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

(11) EP 2 944 206 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.11.2015 Bulletin 2015/47

(51) Int Cl.:
A24F 47/00 *(2006.01)*

(21) Application number: **15167334.0**

(22) Date of filing: **12.05.2015**

(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
Designated Validation States:
MA

(30) Priority: **16.05.2014 NL 2012834**

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(54) **SYSTEM FOR PERFORMING A PROCESSING STEP ON CIGARETTE PARTS OF AN ELECTRONIC CIGARETTE**

(57) A system for performing a processing step on cigarette parts of an electronic cigarette, said system comprising a transport device comprising multiple holding units for holding the cigarette parts, a supply unit which places the cigarette parts in the holding units of the transport device at a receiving location along the circular trajectory so that the cigarette parts are transported along at least part of the circular trajectory, a discharge unit which removes the cigarette part from the holding units at a discharge location along the circular trajectory, and a pivot device comprising multiple processing units positioned along at least a part of the circular trajectory at a process distance from each other which corresponds with the holding distance between the holding units so that the processing units can be associated with the cigarette parts held by the holding units, and also a method for performing a processing step on cigarette parts of an electronic cigarette.

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a system for performing a processing step on cigarette parts of an electronic cigarette.

BACKGROUND OF THE INVENTION

[0002] Electronic cigarette are produced by assembling different parts together. A disadvantage of the known electronic cigarette is that it is difficult to produce, especially to produce it mechanically. The invention is based on the insight that there is a need to reduce the production time of electronic cigarettes.

SUMMARY OF THE INVENTION

[0003] The invention has the objective to provide an improved, or at least alternative, system for performing a processing step on cigarette parts of an electronic cigarette. According to one aspect of the invention, the object is to provide a system which can perform the processing step mechanically. According to a further aspect of the invention, the object is to provide a system which reduces the production time of electronic cigarettes. According to a further aspect of the invention, the object is to provide a system which can perform the processing step more accurately.

[0004] The system for performing a processing step on cigarette parts of an electronic cigarette according the invention comprises;

- a transport device comprising multiple holding units for holding the cigarette parts, wherein the holding units are positioned at a holding distance from each other while forming a circular configuration, and the transport device comprises a transporter drive by which the holding units are moved at a speed in a rotation direction along a circular trajectory having a centre,
- a supply unit which places the cigarette parts in the holding units of the transport device at a receiving location along the circular trajectory so that the cigarette parts are transported along at least part of the circular trajectory,
- a discharge unit which removes the cigarette part from the holding units at a discharge location along the circular trajectory,
- a pivot device comprising multiple processing units positioned along at least a part of the circular trajectory at a process distance from each other which corresponds with the holding distance between the holding units so that the processing units can be associated with the cigarette parts held by the holding units, wherein;
  -- the pivot device is pivotable about a pivot axis extending through the centre of the circular trajectory,
  -- the pivot device comprises a pivot drive to alternately pivot the processing units from a first radial position to a second radial position in a first pivot direction parallel to the circular trajectory and in the rotation direction of the transport device and synchronously with the cigarette parts transported by the transport device and subsequently back from the second radial position to the first radial position in a second pivot direction parallel to the circular trajectory and opposite to the rotation direction of the transport device,
  -- in the first radial position, each processing unit is positioned in an associated position relative to one of the cigarette parts held by the holding units of the transport device, and
  -- each processing unit performs the processing step on the cigarette part associated with said processing unit while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts. The system is able to perform the processing step in an efficient manner.

[0005] In the system according to the invention, the transport device moves the cigarette parts continuously at the same speed in the same rotation direction along at least part of the circular trajectory and the pivot device is alternatively pivoted between the first radial position and the second radial position. Once the processing units are placed in the associated position, the processing step is performed on the associated cigarette parts. The pivot device is pivoted to the second radial position synchronously with the associated cigarette parts, so that the processing units remain in the associated position relative to the associated cigarette parts.

[0006] When the processing units are arrived in the second radial position, the processing step performed on the associated cigarette parts has ended and the pivot device is pivoted back to the first radial position. During the pivoting from the second radial position to the first radial position, the processing units are not positioned in an associated position relative to cigarette parts. When the processing units are back in the first radial position, a new cycle is started on a new batch of cigarette parts.

[0007] In an embodiment of the system according to the invention, the cigarette parts have a tubular form.

[0008] In an embodiment of the system according to the invention, the pivot device comprises an axial drive which moves the processing units located near or at the first radial position towards said associated cigarette parts into a second axial position, while maintaining the processing units in the second axial position during the pivoting to the second radial position, and subsequently moves the processing units located near or at the second

radial position away from said associated cigarette parts into a first axial position, while maintaining the processing units in the first axial position during the pivoting to the first radial position. The reciprocating movement of the pivot device between the first axial position and the second axial position is an axial movement. This facilitates the interaction of the processing units with the cigarette parts.

[0009] In an embodiment of the system according to the invention, the processing units located in the second axial position are in contact with said associated cigarette parts and the processing units located in the first axial position are not in contact with said associated cigarette parts.

[0010] In an embodiment of the system according to the invention, each processing unit comprises a first electrical unit contact member which in the second axial position is in contact with a first electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said first electrical cigarette contact members.

[0011] In an embodiment of the system according to the invention, each processing unit comprises a second electrical unit contact member which in the second axial position is in contact with a second electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said second electrical cigarette contact members.

[0012] In an embodiment of the system according to the invention, the pivot device comprises at least one electrically conductive wire having a wire part extending in the direction of the pivot axis and located between the processing units and the pivot axis, which at least one electrically conductive wire is electronically connected with at least one of the processing units.

[0013] In an embodiment of the system according to the invention, the system comprises more than one of the at least one electrically conductive wire.

[0014] In an embodiment of the system according to the invention, each processing unit is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said processing unit.

[0015] In an embodiment of the system according to the invention, the pivot axis and the processing units are located at a radial distance from each other, which radial distance is measured in a direction perpendicular to the pivot axis.

[0016] In an embodiment of the system according to the invention, the wire part of the at least one electrically conductive wire is located between 0% - 50%, preferably 0% - 33%, of the radial distance when measured from the pivot axis towards the processing units.

[0017] In an embodiment of the system according to the invention, at least one electrically conductive wire is electronically connected to the first electrical unit contact members of the processing units.

[0018] In an embodiment of the system according to the invention, each first electrical unit contact member is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said first electrical unit contact member.

[0019] In an embodiment of the system according to the invention, at least one electrically conductive wire is electronically connected to the second electrical unit contact members of the processing units.

[0020] In an embodiment of the system according to the invention, each second electrical unit contact member is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said second electrical unit contact member.

[0021] In an embodiment of the system according to the invention, each processing unit comprises a sensor which is connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said sensor.

[0022] In an embodiment of the system according to the invention, the sensor is a vapour sensor and the cigarette parts comprise a vaporizer.

[0023] In an embodiment of the system according to the invention,

- the system is controlled by a control device having a memory,
- the first electrical unit contact members of the processing units are connected to an electrical power supply,
- the first electrical unit contact members are placed in contact with the first electrical cigarette contact members of said associated cigarette parts when the processing units are placed in the second axial position to activate the vaporizers,
- the vapour sensors are configured to detect vapour produced by the activated vaporizers,
- the vapour sensors are electronically connected to the control device, and
- the control device is configured to determine from each vapour sensor whether vapour has been detected and to store in the memory:

  a) from which vaporizers of said associated cigarette parts vapour was detected, or
  b) from which vaporizers of said associated cigarette parts no vapour was detected.

[0024] In an embodiment of the system according to the invention, the control device is operatively connected with the transporter drive and the pivot drive.

[0025] In an embodiment of the system according to the invention, the control device is operatively connected with the axial drive.

[0026] In an embodiment of the system according to the invention, the pivot device comprises at least one fluid duct having a duct part extending in the direction of the pivot axis and located between the processing units

and the pivot axis, which at least one fluid duct is in fluid communication with at least one of the processing units.

[0027] In an embodiment of the system according to the invention, the duct part of the at least one fluid duct is located between 0% - 50%, preferably 0% - 33%, of the radial distance when measured from the pivot axis towards to the processing units.

[0028] In an embodiment of the system according to the invention, the vapour sensors are in fluid communication with the fluid duct which is connected to an air pump to create an airflow from the vapour sensors to the fluid duct.

[0029] In an embodiment of the system according to the invention, an air guide is provided near or at the vapour sensors, and the air guide is in fluid communication with the at least one fluid duct which is connected to the air pump to create an airflow from the vapour sensors to the fluid duct to discharge the vapour produced by the activated vaporizers of the associated cigarette parts.

[0030] In an embodiment of the system according to the invention, the control device is operatively connected with the air pump.

[0031] In an embodiment of the system according to the invention, the processing units together cover 50% of the circular trajectory.

[0032] In an embodiment of the system according to the invention, the transport device comprises a rotary wheel having an outer peripheral surface provided with the holding units.

[0033] Any combination can be made of the features of two or more of the above mentioned embodiments of the system.

[0034] The invention further relates to a method for performing a processing step on cigarette parts of an electronic cigarette with a system according to the invention, said method comprising the step of performing the processing step on the cigarette parts associated with the processing units while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Embodiments of the system according to the invention will be described by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts, and in which:

Figure 1 schematically shows a view in perspective of an embodiment of the system according to the invention, wherein the pivot device is located in the first radial position,

Figure 2 schematically shows a view in perspective of the system of fig. 1, wherein the pivot device is located between the first radial position and the second radial position while moving from the first radial position to the second radial position,

Figure 3 schematically shows a view in perspective of the system of fig. 1, wherein the pivot device is located in the second radial position,

Figure 4 schematically shows a view in perspective of the system of fig. 1, wherein the pivot device is located between the first radial position and the second radial position while moving from the second radial position to the first radial position,

Figure 5A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the first radial position and in the first axial position,

Figure 5B shows an enlarged view of part V of fig. 5A,

Figure 5C shows a view in cross section along line C-C in fig. 5B,

Figure 5D shows a view in cross section along line D-D in fig. 5B,Figure 6A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the second axial position and is just moved out of the first radial position towards the second radial position,

Figure 6B shows an enlarged view of part VI of fig. 6A,

Figure 7A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the second axial position and between the first radial position and the second radial position, while moving from the first radial position to the second radial position,

Figure 7B shows an enlarged view of part VII of fig. 7A,

Figure 8A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the second axial position and is about to arrive at the second radial position,

Figure 8B shows an enlarged view of part VIII of fig. 8A,

Figure 9A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the second radial position and in the first axial position,

Figure 9B shows an enlarged view of part IX of fig. 9A,

Figure 10A schematically shows a side view of the system of fig. 1, wherein the pivot device is located in the first axial position and between the first radial position and the second radial position, while moving from the second radial position to the first radial position,

Figure 10B shows an enlarged view of part X of fig. 10A,

the Figures 11-14 schematically shows a front view of the system of fig. 1,

Figure 15 schematically shows a cross sectional view of the system of fig. 1, wherein the pivot device is located in the first axial position,

Figure 16 schematically shows a cross sectional view the system of fig. 1, wherein the pivot device is located in the second axial position,

Figure 17 schematically shows a view in perspective of the rear side of the system of fig. 1, wherein the pivot device is located in the first radial position,

Figure 18 schematically shows a view in perspective of the rear side of the system of fig. 1, wherein the pivot device is located in the second radial position, and

Figure 19 schematically shows a rear view of the system of fig. 1, wherein the pivot device is located in the first radial position.

DETAILED DESCRIPTION OF THE DRAWINGS

[0036] The figures 1-4 show a view in perspective of an embodiment of the system 1 according to the invention. The system 1 is configured to perform a processing step on cigarette parts 2 of an electronic cigarette. In another embodiment of the system 1, a processing step on completely assembled electronic cigarettes, such as testing the electronic cigarette, is performed.

[0037] The system 1 comprises a transport device 4 having multiple holding units 5 for holding the cigarette parts 2. The holding units 5 are positioned at a holding distance 6 from each other while forming a circular configuration. The transport device 4 comprises a transporter drive 8 by which the holding units 5 are moved at a speed in a rotation direction 9 along a circular trajectory 10 having a centre 11. The transport device 4 comprises a rotary wheel 46 having an outer peripheral surface 47 provided with the holding units 5. In another embodiment of the system 1, a different type of transport device 4 is used, such as having an endless belt provided with holding units 5, which belt is held in the circular configuration and moved around the centre 11. The cigarette parts 2 have a tubular form.

[0038] A supply unit 12 places the cigarette parts 2 in the holding units 5 of the transport device 4 at a receiving location 13 along the circular trajectory 10, so that the cigarette parts 2 are transported along at least part of the circular trajectory 10. A discharge unit 14 removes the cigarette part from the holding units 5 at a discharge location 15 along the circular trajectory 10. This is amongst others shown in the figures 13A and B.

[0039] The system 1 is provided with a pivot device 16 comprising multiple processing units 17 positioned along at least a part of the circular trajectory 10 at a process distance 18 from each other which corresponds with the holding distance 6 between the holding units 5, so that the processing units 17 can be associated with the cigarette parts 2 held by the holding units 5.

[0040] The pivot device 16 is pivotable about a pivot axis 19 extending through the centre 11 of the circular trajectory 10. The pivot device 16 comprises a pivot drive 20 to alternately pivot the processing units 17 from a first radial position 21 to a second radial position 22 in a first pivot direction 23 parallel to the circular trajectory 10 and in the rotation direction 9 of the transport device 4 and synchronously with the cigarette parts 2 transported by the transport device 4 and subsequently back from the second radial position 22 to the first radial position 21 in a second pivot direction 24 parallel to the circular trajectory 10 and opposite to the rotation direction 9 of the transport device 4. During the synchronized pivoting of the pivot device 16 from the first radial position 21 to the second radial position 22, the processing units 17 are moved with the same speed as the cigarette parts 2 held by the transport device 4.

[0041] The pivot device 16 is configured to position each processing unit 17 in an associated position 25 relative to one of the cigarette parts 2 held by the holding units 5 of the transport device 4, when the pivot device 16 is the first radial position 21. In the associated position 25, the processing units 17 are located such that they are able to perform the processing step on the associated cigarette part. In an embodiment of the system 1, the processing units 17 located in the associated position 25 are positioned in line with the associated cigarette parts 2. In another embodiment of the system 1, the processing units 17 located in the associated position 25 are positioned in a different position relative to the associated cigarette parts 2.

[0042] The pivot device 16 is configured to perform the processing step on the cigarette parts 2 associated with said processing units 17 while the pivot device 16 pivots from the first radial position 21 to the second radial position 22 synchronously with said associated cigarette parts 2.

[0043] The processing step can be any type of processing step on the cigarette parts 2 required for the production of the electronic cigarettes. The performed processing step amongst others depends on the type of cigarette parts 2 transported by the transport device 4. In the shown system 1, the cigarette parts 2 are vaporizers 38 having a heating member and a cartridge and the processing step preformed is the testing of the vaporizers 38. In another embodiment of the system 1, the processing step preformed is that a liquid is added to the cartridges of the vaporizers 38. In yet another embodiment of the system 1, the cigarette parts 2 comprise an air flow sensor and the processing step preformed is that the air flow sensors are tested.

[0044] The transport device 4 moves the cigarette parts 2 continuously at the same speed in the same rotation direction 9 along at least part of the circular trajectory 10. The pivot device 16 is alternatively pivoted between the first radial position 21 and the second radial position 22.

[0045] In figure 1, the pivot device 16 is located in the first radial position 21. This is the moment that the processing units 17 are placed in the associated position 25 relative to the associated cigarette parts 2. After that, the pivot device 16 is pivoted to the second radial position 22 synchronously with the associated cigarette parts 2, so that the processing units 17 remain in the associated position 25 relative to the associated cigarette parts 2. Once the processing units 17 are placed in the associated

position 25, the processing step is performed on the associated cigarette parts 2.

