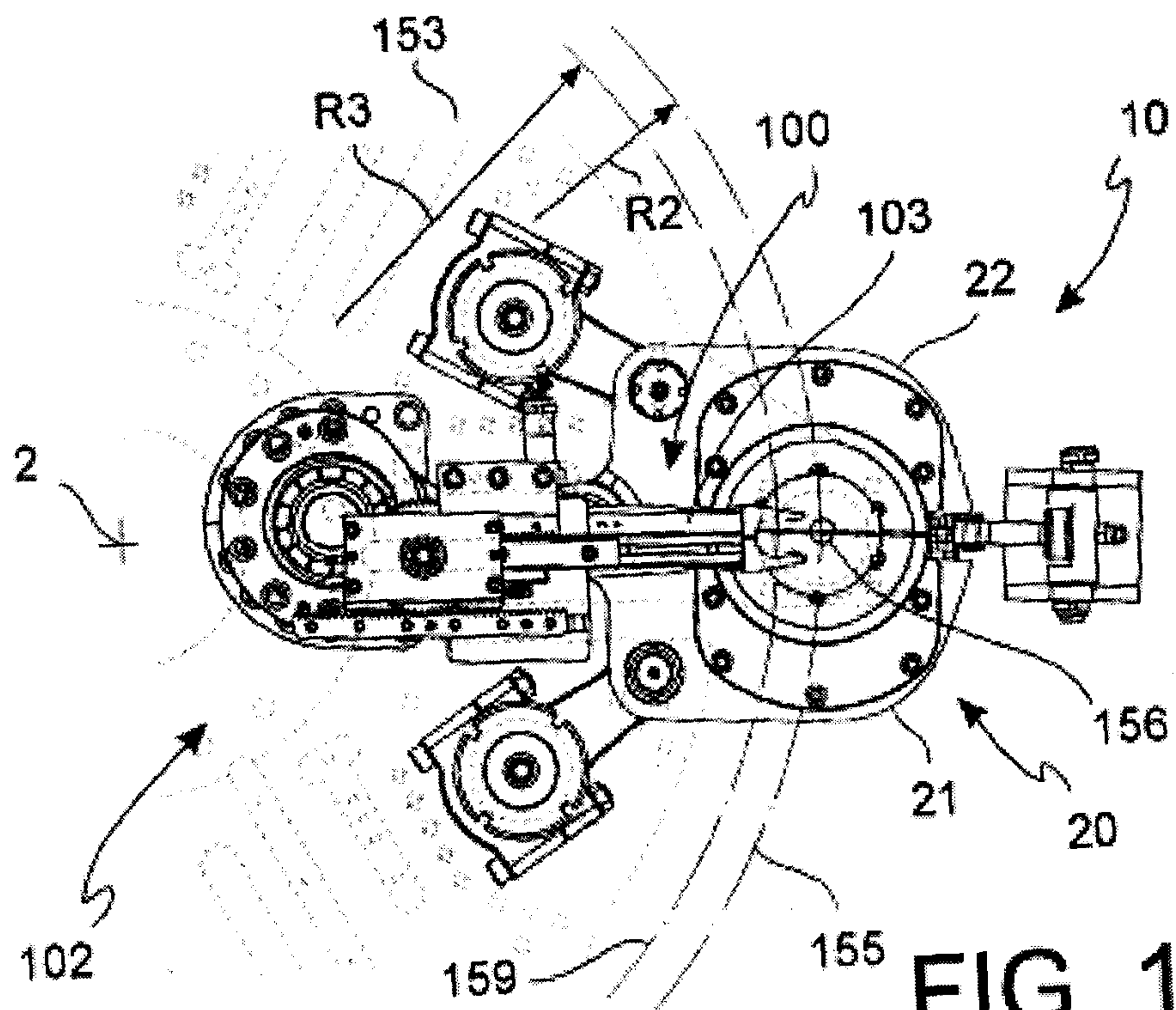


FIG. 10

