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(54) ADJUSTMENT APPARATUS

(57) An adjustment apparatus for adjusting the position of a diamond in a cutting machine, the diamond comprising a cutting face and the apparatus comprising a position sensor for determining the position of the diamond cutting face and a device arranged to adjust the position of the diamond. The position sensor is arranged to communicate the position of the diamond cutting face to the device and the device is arranged to adjust the position of the diamond by a predetermined amount in response to the communication from the position sensor.

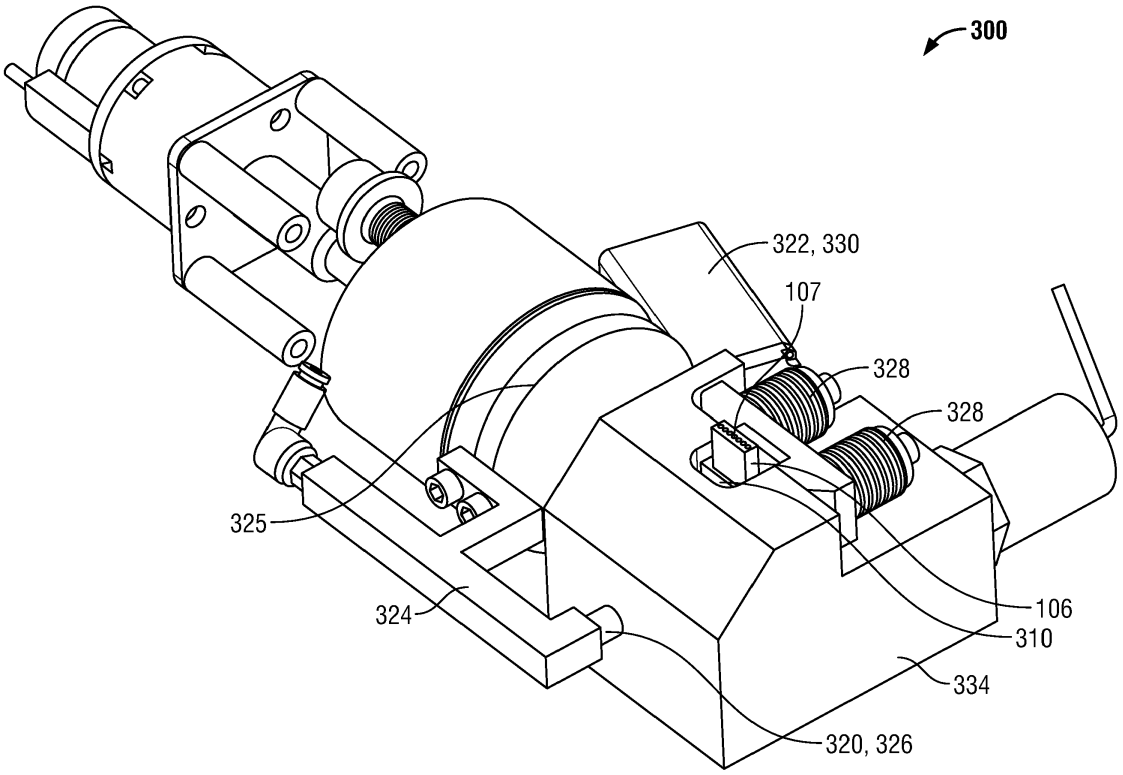

FIG. 3

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Description

[0001] The present invention relates to an adjustment apparatus for adjusting the position of a diamond in a cutting machine and to a method of adjusting the position of a diamond in a cutting machine.

Background

[0002] Cutting machines are known to be used in a number of different industries for processing a range of products such as paper, fabric, tobacco. The product material to be cut can be laminate, fibrous or granular.

[0003] In the tobacco industry, tobacco leaves are processed for cigarette manufacture in a primary tobacco process. The laminate portions of the tobacco leaves are first compressed and then cut in a cutting machine to create tobacco particles suitable for cigarette manufacturers.

[0004] The cutting of tobacco leaves or stems with a cutting machine is known in the art, for example, as described in GB2010/051607. Cutting machines for tobacco leaves generally comprise on a rotatable drum assembly with a plurality of knives with projecting cutting edges that are orientated approximately tangential to the circumference of the drum.

[0005] Compressed tobacco material is extruded towards the knives on the rotating cutting drum, the knives cut the tobacco material into small pieces for subsequent use as a smoking material. The cutting edges of the knives are blunted by the tobacco which is being cut. To compensate, the cutting machine further comprises a grinding wheel and edges of the knives are sharpened by the action of the grinding wheel which traverses to and fro in a direction parallel to the axis of rotation of the drum. The projecting edges of the knives contact the surface of the grinding wheel as they pass it and are continually abraded. It is necessary to feed the knives outwardly from the drum either continuously or at frequent intervals to compensate for this abrasion and maintain the correct geometrical relationship between the edges of the knives and the extruded material being cut.