[0046] In figure 2, the pivot device 16 is located between the first radial position 21 and the second radial position 22 while moving from the first radial position 21 to the second radial position 22. During this pivot movement, the processing units 17 remain in the associated position 25 relative to the associated cigarette parts 2 while performing the processing step.

[0047] In figure 3, the pivot device 16 is located in the second radial position 22. When the processing units 17 are arrived in the second radial position 22, the processing step performed on the associated cigarette parts 2 has ended and the pivot device 16 will be pivoted back to the first radial position 21.

[0048] In figure 4, the pivot device 16 is located between the first radial position 21 and the second radial position 22 while moving from the second radial position 22 to the first radial position 21. During the pivoting from the second radial position 22 to the first radial position 21, the processing units 17 are not positioned in an associated position 25 relative to cigarette parts 2. When the processing units 17 are arrived in the first radial position 21, a new cycle is started on a new batch of cigarette parts 2. The figures 1-4 show a complete cycle of the system.

[0049] The figure 5-10 show a complete cycle of the system 1 of fig. 1 when seen from a side view. The pivot device 16 comprises an axial drive 26 which moves the processing units 17 located near the first radial position 21 towards said associated cigarette parts 2 into a second axial position 27, while maintaining the processing units 17 in the second axial position 27 during the pivoting to the second radial position 22, and subsequently moves the processing units 17 located near the second radial position 22 away from said associated cigarette parts 2 into a first axial position 28, while maintaining the processing units 17 in the first axial position 28 during the pivoting to the first radial position 21. The reciprocating movement of the pivot device 16 between the first axial position 28 and the second axial position 27 is an axial movement 29 along the pivot axis 19. In another embodiment of the system, axial drive 26 moves the processing units 17 located at the first radial position 21 towards said associated cigarette parts 2 into a second axial position 27, while maintaining the processing units 17 in the second axial position 27 during the pivoting to the second radial position 22, and subsequently moves the processing units 17 located at the second radial position 22 away from said associated cigarette parts 2 into a first axial position 28, while maintaining the processing units 17 in the first axial position 28 during the pivoting to the first radial position 21.

[0050] The processing units 17 located in the second axial position 27 are in contact with said associated cigarette parts 2 and the processing units 17 located in the first axial position 28 are not in contact with said associated cigarette parts 2. In the second axial position 27, the processing units 17 are placed in physical contact with the associated cigarette parts 2 to perform the processing step. In another embodiment of the system 1, the processing step is performed while the processing units 17 are not placed in physical contact with the associated cigarette parts 2.

[0051] Each processing unit 17 comprises a first electrical unit contact member 30 which in the second axial position 27 is in contact with a first electrical cigarette contact member 32 provided on each of said associated cigarette parts 2 and in the first axial position 28 is not in contact with said first electrical cigarette contact members 32. Each processing unit 17 furthermore comprises a second electrical unit contact member 31 which in the second axial position 27 is in contact with a second electrical cigarette contact member 33 provided on each of said associated cigarette parts 2 and in the in the first axial position 28 is not in contact with said second electrical cigarette contact members 33. The first and second electrical unit contact member 30, 31 are placed in contact with the first and second electrical cigarette contact member 32, 33 to supply electrical power to the associated cigarette parts 2. The electrical power is used to active the heating member of the vaporizer 38. In another embodiment of the system 1, the electrical power is used for a different purpose. In yet another embodiment of the system 1, the first and second electrical unit contact member 31 are placed in contact with the first and second electrical cigarette contact member 33 to perform a measurement on the associated cigarette parts 2. In another embodiment of the system 1, only a single electrical unit contact member is placed in contact with a single electrical cigarette contact member to perform the processing step.

[0052] In figure 5A and B, the pivot device 16 is located in the first radial position 21 and in the first axial position 28. The processing units 17 are located in the associated position 25 relative to the associated cigarette parts 2 but at a distance from the associated cigarette parts 2. The processing units 17 are subsequently moved towards the second axial position 27.

[0053] Figure 5C shows the first and second electrical unit contact members 30, 31 of the processing unit 17.

[0054] Figure 5D shows the first and second electrical cigarette contact members 32, 33 of the cigarette part 2.

[0055] In figure 6A and B, the pivot device 16 is just move out of the first radial position 21 and located in the second axial position 27. The processing units 17 are located in the associated position 25 relative to the associated cigarette parts 2 and in contact with the associated cigarette parts 2. From this moment, processing units 17 perform the processing step on the associated cigarette parts 2.

[0056] In figure 7A and B, the pivot device 16 is located in the second axial position 27 and between the first radial position 21 and the second radial position 22, while moving from the first radial position 21 to the second radial position 22. During this movement, the processing units

17 remain in the associated position 25 relative to the associated cigarette parts 2 and perform the processing step on the associated cigarette parts 2.

[0057] In figure 8A and B, the pivot device 16 is about to arrive at the second radial position 22 and located in the second axial position 27. At this moment, the processing units 17 have ended the processing step performed on the associated cigarette parts 2. The processing units 17 will subsequently be moved to the first axial position 28.

[0058] In figure 9A and B, the pivot device 16 is located in the second radial position 22 and in the first axial position 28.

[0059] In figure 10A and B, the pivot device 16 is located in the first axial position 28 and between the first radial position 21 and the second radial position 22, while moving from the second radial position 22 to the first radial position 21. During this pivot movement, the processing units 17 are not located in an associated position 25 relative to cigarette parts 2.

[0060] The figures 11-14 show a front view of the system 1 of fig. 1. In figure 11, the pivot device 16 is located in the first radial position 21. Figure 12 differs from figure 11 in that the air guide 44 is removed. Figure 13A differs from figure 12 in that the pivot device 16 is removed. Figure 13B differs from figure 13A in that the transport device 4 is removed in order to show the circular trajectory 10. Figure 14 differs from figure 1 in that the pivot device 16 is located in the second radial position 22.

[0061] Figure 15 shows a cross sectional view of the system 1 along line XV-XV of fig. 11. The pivot device 16 is located in the first axial position 28. Figure 16 shows a cross sectional view of the system 1 along line XVI-XVI of fig. 14. The pivot device 16 is located in the second axial position 27. The reciprocating axial movement 29 is created by an axial drive 26. In the pivot device 16, the axial drive 26 is formed by springs 50 and electrical magnets 53. In another embodiment of the system 1, the axial drive 26 is formed by a cam drive or an controlled electrical or pneumatic motor.

[0062] The pivot device 16 comprises multiple electrically conductive wires 34 having a wire part 36 extending in the direction of the pivot axis 19 and located between the processing units 17 and the pivot axis 19. The electrically conductive wires 34 are electronically connected with the processing units 17. In another embodiment of the system 1, the pivot device 16 only comprises a single electrically conductive wire 34.

[0063] This configuration allows that the movements of the multiple electrically conductive wires 34 is reduced when the pivot device 16 is pivoted.

[0064] There are two electrically conductive wires 34 for the electrical power supply 41. Said two electrically conductive wires 34 are connected to all the processing units 17 to provide them with electrical power. Said two electrically conductive wires 34 are electronically connected with the first and second electrical unit contact member 30, 31 of the processing units 17 to active the heating members of the cigarette parts 2. Said two electrically conductive wires 34 are electronically connected with the processing units 17 via conductive lines 48.

[0065] In another embodiment of the system 1, said two electrically conductive wires 34 are used for a different purpose, such as performing a measurement on the associated cigarette parts 2.

[0066] In another embodiment of the system 1, each first electrical unit contact member 30 is electrically connected to one of the electrically conductive wires 34, and said electrically conductive wire 34 is only connected to said first electrical unit contact member 30 and each second electrical unit contact member 31 is electrically connected to one of the electrically conductive wires 34, and said electrically conductive wire 34 is only connected to said second electrical unit contact member 31. Said embodiment is very suitable to supply electrical power to individual cigarette part or to perform a measurement on individual cigarette parts 2.

[0067] In addition to this, there are multiple electrically conductive wires 34 connected to the vapour sensors 37 of the processing units 17. Each vapour sensor 37 is connected to one of the electrically conductive wire 34, and said electrically conductive wire 34 is only connected to said vapour sensor 37. Said multiple electrically conductive wires 34 are electronically connected with the vapour sensors 37 via conductive lines 48.

[0068] The pivot axis 19 and the processing units 17 are located a radial distance 35 from each other, which radial distance 35 is measured in a direction perpendicular to the pivot axis 19. The wire parts 36 of the electrically conductive wires 34 are located between 0% - 50%, preferably 0% - 33%, of the radial distance 35 when measured from the pivot axis 19 towards the processing units 17. This configuration allows that the movements of the multiple electrically conductive wires 34 is further reduced when the pivot device 16 is pivoted.

[0069] The pivot device 16 comprises a fluid duct 42 having a duct part 54 extending in the direction of the pivot axis 19 and located between the processing units 17 and the pivot axis 19, which at least one fluid duct 42 is in fluid communication with at least one of the processing units 17. The fluid duct 42 is used to discharge vapour provided to the processing units 17 by the activated associated cigarette parts 2. In another embodiment of the system 1, the fluid duct 42 is used to discharge a liquid from the processing units 17. In yet another embodiment of the system 1, the fluid duct 42 is used to supply a gas and/or a liquid to the processing units 17. The system 1 can be provided with multiple fluid ducts 42.

[0070] The duct part 54 of the fluid duct 42 is located between 0% - 50%, preferably 0% - 33%, of the radial distance 35 when measured from the pivot axis 19 towards to the processing units 17. More specifically, the fluid duct 42 is positioned coaxial with the pivot axis 19.

[0071] The vapour sensors 37 are in fluid communication with the fluid duct 42 which is connected to an air pump 43 to create an airflow from the vapour sensors 37

to the fluid duct 42. An air guide 44 is provided at the vapour sensors 37, and the air guide 44 is in fluid communication with the fluid duct 42 which is connected to the air pump 43 to create an airflow from the vapour sensors 37 to the fluid duct 42 to discharge the vapour produced by the activated vaporizers 38 of the associated cigarette parts 2. The control device 39 is operatively connected with the air pump 43.

[0072] The processing units 17 together cover 50% of the circular trajectory 10. This means 50 % of the holding units 5 are holding an associated cigarette part 2 when the processing step is performed.

[0073] The figures 17 and 18 show a view in perspective of the rear side of the system 1 of fig. 1. In figure 17, the pivot device 16 is located in the first radial position 21. In figure 18, the pivot device 16 is located in the second radial position 22.

[0074] Figure 19 shows a rear view of the system 1 of fig. 1, wherein the pivot device 16 is located in the first radial position 21. The system 1 is controlled by a control device 39 having a memory 40. The first electrical unit contact members 30 of the processing units 17 are connected to an electrical power supply 41. The first electrical unit contact members 30 are placed in contact with the first electrical cigarette contact members 32 of said associated cigarette parts 2 when the processing units 17 are placed in the second axial position 27 to activate the vaporizers 38. The vapour sensors 37 are configured to detect vapour produced by the activated vaporizers 38. The vapour sensors 37 are electronically connected to the control device 39. The control device 39 is configured to determine from each vapour sensor 37 whether vapour has been detected and to store in the memory 40:

a) from which vaporizers 38 of said associated cigarette parts 2 vapour was detected, or
b) from which vaporizers 38 of said associated cigarette parts 2 no vapour was detected.

[0075] It is of course also possible that the control device 39 is configured to determine from each vapour sensor 37 whether vapour has been detected and to store in the memory 40 from which vaporizers 38 of said associated cigarette parts 2 vapour was detected and from which vaporizers 38 of said associated cigarette parts 2 no vapour was detected.

[0076] From this, it can be determined which of the associated cigarette parts 2 did not produce (sufficient) vapour. If no vapour is produced, either the heating member does not function or there is no (or not sufficient) liquid in the cartridge. This allows that in a later stage the not proper functioning cigarette parts 2 are separated from the proper functioning cigarette parts 2.

[0077] The control device 39 is furthermore operatively connected with the transporter drive 8, the pivot drive 20, and the axial drive 26 to control their operation. This connection is established by communication lines 45, but other means of connecting are possible, such as a wireless connection.

[0078] The following clauses form a further description of the system and method according to the invention.

1. System for performing a processing step on cigarette parts of an electronic cigarette, said system comprising;

- a transport device comprising multiple holding units for holding the cigarette parts, wherein the holding units are positioned at a holding distance from each other while forming a circular configuration, and the transport device comprises a transporter drive by which the holding units are moved at a speed in a rotation direction along a circular trajectory having a centre,
- a supply unit which places the cigarette parts in the holding units of the transport device at a receiving location along the circular trajectory so that the cigarette parts are transported along at least part of the circular trajectory,
- a discharge unit which removes the cigarette part from the holding units at a discharge location along the circular trajectory,
- a pivot device comprising multiple processing units positioned along at least a part of the circular trajectory at a process distance from each other which corresponds with the holding distance between the holding units so that the processing units can be associated with the cigarette parts held by the holding units, wherein;

-- the pivot device is pivotable about a pivot axis extending through the centre of the circular trajectory,
-- the pivot device comprises a pivot drive to alternately pivot the processing units from a first radial position to a second radial position in a first pivot direction parallel to the circular trajectory and in the rotation direction of the transport device and synchronously with the cigarette parts transported by the transport device and subsequently back from the second radial position to the first radial position in a second pivot direction parallel to the circular trajectory and opposite to the rotation direction of the transport device,
-- in the first radial position, each processing unit is positioned in an associated position relative to one of the cigarette parts held by the holding units of the transport device, and
-- each processing unit performs the processing step on the cigarette part associated with said processing unit while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts.

2. System according to clause 1, wherein the pivot device comprises an axial drive which moves the processing units located near or at the first radial position towards said associated cigarette parts into a second axial position, while maintaining the processing units in the second axial position during the pivoting to the second radial position, and subsequently moves the processing units located near or at the second radial position away from said associated cigarette parts into a first axial position, while maintaining the processing units in the first axial position during the pivoting to the first radial position.

3. System according to clause 2, wherein the processing units located in the second axial position are in contact with said associated cigarette parts and the processing units located in the first axial position are not in contact with said associated cigarette parts.

4. System according to clause 3, wherein each processing unit comprises a first electrical unit contact member which in the second axial position is in contact with a first electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said first electrical cigarette contact members.

5. System according to clause 3 or 4, wherein each processing unit comprises a second electrical unit contact member which in the second axial position is in contact with a second electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said second electrical cigarette contact members.

6. System according to any of the preceding clauses, wherein the pivot device comprises at least one electrically conductive wire having a wire part extending in the direction of the pivot axis and located between the processing units and the pivot axis, which at least one electrically conductive wire is electronically connected with at least one of the processing units.

7. System according to clause 6, wherein the system comprises more than one of the at least one electrically conductive wire.

8. System according to clause 6 or 7, wherein each processing unit is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said processing unit.

9. System according to any of the preceding clauses, wherein the pivot axis and the processing units are located at a radial distance from each other, which radial distance is measured in a direction perpendicular to the pivot axis.

10. System according to clause 9, wherein the wire part of the at least one electrically conductive wire is located between 0% - 50%, preferably 0% - 33%, of the radial distance when measured from the pivot axis towards the processing units.

11. System according to any of the clauses 6-8, 10, wherein at least one electrically conductive wire is electronically connected to the first electrical unit contact members of the processing units.

12. System according to any of the clauses 6-8, 10, 11, wherein each first electrical unit contact member is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said first electrical unit contact member.

13. System according to any of the clauses 6-8, 10-12, wherein at least one electrically conductive wire is electronically connected to the second electrical unit contact members of the processing units.

14. System according to any of the clauses 6-8, 10-13, wherein each second electrical unit contact member is electrically connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said second electrical unit contact member.

15. System according to any of the clauses 6-8, 10-14, wherein each processing unit comprises a sensor which is connected to one of the electrically conductive wires, and said electrically conductive wire is only connected to said sensor.