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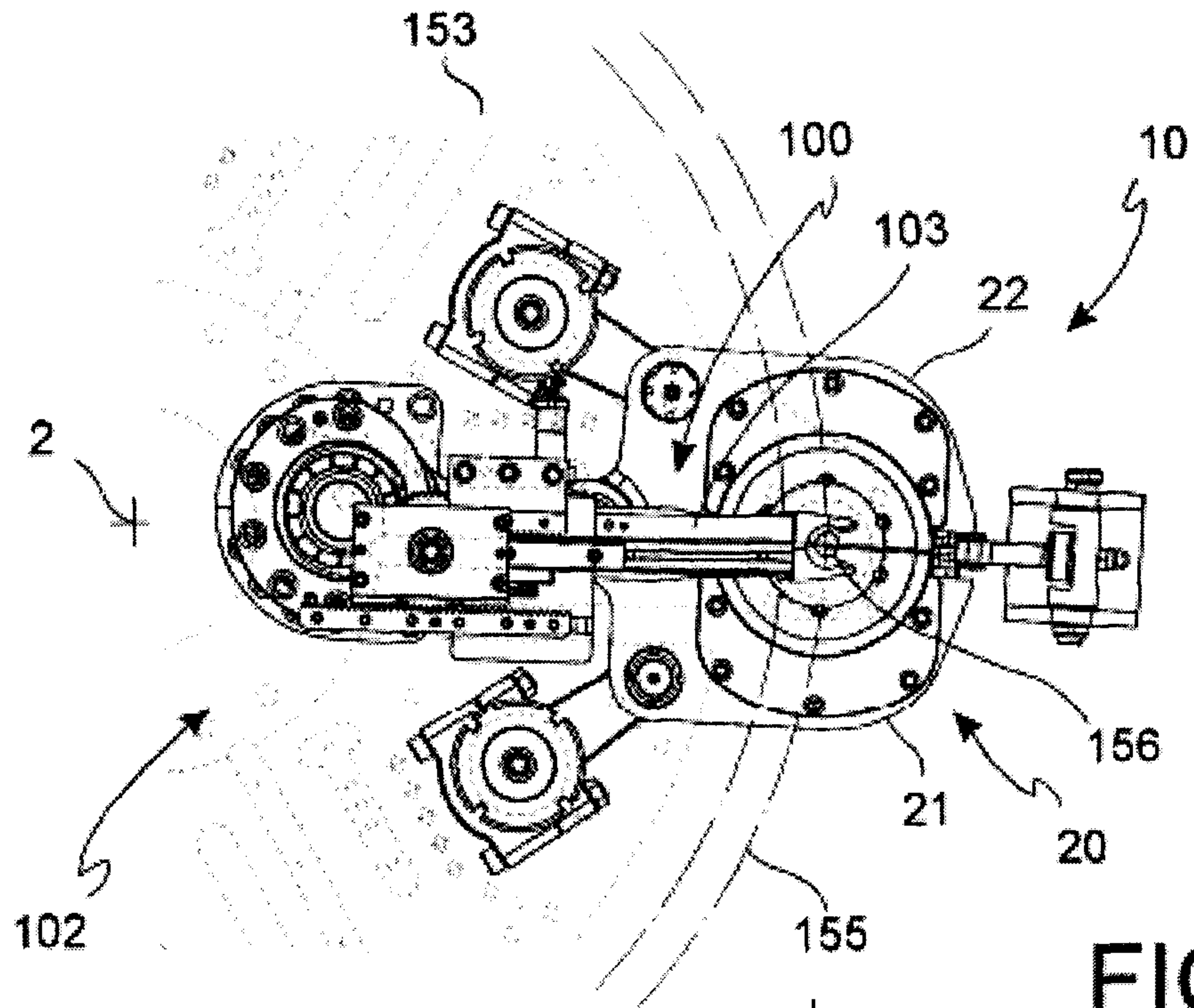