[0006] The grinding wheel is periodically dressed by passing it over a diamond that is often located at the end of its traverse motion near the edge of the rotating drum. The diamond removes a thin layer from the grinding wheel (which commonly comprises bonding material and abrasive grit). The diamond can be an industrial diamond pillar, comprising diamond threads or seams mounted within an aluminium support, or alternatively a conical pointed industrial diamond. The diamond has a cutting face. The dressing action of the diamond performs several functions:

1. Ensures that sharp abrasive particles are present on the surface of the grinding wheel to sharpen the knives efficiently, thus preventing the grinding wheel from become polished and loaded with tobacco gums which would reduce its effectiveness; and

2. Ensures that the radial surface of the grinding wheel is in the correct geometrical relationship to the static parts of the cutting machine, so that the correct clearances between the sharpened edges of the knives and the static mouth parts and material to be cut are maintained.

[0007] The grinding wheel is gradually advanced in a radial direction either continuously or periodically to compensate for the material lost by the dressing action of the diamond. When the grinding wheel is spent, it is replaced with a new one.

[0008] The overall cutting performance of the cutting machine is greatly affected by the precision of the grinding process performed by the grindstone, particularly with regard to maintaining the correct clearance between the edges of the knives and the static mouth part of the machine. If the clearance is too great, then un-cut pieces of tobacco are pulled from the mouth. If the clearance is too small, there is a risk of mechanical collision between the knives and the static parts, with consequent risk of damage to the machine and loss of production.

[0009] The position of the diamond is therefore critical in maintaining the correct radial position of the grinding wheel relative to the cutting drum axis, which subsequently determines the radius of the knife edges from the drum axis and hence clearance between the edges and the static mouth part.

[0010] During standard operation, the diamond gradually wears and needs to be adjusted manually to maintain the correct clearance and cut quality. As the diamond wears, the clearance increases, so the quality of the cut tobacco material can deteriorate. Manual adjustment of the diamond is typically required every 24 - 48 hour of operation, and is a task for a skilled operator. If it is performed incorrectly there is a possibility that the clearance may be set too small, with consequent risk of damage to the machine.

[0011] To manually adjust the diamond, the rotation of the rotatable drum and grinding stone in the cutting machine must first be stopped i.e. the machine must be turned off. A stopper is extended or positioned manually proximal to the diamond and the diamond is raised by an operator until it contacts a feeler gauge held between the diamond and the stopper. The diamond is then clamped in place by the operator, the stopper retracted and the cutting machine restarted. The stopper provides the datum or reference point for the optimum position of the diamond hence the accuracy of the diamond adjustment is related to the accuracy of the position of the stopper and the skill of the operator.

[0012] We have now devised an improved adjustment apparatus for adjusting the position of a diamond in a cutting machine that alleviates some of the above-mentioned problems.

Statements of Invention

[0013] According to the present invention, as seen from a first aspect, there is provided an adjustment apparatus for adjusting the position of a diamond in a cutting machine, the diamond comprising a cutting face and the apparatus comprising:

> a position sensor arranged to determine the position of the diamond cutting face and a device arranged to adjust the position of the diamond; and
> wherein the position sensor is further arranged to communicate the position of the diamond cutting face to the device and the device is arranged to adjust the position of the diamond by a predetermined amount in response to the communication from the position sensor.

[0014] Preferably, the position sensor may be arranged to determine and communicate the position of the diamond cutting face when in a sensing configuration.

[0015] Preferably, the cutting machine comprises a rotatable drum comprising one or more knives each comprising a knife edge and a grinding wheel. Preferably, the grinding wheel is arranged to abrade the one or more knife edges by making one or more traverses in a direction parallel to an axis of rotation of the rotatable drum. Preferably, the diamond is arranged to dress the grinding wheel. The grinding wheel is preferably passed over the diamond periodically so it can be dressed.

[0016] Preferably, the adjustment apparatus is arranged to adjust the position of a diamond on a tobacco cutting machine.

[0017] To adjust the position of the diamond, it is envisaged that the grindstone will first be inhibited from passing over the diamond and the position sensor will be arranged in the sensing configuration. The position sensor will then determine the position of the diamond cutting face and communicate said position to the device arranged to adjust the position of the diamond. The device will then adjust the position of the diamond by a predetermined amount in response to the communication from the position sensor such that the diamond cutting face is adjusted to an optimum position for contacting the grindstone. Operation of the grinding wheel will then be resumed, and it will be traversed to sharpen the knives and allowed to pass over the diamond for dressing at the end of one or more traverses.