16. System according to clause 15, wherein the sensor is a vapour sensor and the cigarette parts comprise a vaporizer.

17. System according to any of the preceding clauses, wherein;

- the system is controlled by a control device having a memory,
- the first electrical unit contact members of the processing units are connected to an electrical power supply,
- the first electrical unit contact members are placed in contact with the first electrical cigarette contact members of said associated cigarette parts when the processing units are placed in the second axial position to activate the vapor-

izers,
- the vapour sensors are configured to detect vapour produced by the activated vaporizers,
- the vapour sensors are electronically connected to the control device, and
- the control device is configured to determine from each vapour sensor whether vapour has been detected and to store in the memory:

    a) from which vaporizers of said associated cigarette parts vapour was detected, or
    b) from which vaporizers of said associated cigarette parts no vapour was detected.

18. System according to clause 17, wherein the control device is operatively connected with the transporter drive and the pivot drive.

19. System according to clause 17 or 18, wherein the control device is operatively connected with the axial drive.

20. System according to any of the preceding clauses, wherein the pivot device comprises at least one fluid duct having a duct part extending in the direction of the pivot axis and located between the processing units and the pivot axis, which at least one fluid duct is in fluid communication with at least one of the processing units.

21. System according to clause 20, and in combination with clause 9, wherein the duct part of the at least one fluid duct is located between 0% - 50%, preferably 0% - 33%, of the radial distance when measured from the pivot axis towards to the processing units.

22. System according to clause 20 or 21, and in combination with clause 16, wherein the vapour sensors are in fluid communication with the fluid duct which is connected to an air pump to create an airflow from the vapour sensors to the fluid duct.

23. System according to clause 22, wherein an air guide is provided near or at the vapour sensors, and the air guide is in fluid communication with the at least one fluid duct which is connected to the air pump to create an airflow from the vapour sensors to the fluid duct to discharge the vapour produced by the activated vaporizers of the associated cigarette parts.

24. System according to clause 22 or 23, wherein the control device is operatively connected with the air pump.

25. System according to any of the preceding clauses, wherein the processing units together cover 50% of the circular trajectory.

26. System according to any of the preceding clauses, wherein the transport device comprises a rotary wheel having an outer peripheral surface provided with the holding units.

27. Method for performing a processing step on cigarette parts of an electronic cigarette with a system according to any of the preceding clauses, said method comprising the step of performing the processing step on the cigarette parts associated with the processing units while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts.

[0079] As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure. Further, the terms and phrases used herein are not intended to be limiting, but rather, to provide an understandable description of the invention.

[0080] The terms "a" or "an", as used herein, are defined as one or more than one. The term multiple, as used herein, is defined as two or more than two. The terms including and/or having, as used herein, are defined as comprising (i.e., open language, not excluding other elements or steps). Any reference signs in the claims should not be construed as limiting the scope of the claims or the invention.

[0081] It will be apparent to those skilled in the art that various modifications can be made to the system without departing from the scope as defined in the claims.

Claims

1. System for performing a processing step on cigarette parts of an electronic cigarette, said system comprising;

    - a transport device comprising multiple holding units for holding the cigarette parts, wherein the holding units are positioned at a holding distance from each other while forming a circular configuration, and the transport device comprises a transporter drive by which the holding units are moved at a speed in a rotation direction along a circular trajectory having a centre,
    - a supply unit which places the cigarette parts

in the holding units of the transport device at a receiving location along the circular trajectory so that the cigarette parts are transported along at least part of the circular trajectory,
- a discharge unit which removes the cigarette part from the holding units at a discharge location along the circular trajectory,
- a pivot device comprising multiple processing units positioned along at least a part of the circular trajectory at a process distance from each other which corresponds with the holding distance between the holding units so that the processing units can be associated with the cigarette parts held by the holding units, wherein;

-- the pivot device is pivotable about a pivot axis extending through the centre of the circular trajectory,
-- the pivot device comprises a pivot drive to alternately pivot the processing units from a first radial position to a second radial position in a first pivot direction parallel to the circular trajectory and in the rotation direction of the transport device and synchronously with the cigarette parts transported by the transport device and subsequently back from the second radial position to the first radial position in a second pivot direction parallel to the circular trajectory and opposite to the rotation direction of the transport device,
-- in the first radial position, each processing unit is positioned in an associated position relative to one of the cigarette parts held by the holding units of the transport device, and
-- each processing unit performs the processing step on the cigarette part associated with said processing unit while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts.

2. System according to claim 1, wherein the pivot device comprises an axial drive which moves the processing units located near or at the first radial position towards said associated cigarette parts into a second axial position, while maintaining the processing units in the second axial position during the pivoting to the second radial position, and subsequently moves the processing units located near or at the second radial position away from said associated cigarette parts into a first axial position, while maintaining the processing units in the first axial position during the pivoting to the first radial position.

3. System according to claim 2, wherein the processing units located in the second axial position are in contact with said associated cigarette parts and the processing units located in the first axial position are not in contact with said associated cigarette parts.

4. System according to claim 3, wherein each processing unit comprises a first electrical unit contact member which in the second axial position is in contact with a first electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said first electrical cigarette contact members.

5. System according to claim 3 or 4, wherein each processing unit comprises a second electrical unit contact member which in the second axial position is in contact with a second electrical cigarette contact member provided on each of said associated cigarette parts and in the in the first axial position is not in contact with said second electrical cigarette contact members.

6. System according to any of the preceding claims, wherein the pivot device comprises at least one electrically conductive wire having a wire part extending in the direction of the pivot axis and located between the processing units and the pivot axis, which at least one electrically conductive wire is electronically connected with at least one of the processing units.

7. System according to any of the preceding claims, wherein the pivot axis and the processing units are located at a radial distance from each other, which radial distance is measured in a direction perpendicular to the pivot axis.

8. System according to claim 7, wherein the wire part of the at least one electrically conductive wire is located between 0% - 50%, preferably 0% - 33%, of the radial distance when measured from the pivot axis towards the processing units.

9. System according to any of the claims 6 or 8, wherein at least one electrically conductive wire is electronically connected to the first electrical unit contact members of the processing units.

10. System according to any of the claims 6, 8, or 9, wherein each processing unit comprises a sensor which is connected to one of the electrically conductive wires, said electrically conductive wire is only connected to said sensor, and the sensor is a vapour sensor and the cigarette parts comprise a vaporizer.

11. System according to any of the preceding claims, wherein;

- the system is controlled by a control device having a memory,

- the first electrical unit contact members of the processing units are connected to an electrical power supply,
- the first electrical unit contact members are placed in contact with the first electrical cigarette contact members of said associated cigarette parts when the processing units are placed in the second axial position to activate the vaporizers,
- the vapour sensors are configured to detect vapour produced by the activated vaporizers,
- the vapour sensors are electronically connected to the control device, and
- the control device is configured to determine from each vapour sensor whether vapour has been detected and to store in the memory:

a) from which vaporizers of said associated cigarette parts vapour was detected, or
b) from which vaporizers of said associated cigarette parts no vapour was detected.

12. System according to any of the preceding claims, wherein the pivot device comprises at least one fluid duct having a duct part extending in the direction of the pivot axis and located between the processing units and the pivot axis, which at least one fluid duct is in fluid communication with at least one of the processing units.

13. System according to any of the preceding claims, wherein the processing units together cover 50% of the circular trajectory.

14. System according to any of the preceding claims, wherein the transport device comprises a rotary wheel having an outer peripheral surface provided with the holding units.

15. Method for performing a processing step on cigarette parts of an electronic cigarette with a system according to any of the preceding claims, said method comprising the step of performing the processing step on the cigarette parts associated with the processing units while the pivot device pivots from the first radial position to the second radial position synchronously with said associated cigarette parts.