FIG. 11

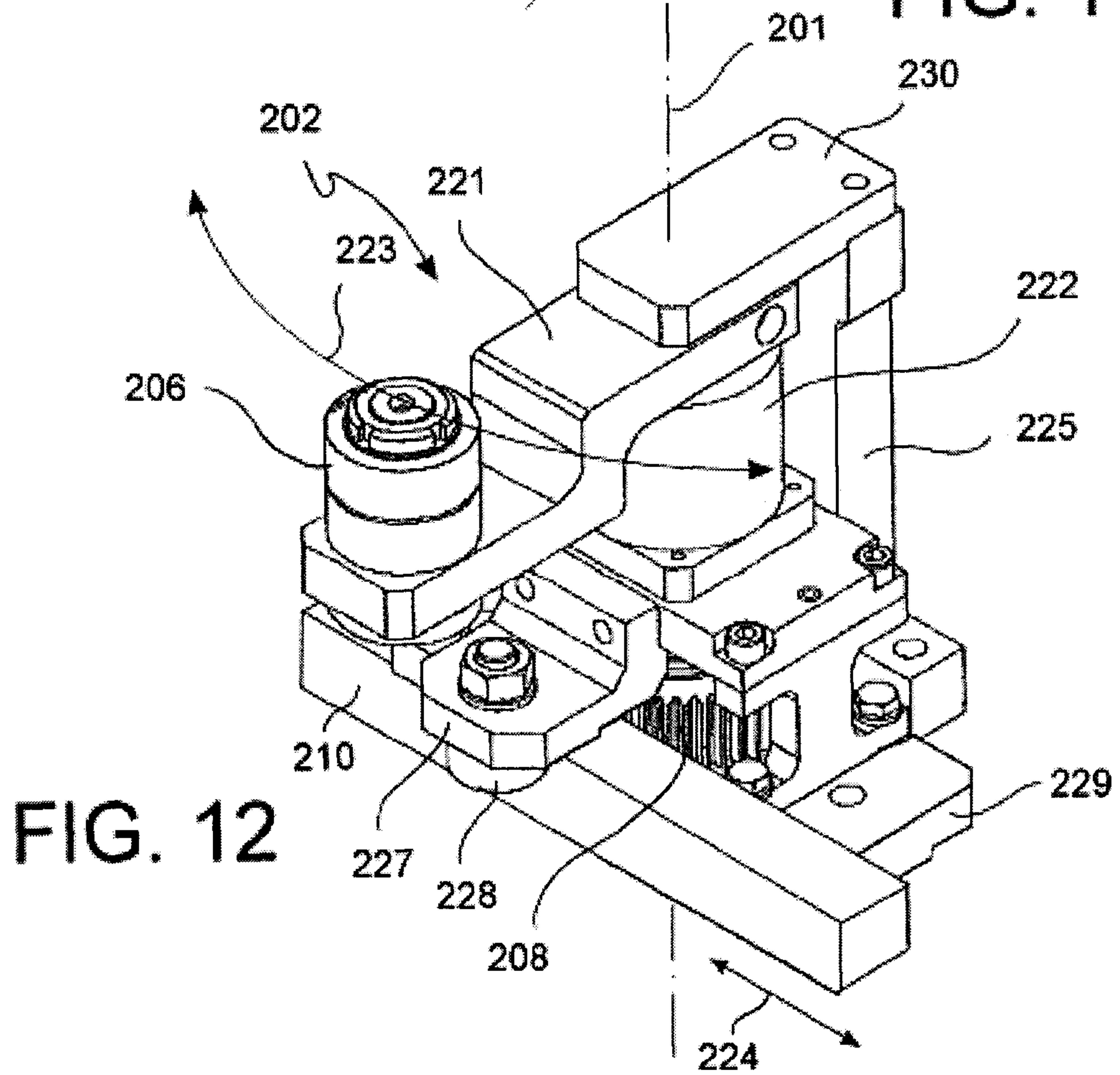


FIG. 12