[0018] If the position sensor determines that the diamond is already in the optimum position, it will communicate this to the device which will respond by taking no action to move the diamond i.e. the device will adjust the position of the diamond by a predetermined amount substantially equal to 0.

[0019] Correct positioning of the diamond is crucial for maintaining the correct radial position of the grinding wheel relative to the axis of rotation of the rotatable drum, which ensures that there is optimum clearance between the one or more knife edges and the static mouth part in the cutting machine. Maintaining an optimum clearance provides a tobacco product with an optimum cut quality for use in smoking articles and also reduces the risk of damage to the cutting machine.

[0020] Preferably, the position sensor comprises an air gauge. The air gauge will typically comprise a regulated air supply that is arranged to flow from a first orifice to a second orifice. Preferably, the second orifice will be located proximal the diamond cutting face when the position sensor is in the sensing configuration. A pressure difference across the second orifice will thus be proportional to the distance between the second orifice and the diamond cutting face. This pressure difference is preferably sensed by a transducer.

[0021] Alternatively, the position sensor may comprise a laser or an LED to determine positional information. Other alternative optical sensing apparatuses and proximity sensors for determining positional information are also envisaged and will be known to those skilled in the art. Air gauging is preferable as it is an accurate non-contact method which is robust and unaffected by the presence of dust and grinding grit on the diamond cutting face which is typically present in the area around the diamond pillar.

[0022] Preferably, when in the sensing configuration, the position sensor and the diamond cutting face are proximal but do not touch i.e. the sensing operation is contactless. Using a position sensor that does not require physical contact with the diamond cutting face greatly reduces the possibility of measurement errors, for example, due to dirt contamination between the position sensor and cutting face. There is also no risk of deformation of the position sensor caused by contact forces as found in the prior art.

[0023] Preferably, the position sensor determines the position of the diamond cutting face with an accuracy between 0.005 mm and 0.001 mm. As previously discussed, the quality of the cut material produced by the cutting machine is directly linked to the accuracy of the diamond position. The ability to determine the position of the diamond to a high degree of accuracy is important to maintain the diamond in the optimum position.

[0024] Preferably, the diamond is housed within a cutting machine and is fixed to a static part of the cutting machine.

[0025] Preferably, the device arranged to adjust the position of the diamond comprises a stepper motor. Preferably, the device is arranged to adjust the position of the diamond with an accuracy between 0.005 mm and 0.001 mm. Since the quality of the cut material produced by the cutting machine is directly linked to the accuracy of the diamond position, the ability to adjust the position of the diamond to a high degree of accuracy is important to maintain the diamond in the optimum position. The combined accuracy of the position sensor and device arranged to adjust the position of the diamond together determine the quality of the material cut by the machine.

[0026] The communication between the position sensor and the device may be direct or indirect. For example, the apparatus may further comprise a processor arranged to receive and transmit communications between the position sensor and the device. The processor may also be arranged to interpret positional information received by the position sensor, to perform calculations on the positional information and/or transmit communications in a format that can be received and actuated by the device.

[0027] Preferably, the position of the diamond is adjusted substantially along an adjustment axis that extends from the diamond cutting face to the position sensor. Preferably, the position sensor in the sensing position will be directly above the cutting face of the diamond. Preferably, the device responds to the communication from the position sensor to move the diamond along the adjustment axis to position the diamond closer to or further from the position sensor.

[0028] In alternative embodiments, the position sensor may be fixed at an optimum position such that the air flow, laser, LED or similar sensor is aligned at an optimum position relative to the grinding wheel, perpendicular to the adjustment axis The position sensor will then communicate with the device if the cutting face of the diamond is at said optimum position by determining an interference, presence or obstruction in the air flow, laser or LED etc.

[0029] The position sensor may be fixed in the sensing configuration or may be moveable between the sensing configuration and an idle configuration remote from the vicinity of the diamond cutting face when not required for sensing.

[0030] Preferably, the adjustment apparatus further comprises an arm arranged to move the position sensor between the sensing configuration and the idle configuration. Preferably, the arm is arranged on a rotating wheel, wherein the rotating wheel rotates about an axis substantially perpendicular to the diamond adjustment axis. The rotatable wheel allows the position sensor to be safely stored in the idle configuration remote from the diamond, grinding wheel and other parts of the cutting drum when it is not required for use. The rotatable wheel may be actuated by a control device.