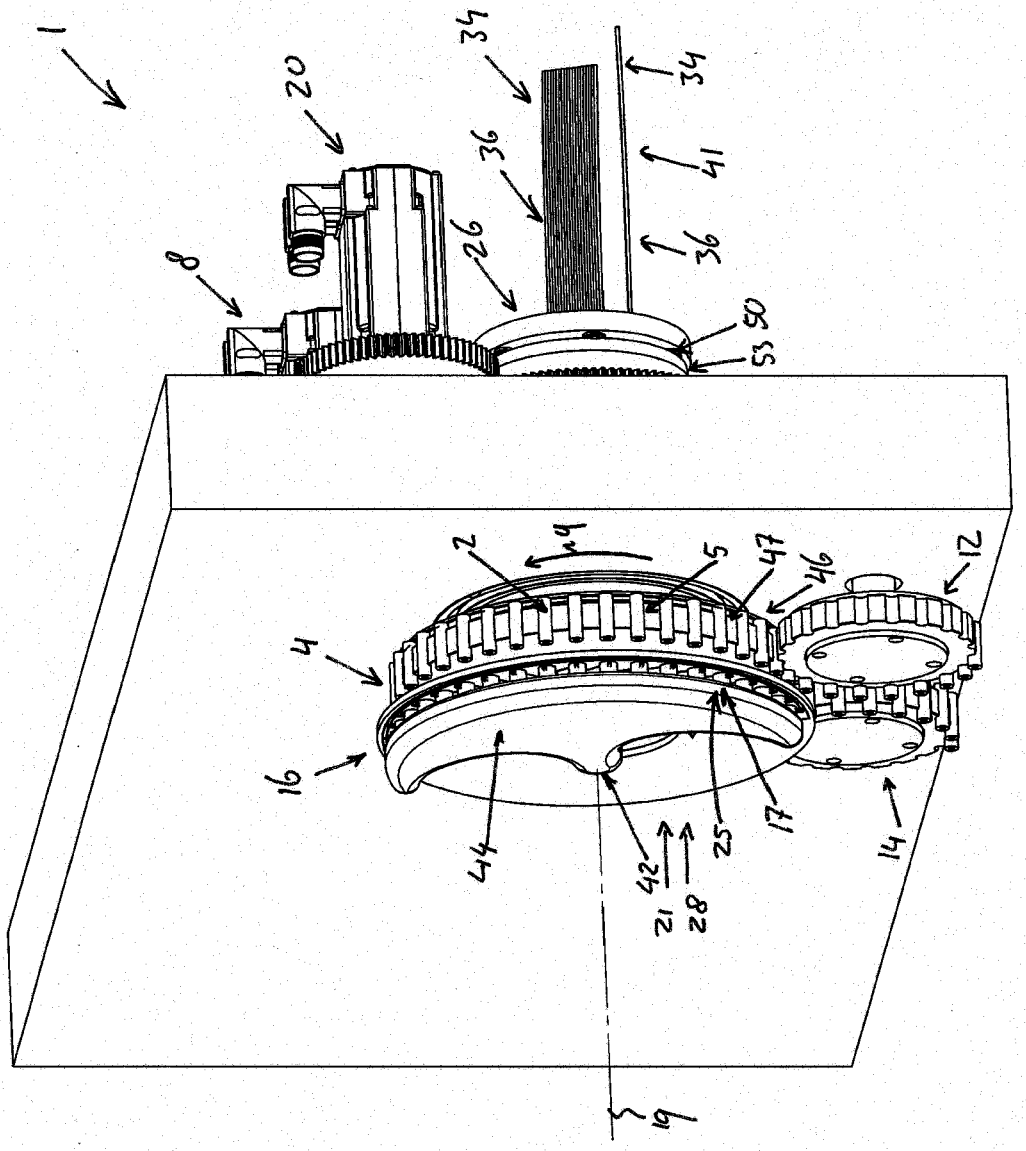

Fig. 1

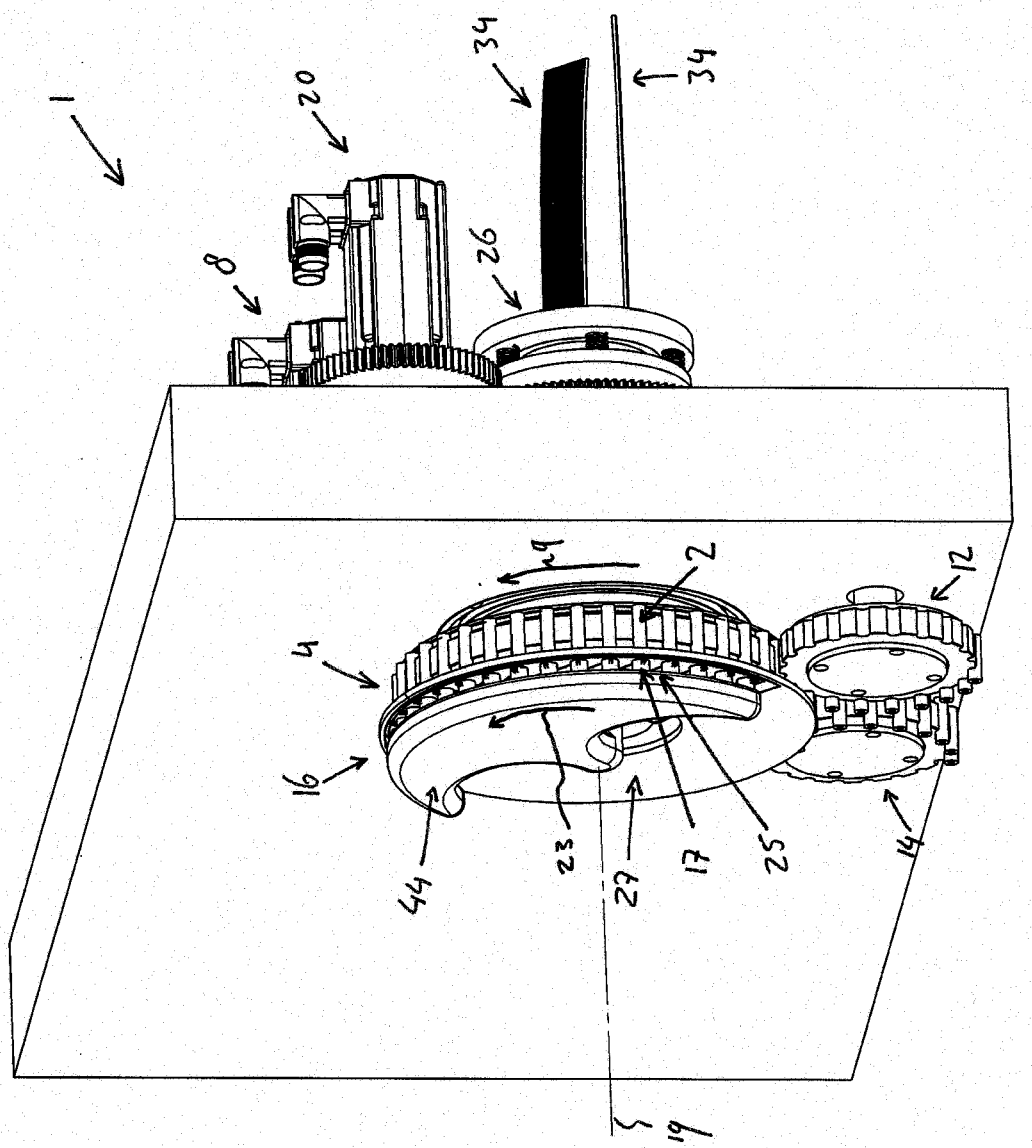

Fig. 2

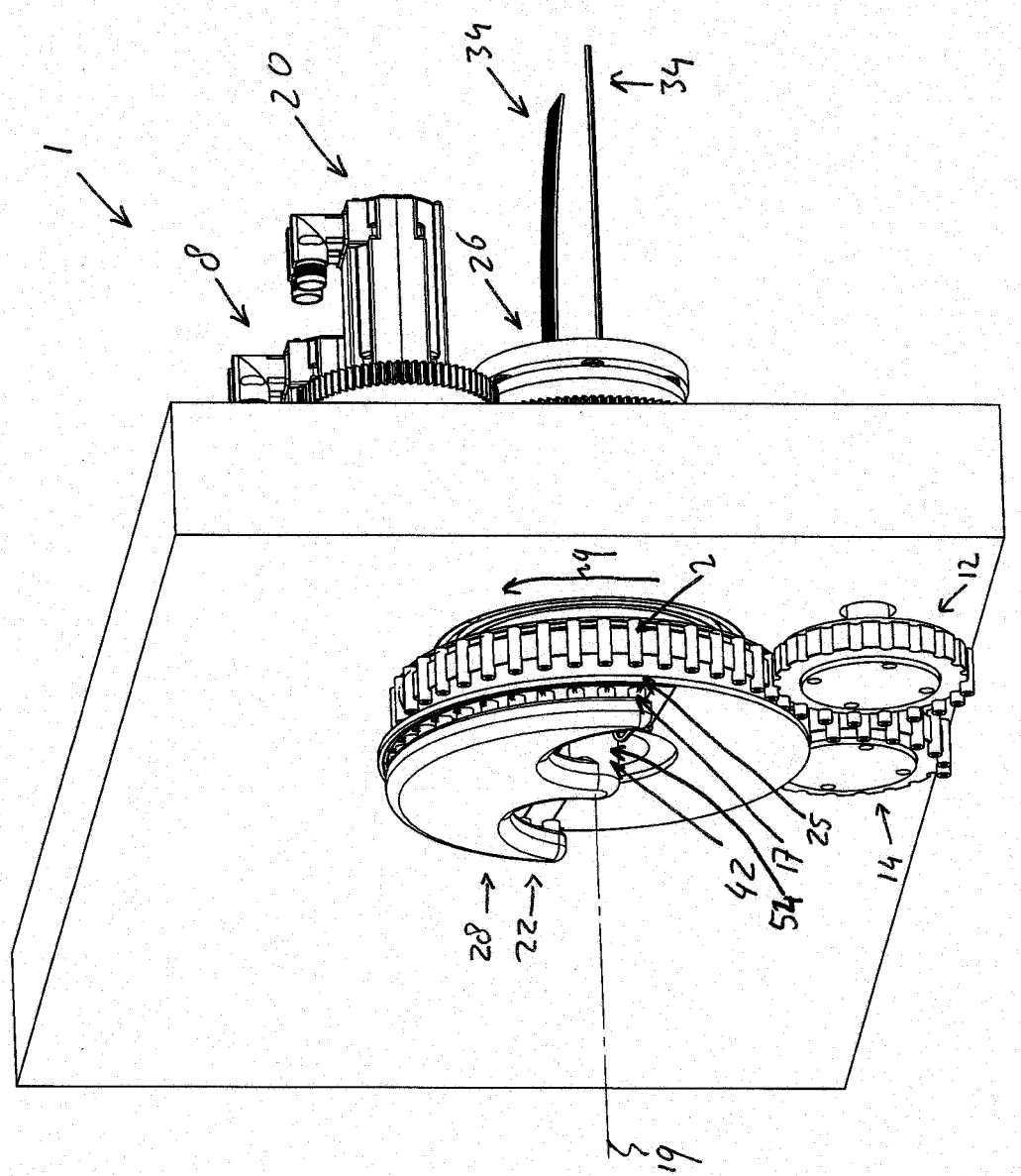

Fig. 3

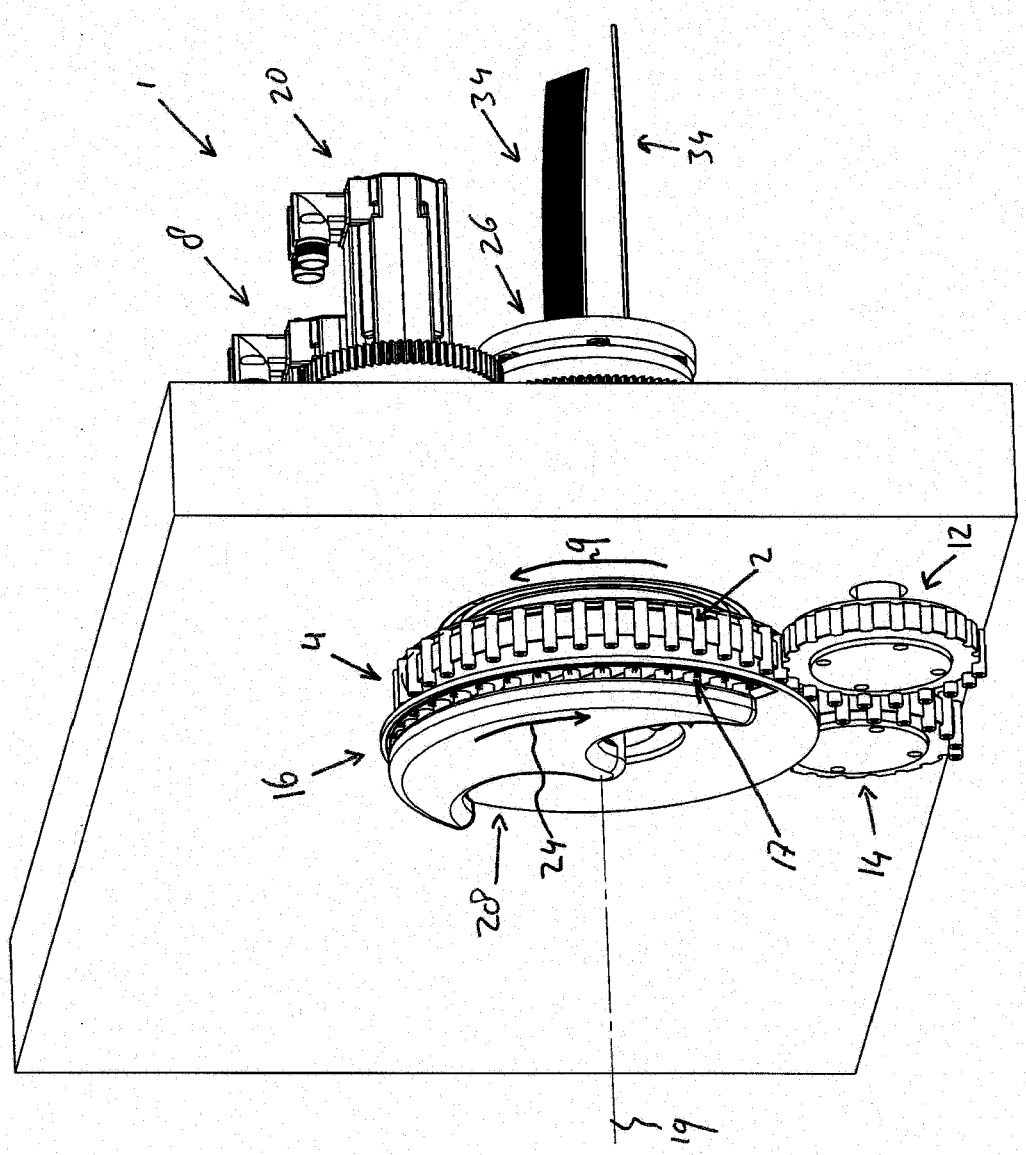

Fig. 4

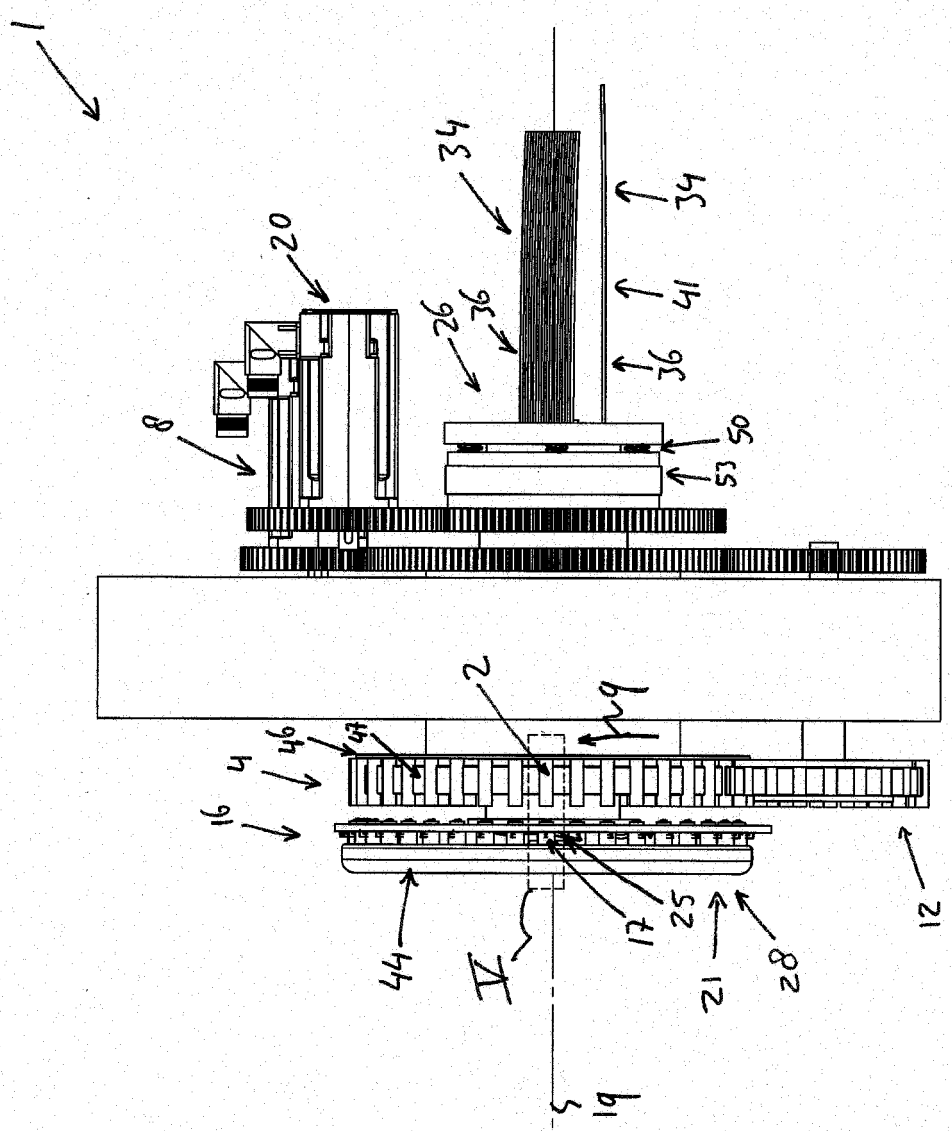

Fig. 5A

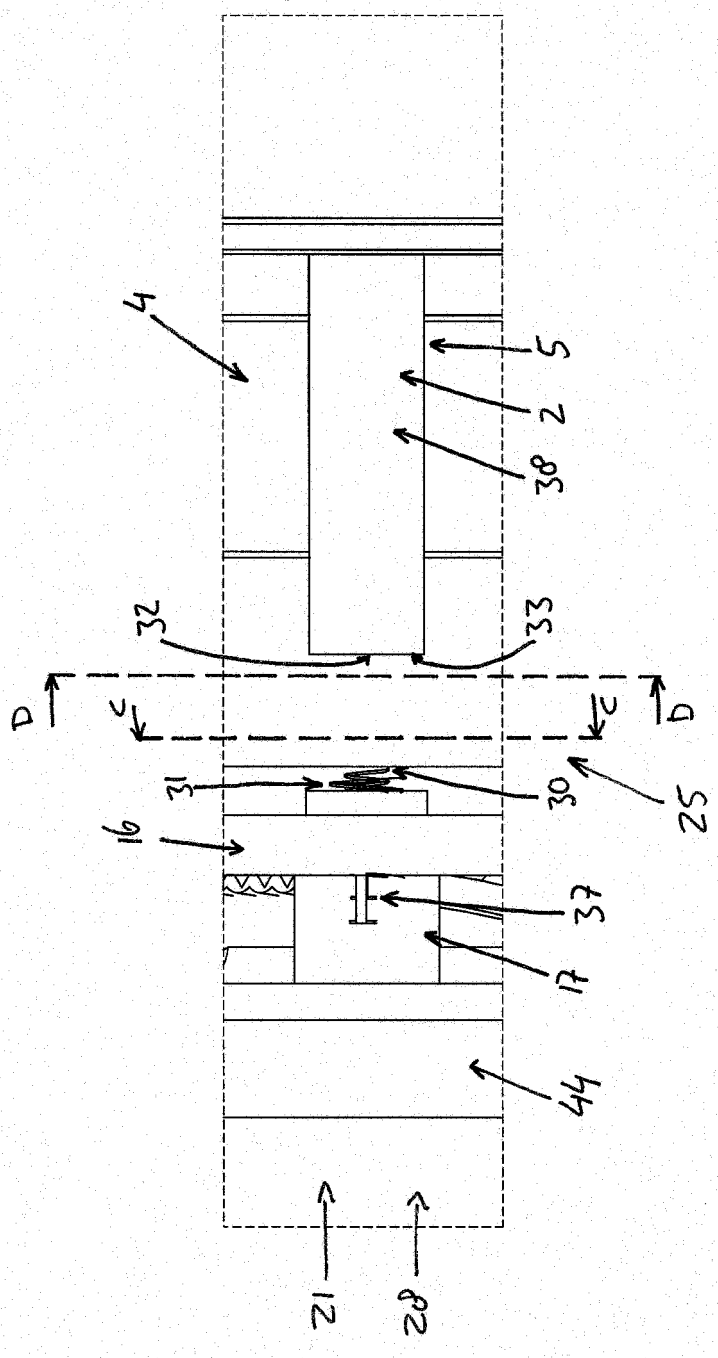

Fig. 5B

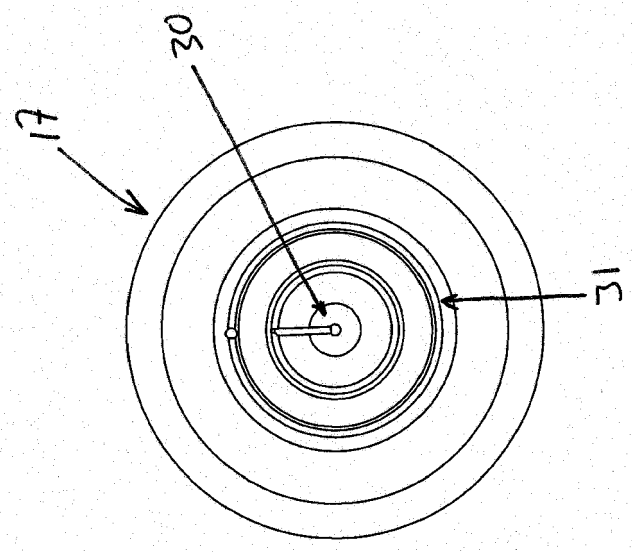

Fig. 5C