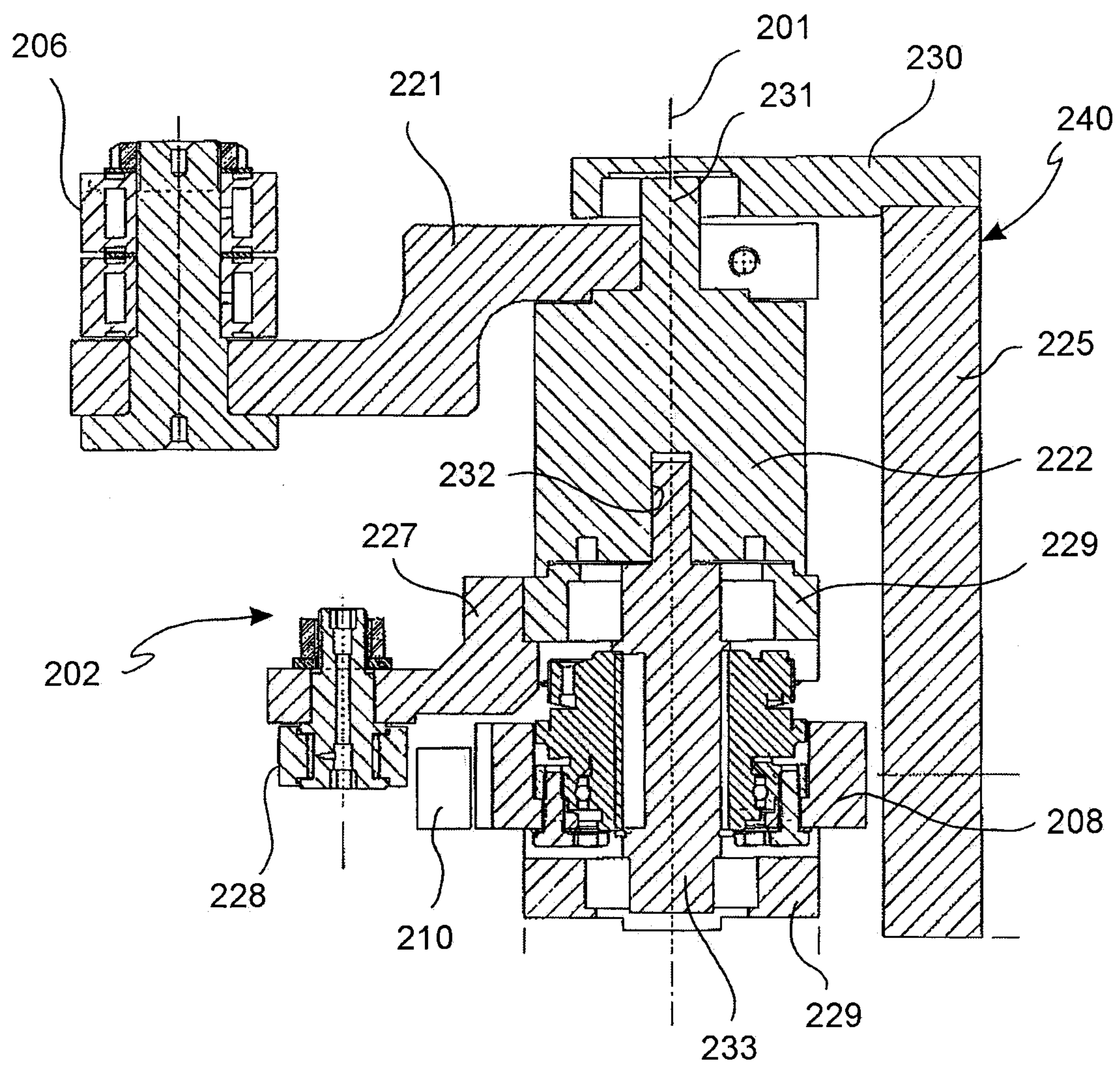


FIG. 13

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