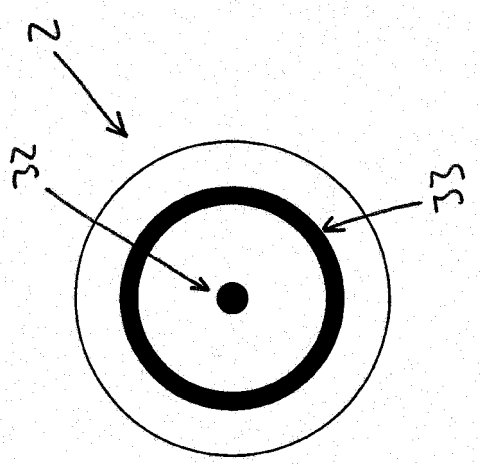

Fig. 5D

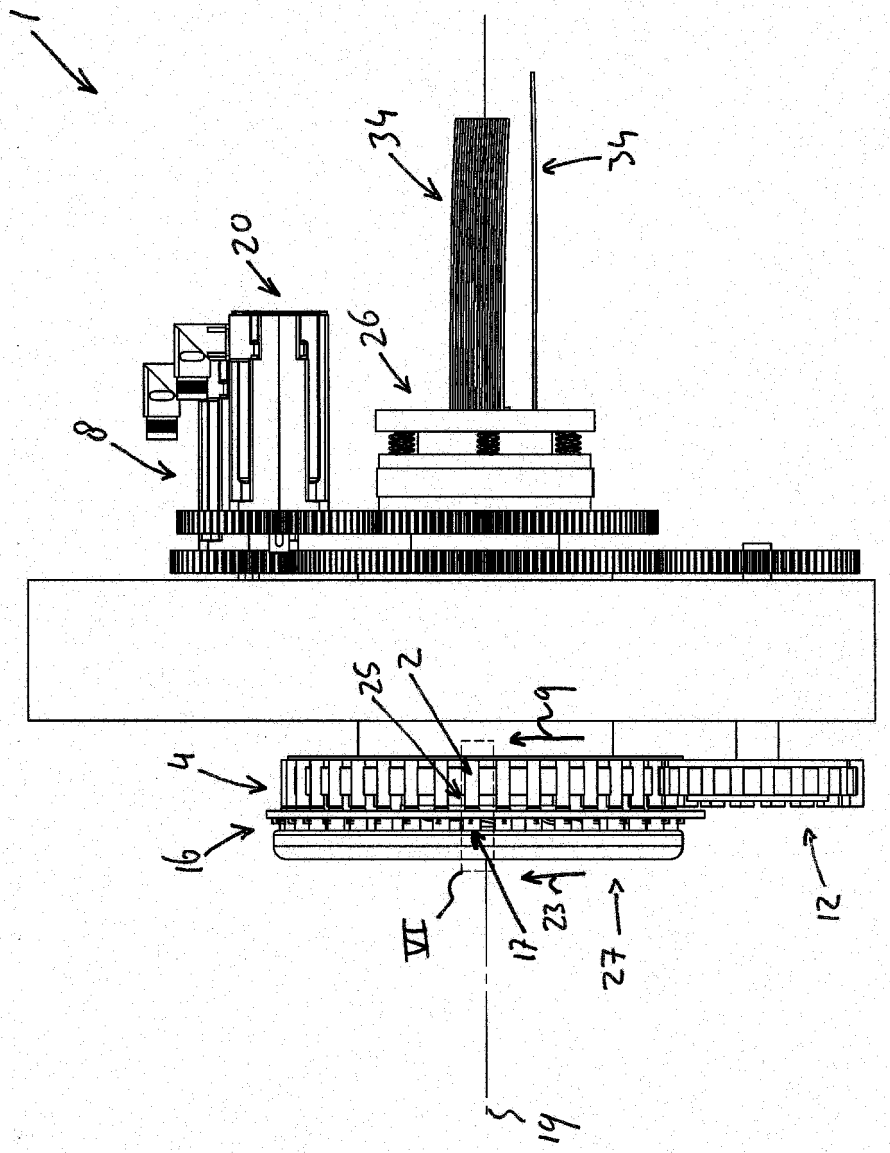

Fig. 6A

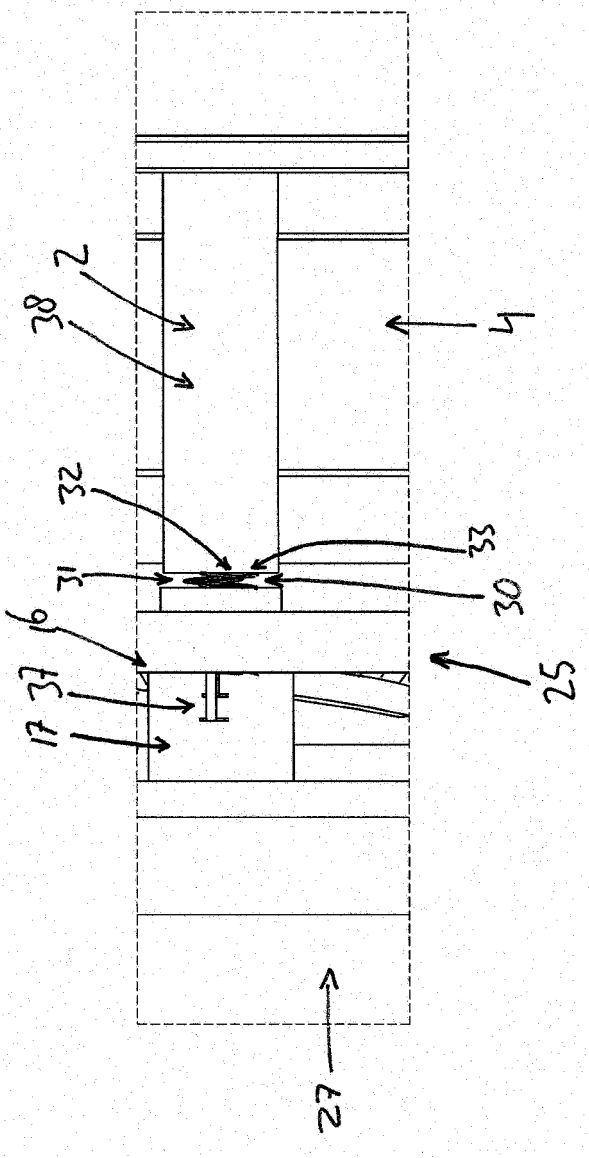

Fig. 6B

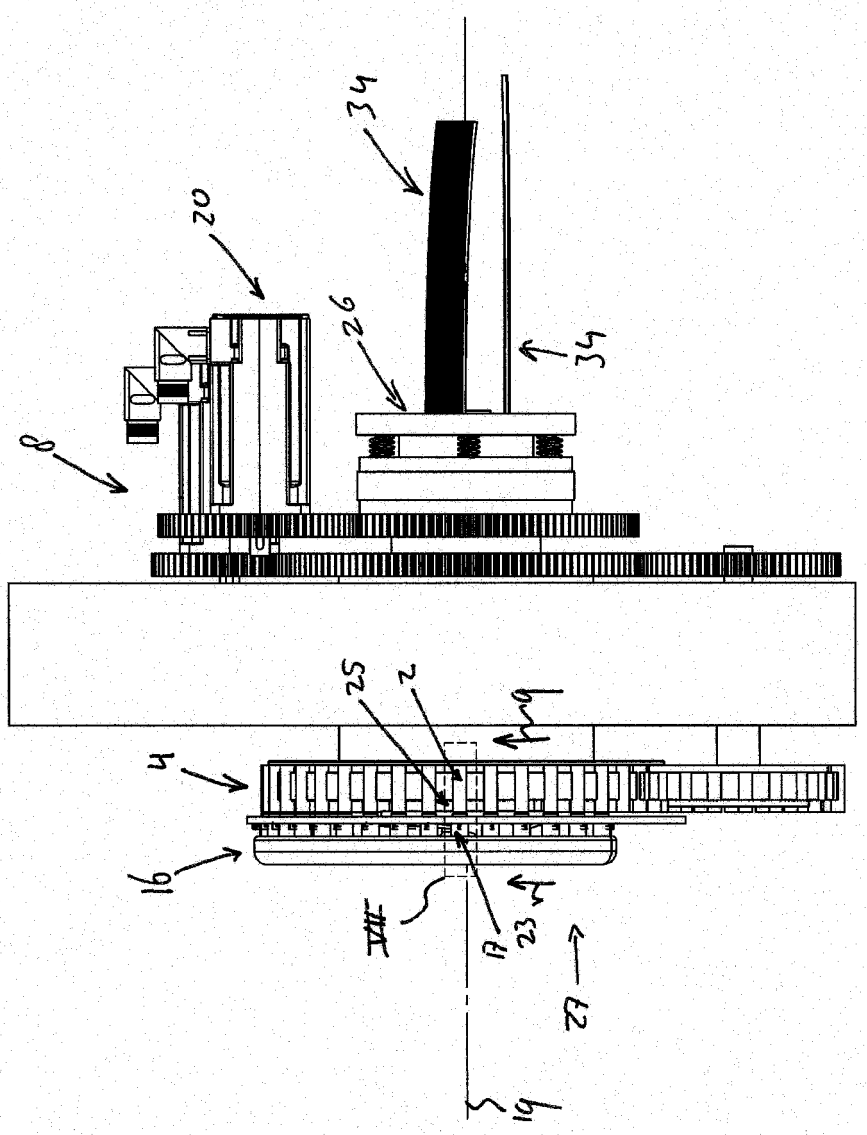

Fig. 7A

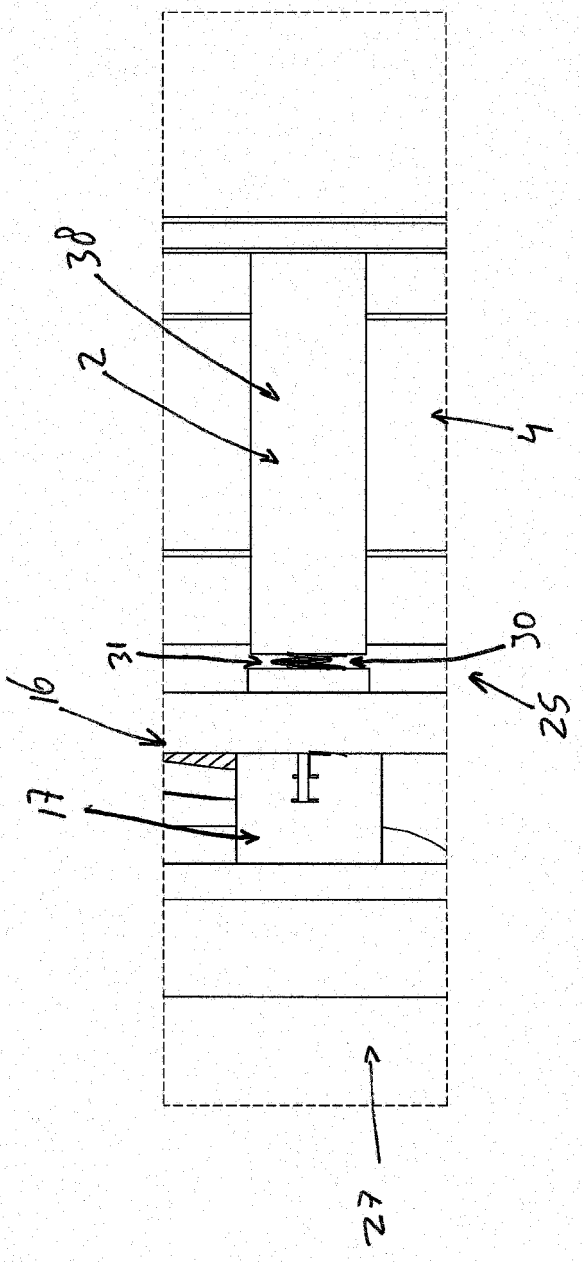

Fig. 7b

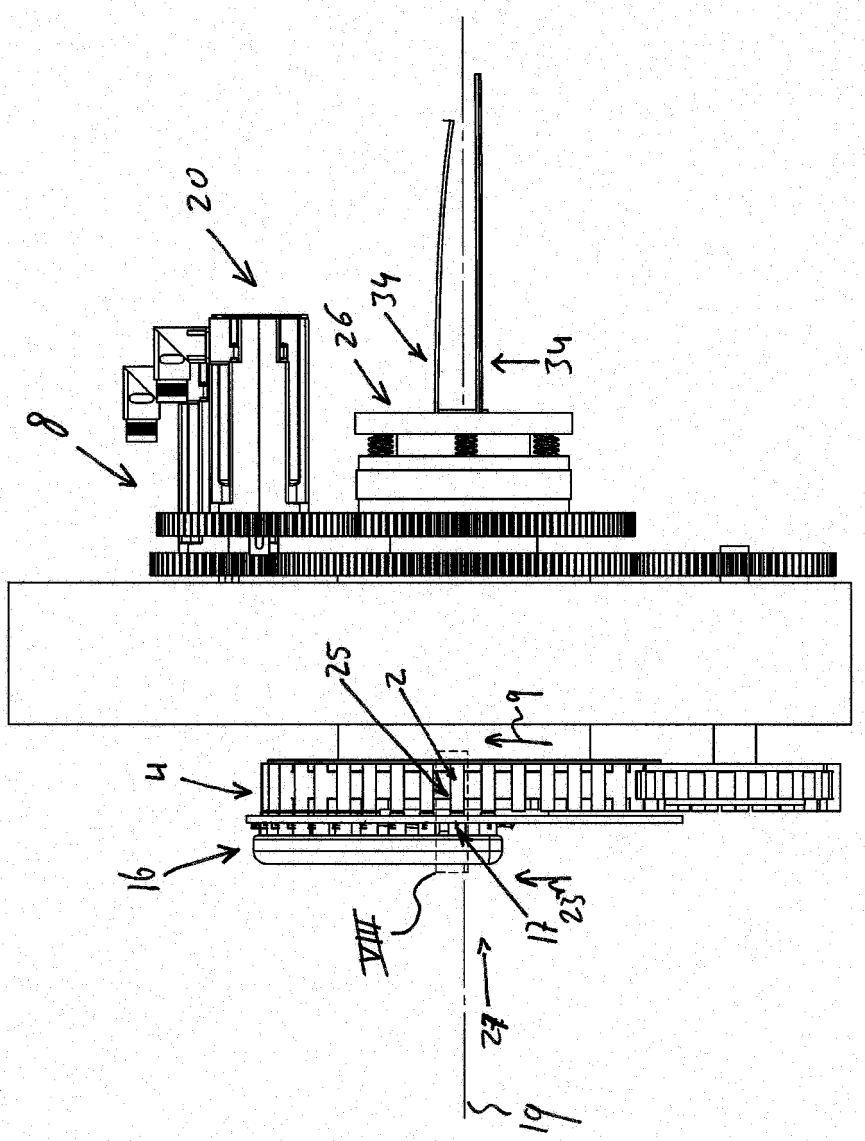

Fig. 8A

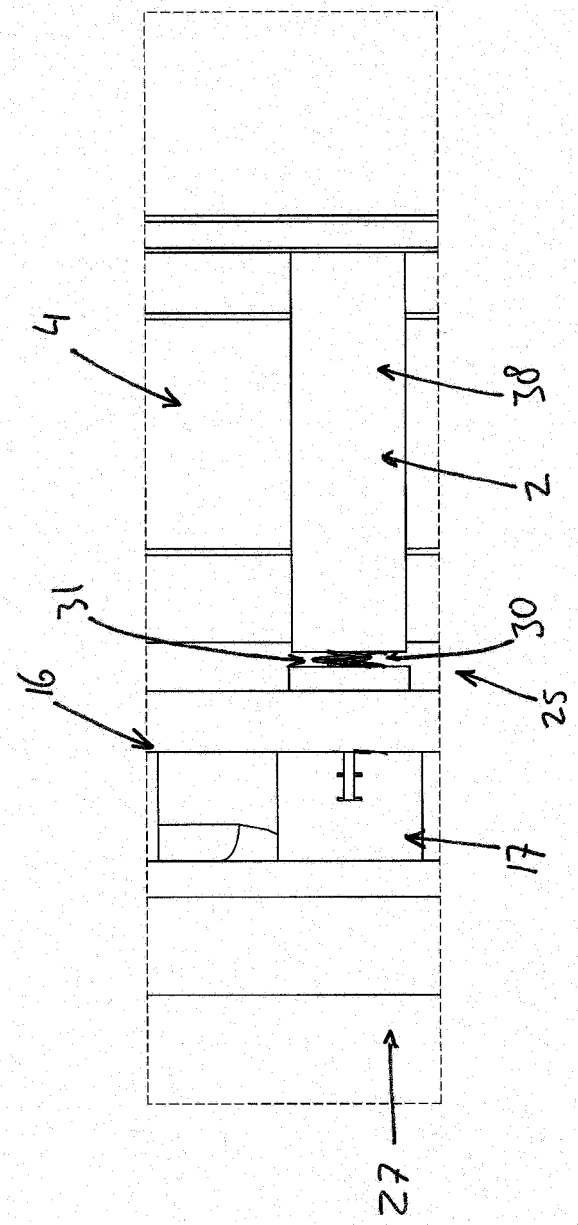

Fig. 8B

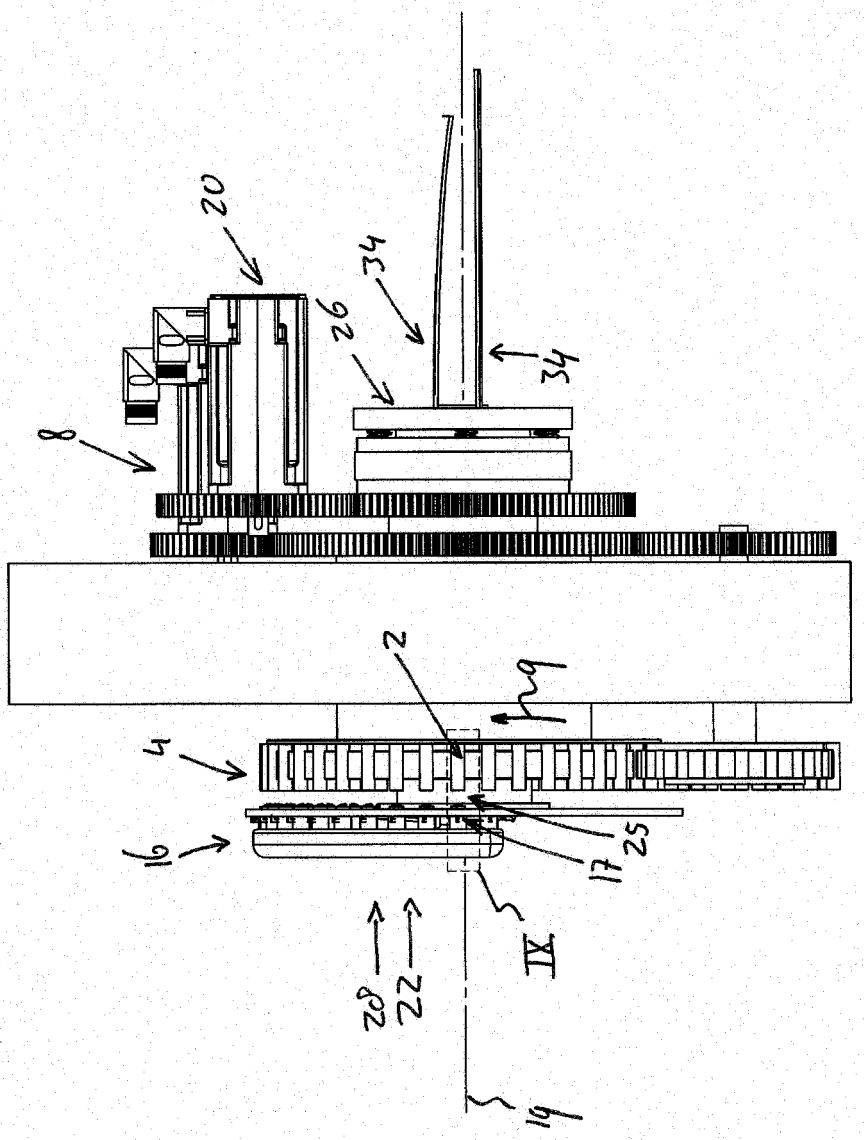

Fig. 9A

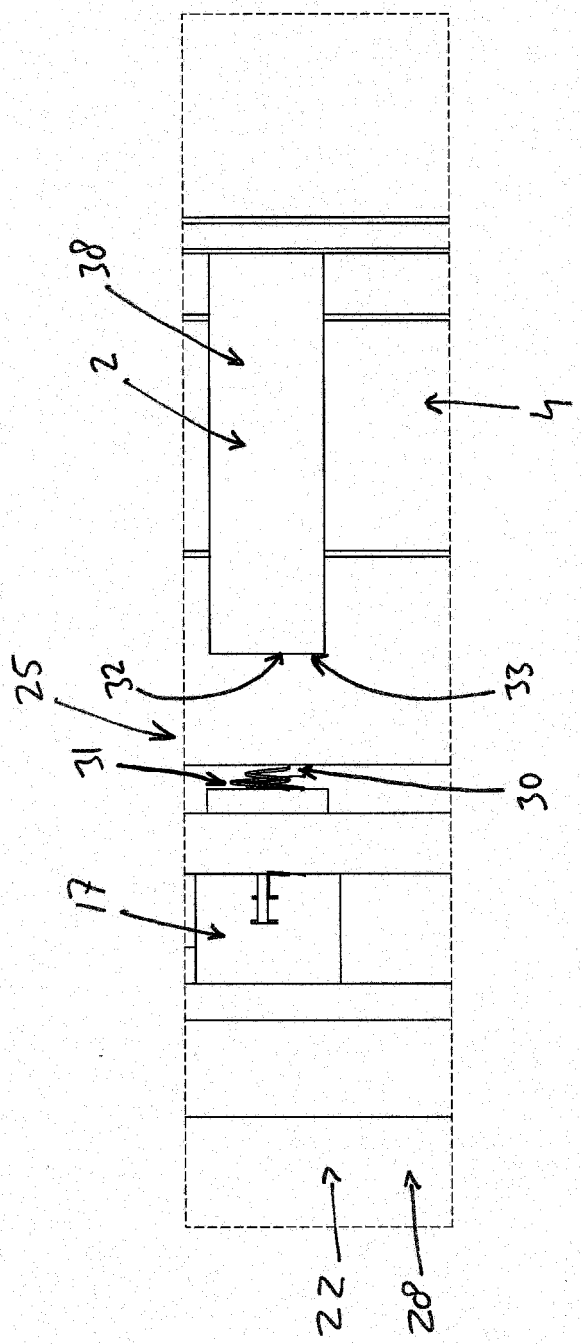

Fig. 9B

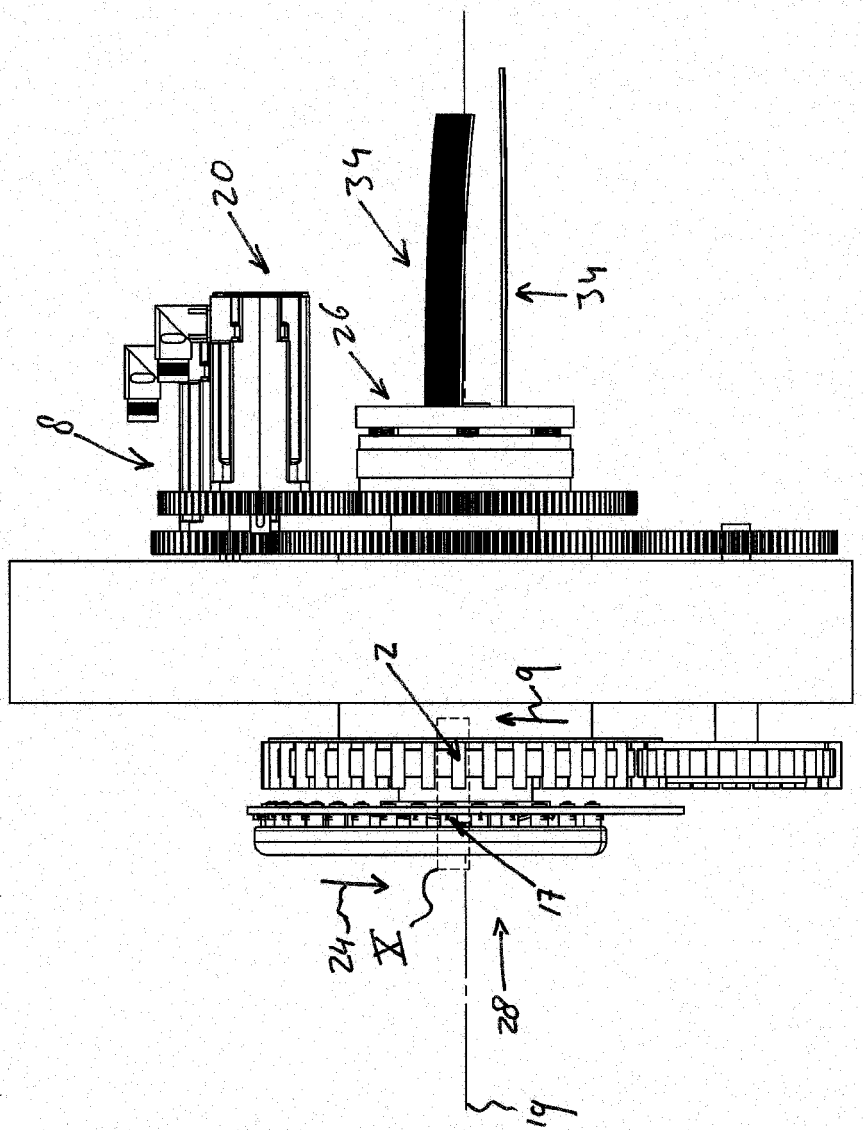

Fig. 10A

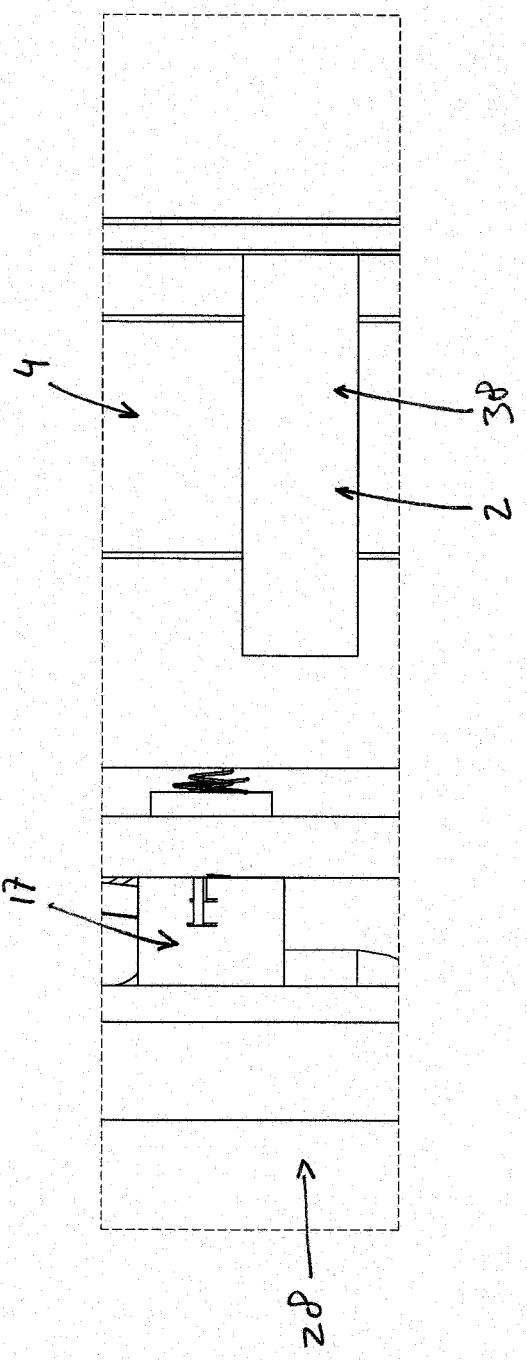

Fig. 10B

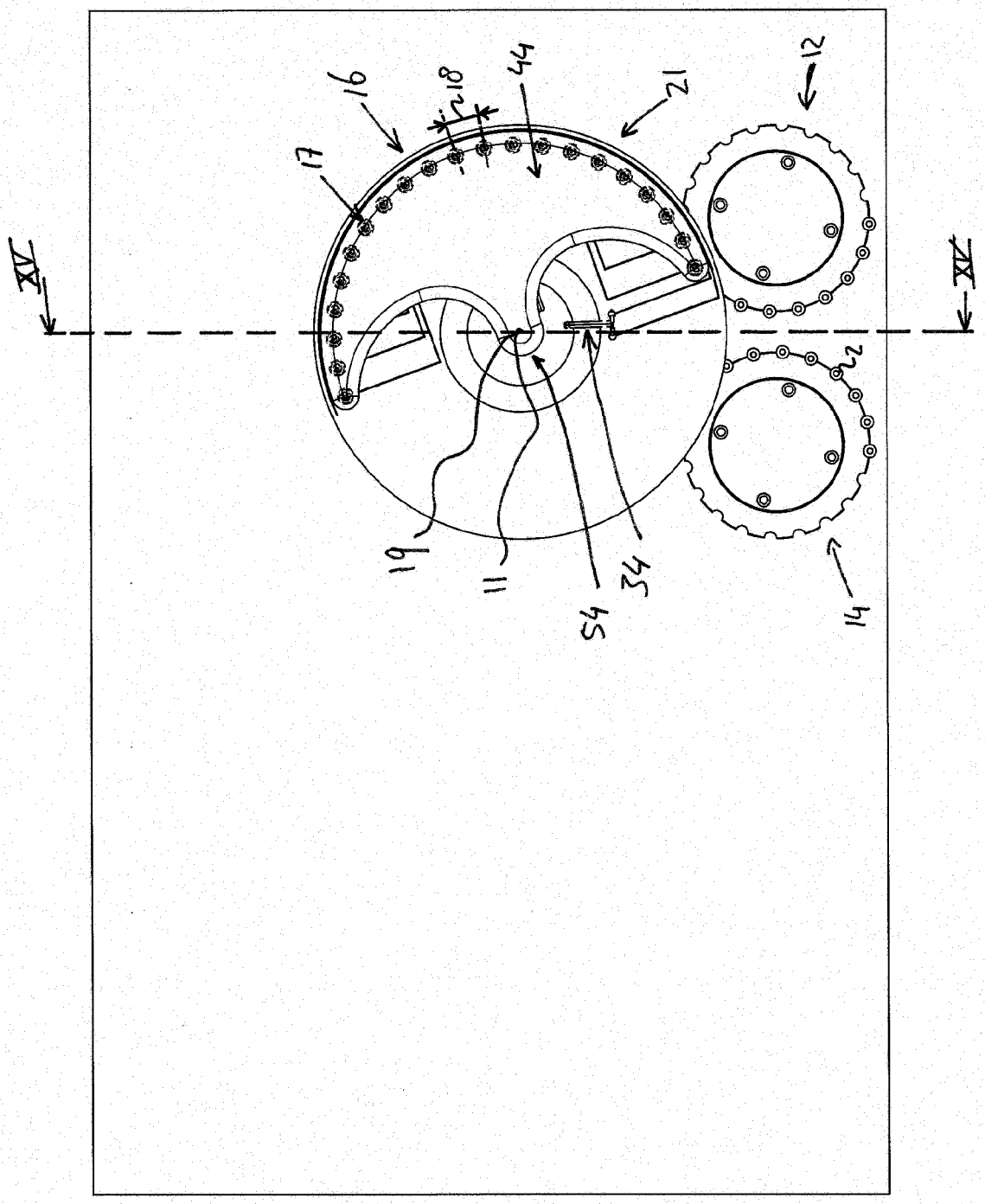

Fig. 11

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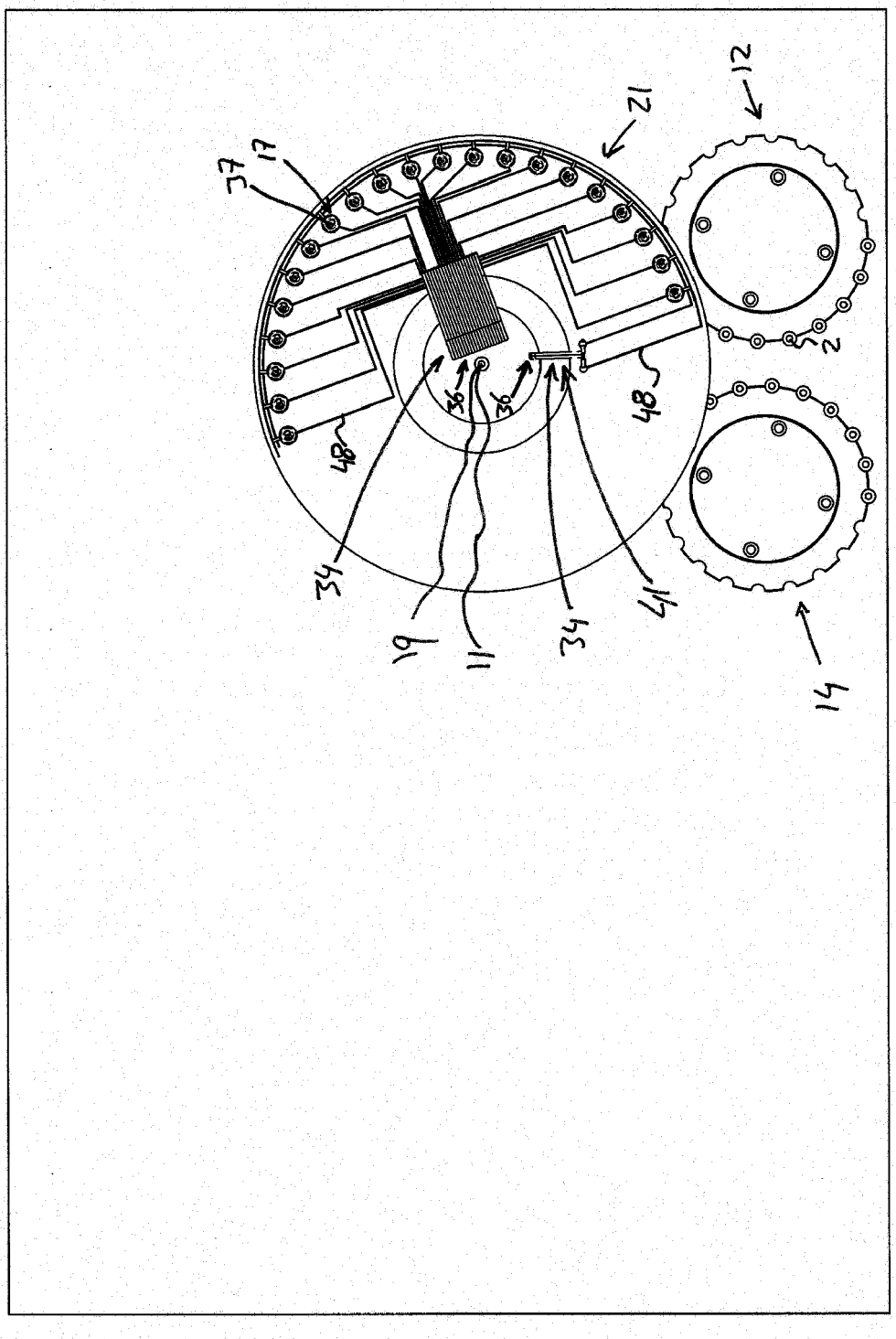