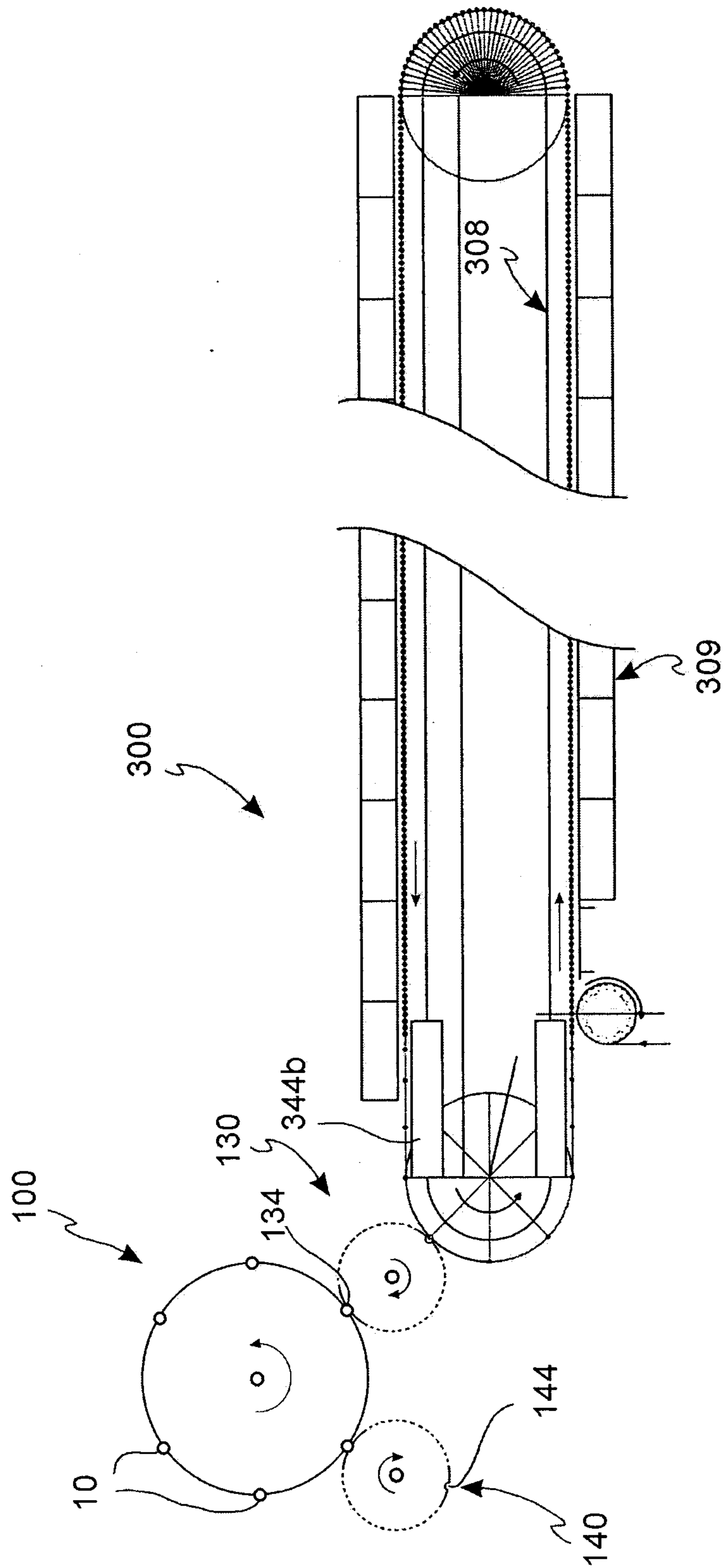


FIG. 14