Fig. 12

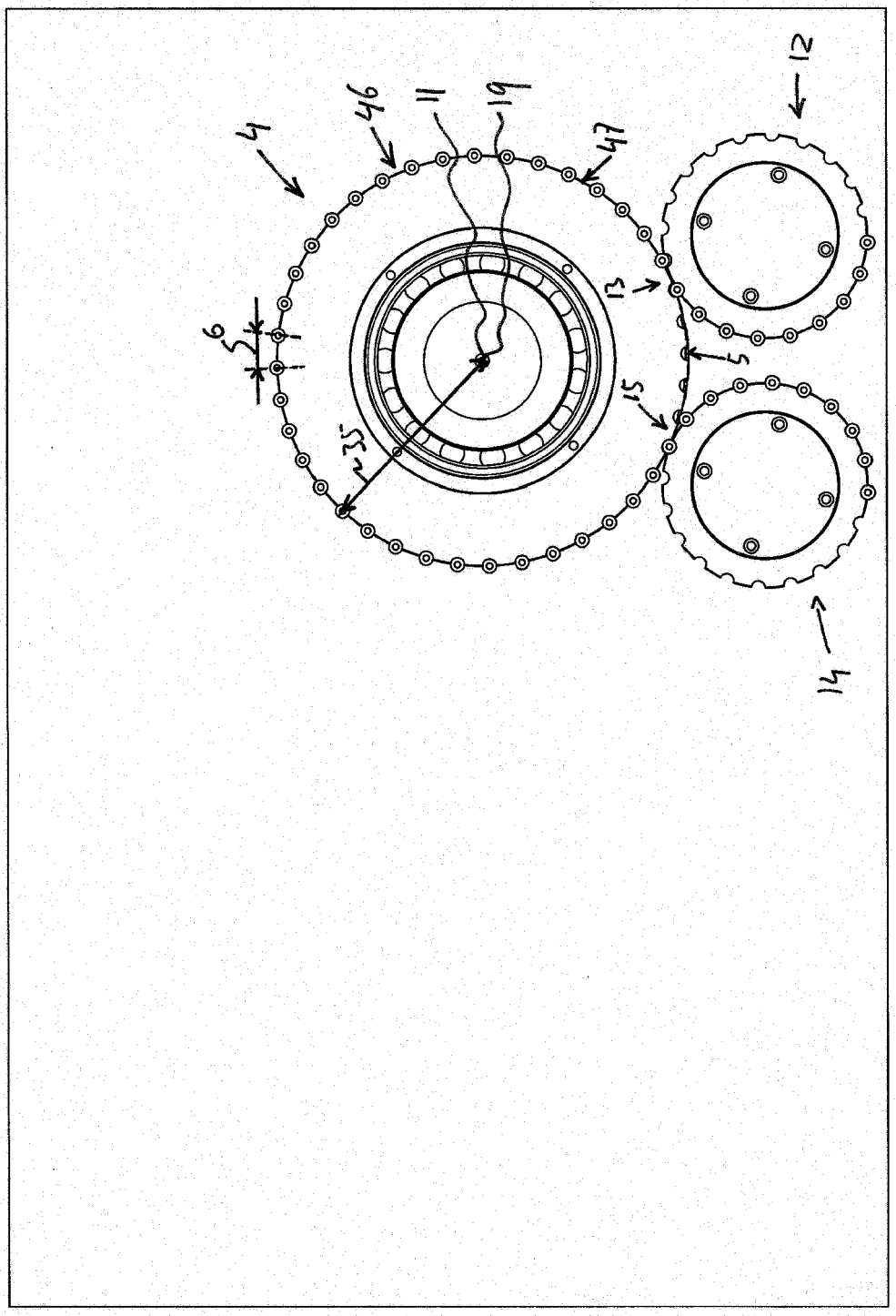

Fig. 13A

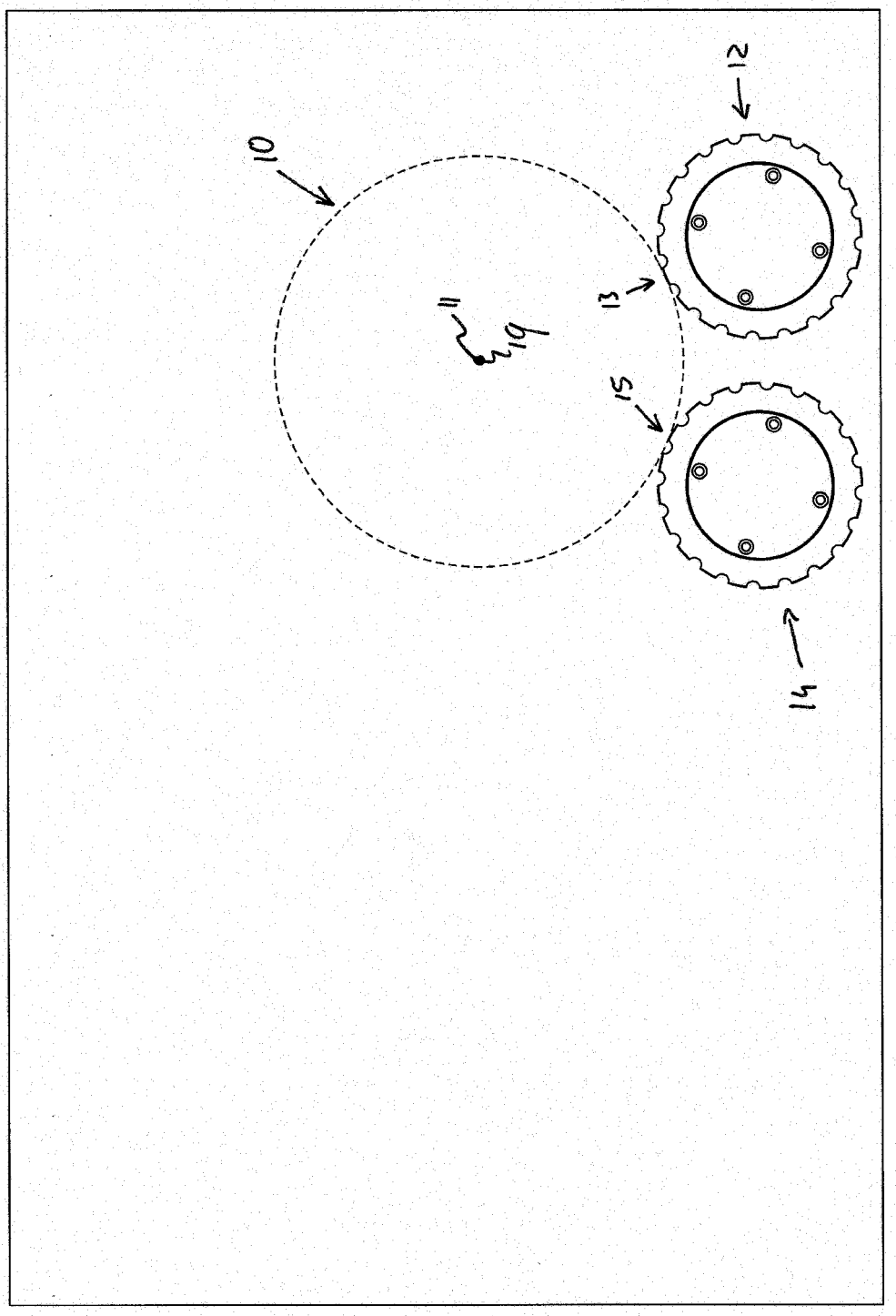

Fig. 13B

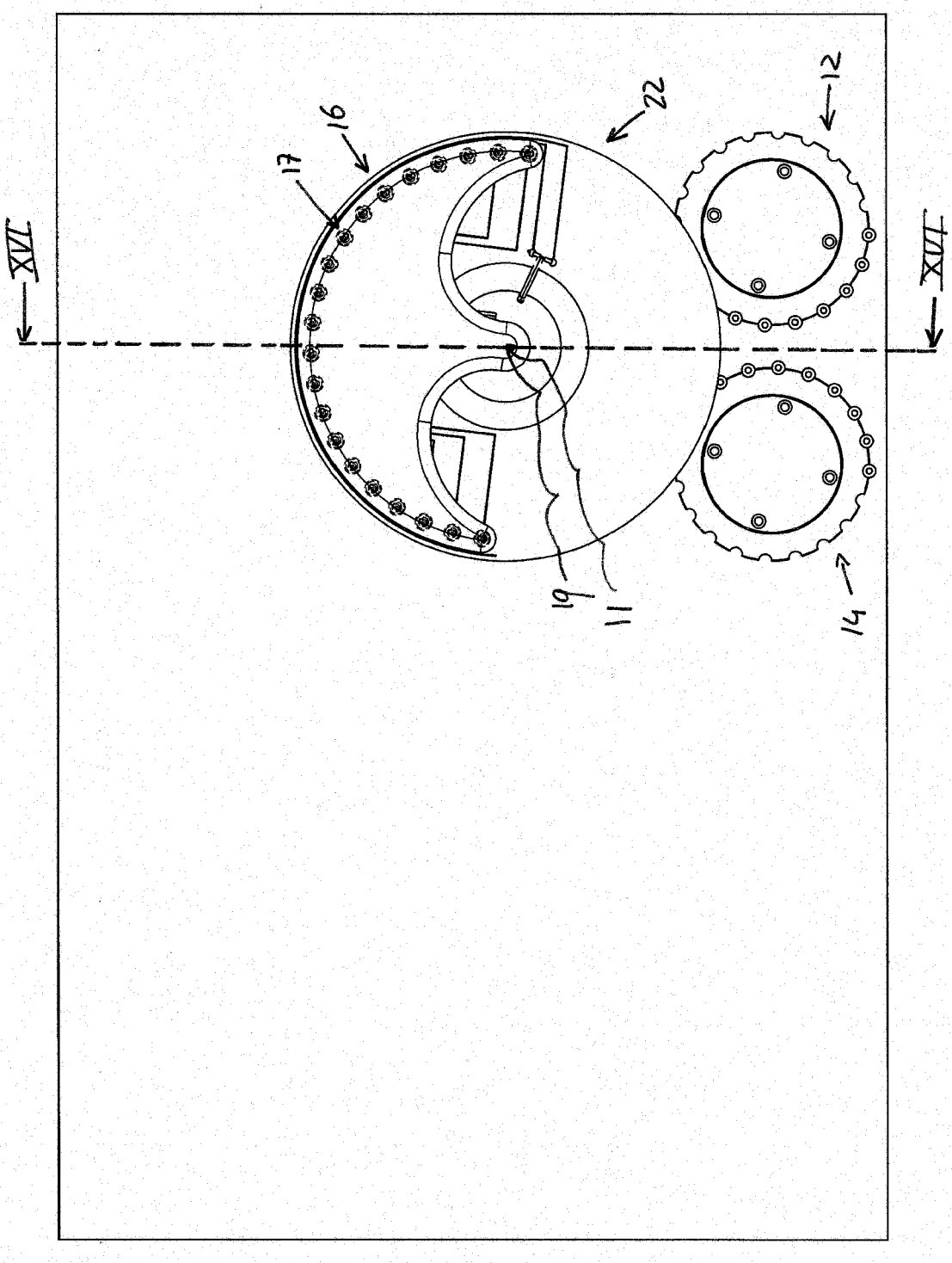

Fig. 14

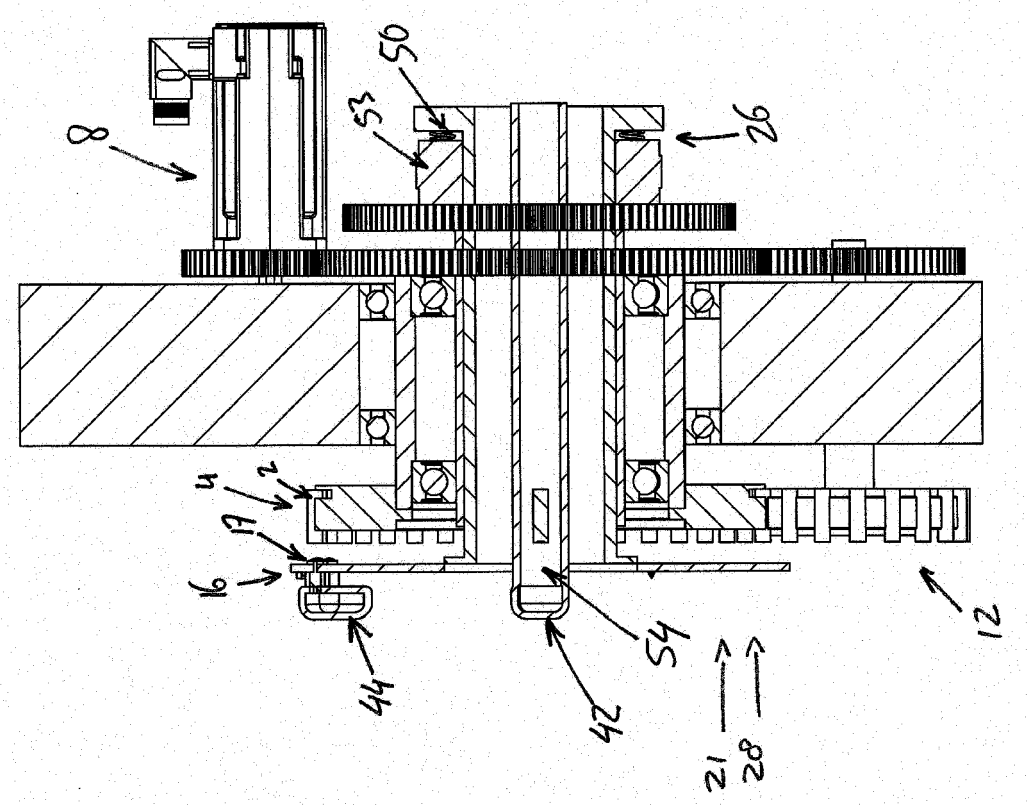

Fig. 15

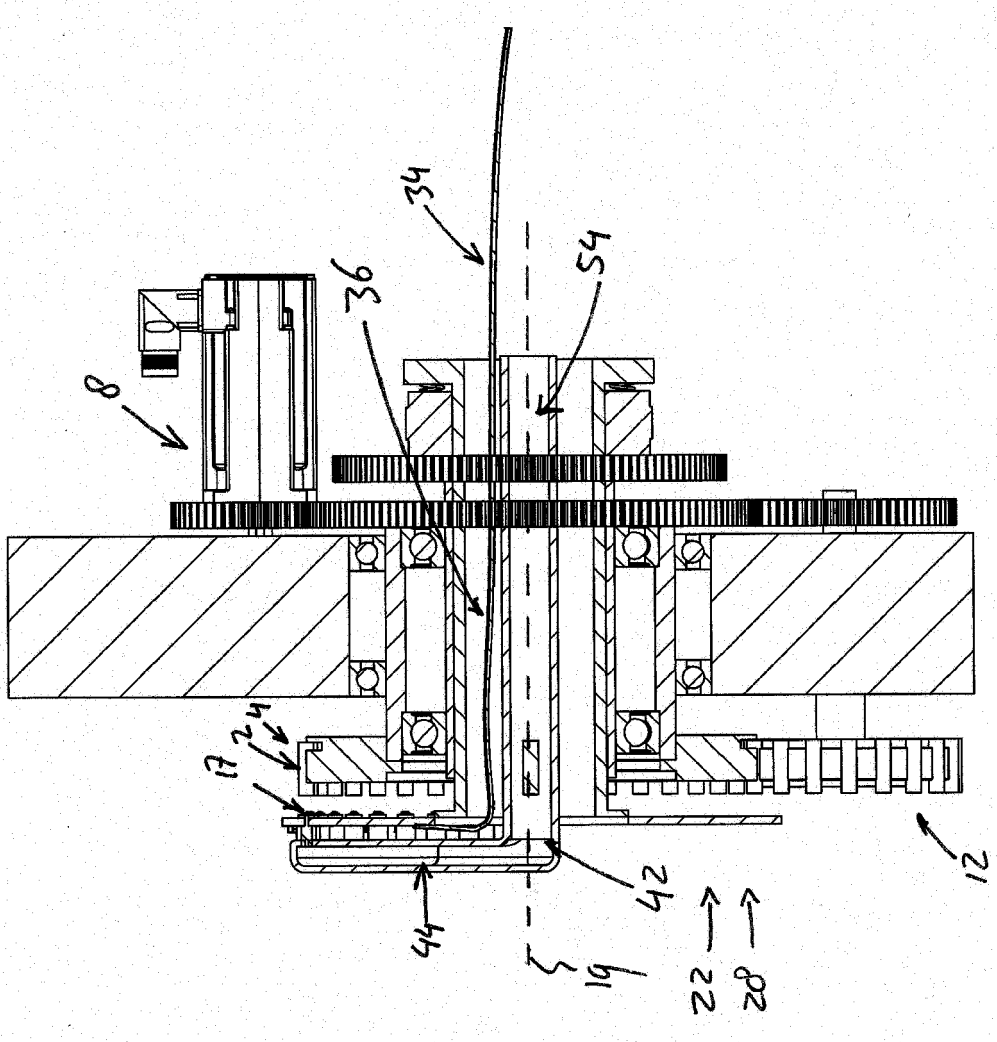

Fig. 16

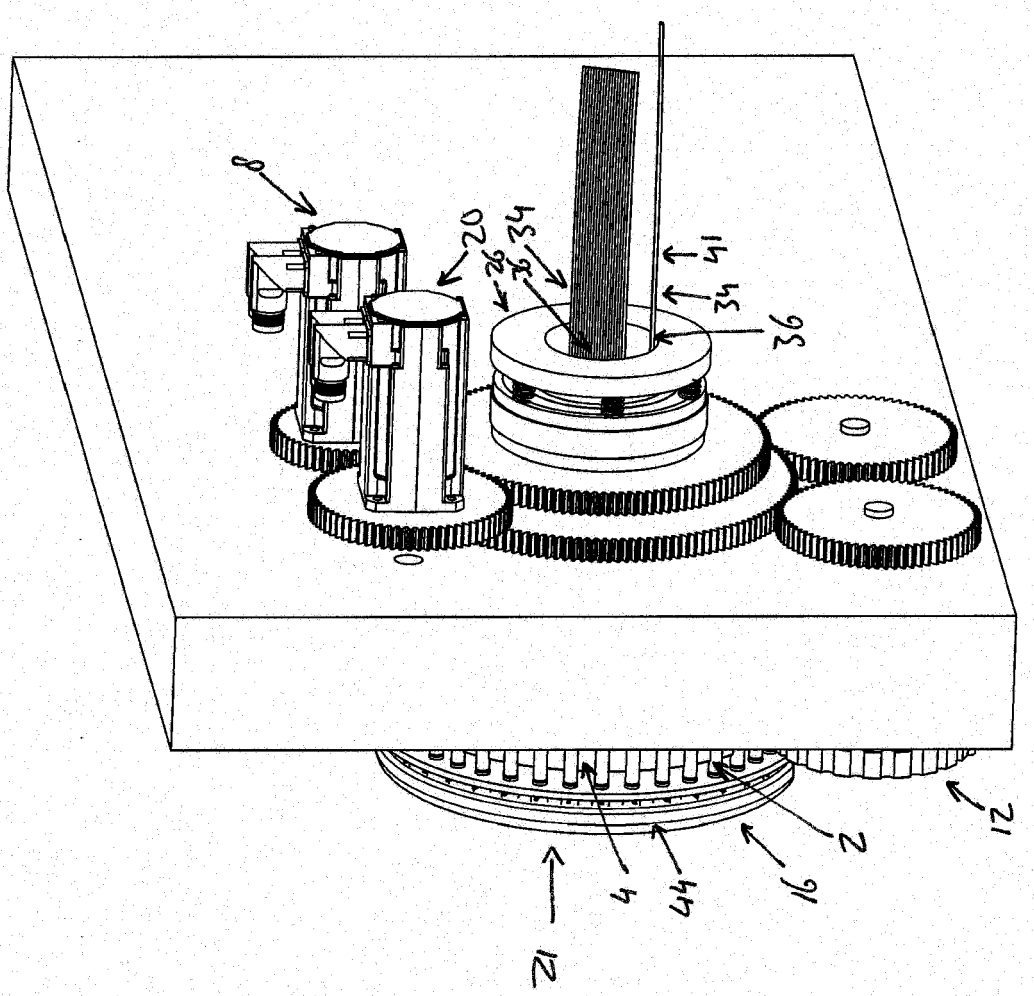

Fig. 17

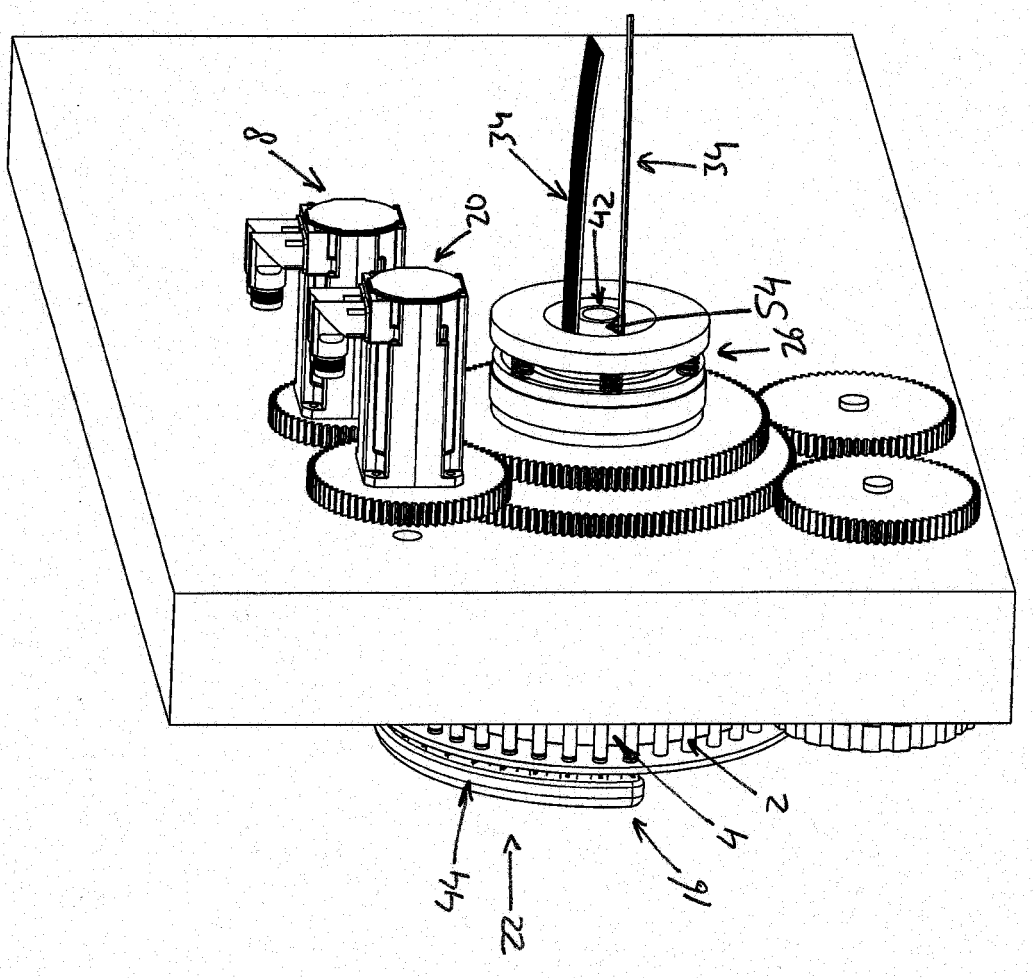

Fig. 18

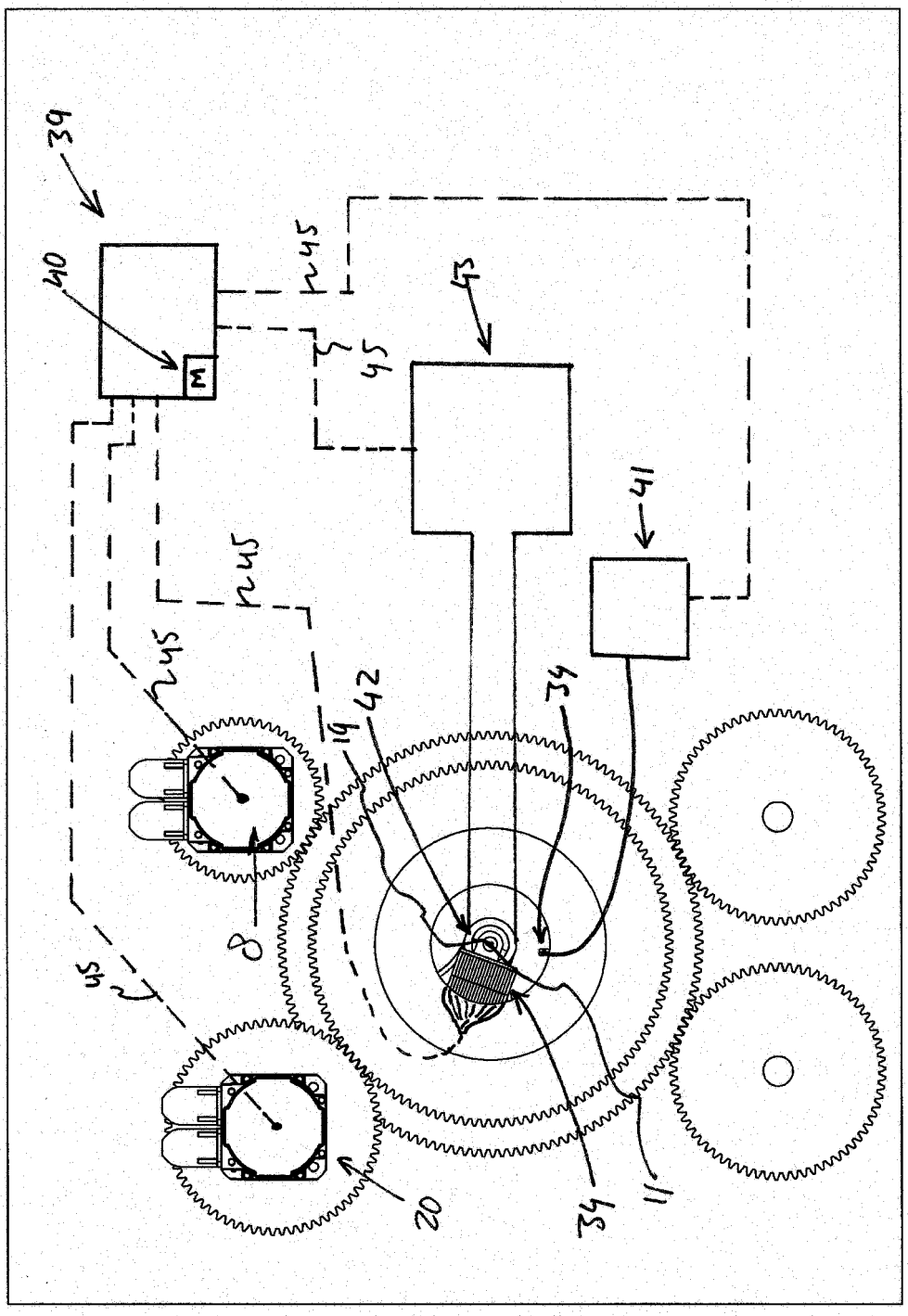

Fig. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 7334

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	WO 2011/040810 A1 (SLUIS CIGAR MACHINERY B V V D [NL]; VAN DER VLIET ALBERT [NL]; SLOBBE) 7 April 2011 (2011-04-07) * claims 1, 11; figure 1 *	1-15	INV. A24F47/00
A	US 4 558 778 A (CRISTIANI ATHOS [IT]) 17 December 1985 (1985-12-17) * figure 1 *	1-15	
A	JP S58 78914 A (KOBE STEEL LTD) 12 May 1983 (1983-05-12) * abstract *	1-15	
A	WO 2011/114439 A1 (JAPAN TOBACCO INC [JP]; SASAKI TATSUYA [JP]; ZENTANI KENICHI [JP]) 22 September 2011 (2011-09-22) * abstract *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

A24F
A24C
B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 June 2015	Pille, Stefaan

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 16 7334

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01-06-2015

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