[0031] The position of the diamond may be checked at periodically programmed intervals determined by the control device or as determined by an operator. In use, the control device or operator will activate the adjustment apparatus to begin the process of adjusting the diamond and the position sensor will be moved from the idle configuration to the sensing configuration. The diamond will then be raised or lowered with respect to the grinding wheel. When the position sensor in the sensing position determines that the diamond cutting face is at an optimal position, the position sensor is moved from the sensing position to the idle configuration by the arm.

[0032] According to the present invention, as seen from a second aspect, there is provided a method of adjusting the position of a diamond in a cutting machine, the method comprising:

providing a position sensor for determining the position of the diamond cutting face;
arranging the position sensor proximal said diamond;
providing a device for adjusting the position of the diamond;
determining the position of the diamond cutting face with the position sensor;
communicating the position of the diamond cutting face to the device;
adjusting the position of the diamond by a predetermined amount with the device.

[0033] Preferably, the position of the diamond is adjusted by a predetermined amount in response to the position of the diamond cutting face communicated to the device by the position sensor. Communication between the position sensor and the device can occur continuously or at periodic interval as determined by the operator. This ensures that the optimum position of the diamond is maintained at all times to provide a high quality cut product.

[0034] The method of adjusting the position of the diamond may be performed while the cutting machine is in operation. The optimum position of the diamond cutting face can be checked and maintained without the need to stop the machine. This prevents loss in productivity resulting from machine down-time, significantly increases outputs and reduces the cost of running the machine.

[0035] The present invention negates the need for manual adjustment of the diamond in a cutting machine by an operator and therefore reduces the cost of carrying out the adjustment. The apparatus is safe and does not require a user to come into close proximity with various sharp edges and moving parts present in the cutting machine. The diamond position can be adjusted as frequently as required and clearance between the knife edges and the machine mouth can be controlled to a high level of accuracy, thus increasing the quality of the cut and reducing the risk of damage to the cutting machine.

Specific Description

[0036] An embodiment of the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional illustration of an example of a cutting machine that forms part of the prior art;

Figures 2a and 2b illustrate an adjustment apparatus for positioning a diamond on the cutting machine of Figure 1 that forms part of the prior art;

Figure 3 illustrates an adjustment apparatus for ad-

justing the position of a diamond on a cutting machine according to an embodiment of the present invention, with the position sensor shown in the idle configuration;

Figure 4 illustrates the adjustment apparatus of Figure 3, with the position sensor shown in the sensing configuration;

Figure 5 illustrates part of the adjustment apparatus of Figure 3 with the outer casing removed.

[0037] Referring to Figure 1, there is shown a cutting machine 100 that forms part of the prior art. The cutting machine 100 has a rotatable drum 101 comprising a plurality of knives 102 that protrude from the circumference of the drum 101 and a mouth 103 adjacent the rotatable drum 101. A conveyor belt 104 is arranged to carry material to be cut (not shown) towards the mouth 103 where it is delivered to the rotatable drum 101 and is cut by the knives 102. In use, the rotatable drum 101 typically rotates at a speed between 200 and 600 rpm. The arrow on Figure 1 shows the direction of rotation of the rotatable drum 101. As the knives 102 cut the material that is delivered by the mouth, they are rapidly blunted. To compensate for this, the cutting machine 100 has a grinding wheel (or grindstone) 105 arranged to sharpen and maintain the profile of the knives 102. The grinding wheel 105 is typically composed of abrasive grit and a bonding material. In use, the grinding wheel 105 is traversed parallel to the axis of rotation of the rotatable drum 101. It is necessary to feed the knives 102 outwardly from the rotatable drum 101 either continuously or at frequent intervals to compensate for this abrasion of the grinding wheel 105 and maintain the correct geometrical relationship between the edges of the knives 102 and the material being cut.

[0038] The cutting machine 100 further comprises a diamond 106 located near the edge of the rotating drum 101 (as seen in Figure 2a and 2b). The grinding wheel 105 is periodically dressed when it passes over the diamond 106 at the end of a traverse. The diamond 106 removes a thin layer of the bonding material and abrasive grit from the grinding wheel 105.

[0039] To compensate for the material lost from the grinding wheel 105 by the dressing action of the diamond 106, the grinding wheel 105 must be gradually advanced in a radial direction towards the knives 102 on the rotating drum 101. The advancement may be either continuous or periodic.

[0040] Referring to Figures 2a and 2b, there is shown an adjustment apparatus 200 for positioning a diamond 106 on the cutting machine 100 that forms part of the prior art. The diamond 106 has a cutting face 107 comprised of several diamond threads mounted on a static aluminium support. The cutting face 107 of the diamond 106 is orientated such that it will contact the outer circumference of the grinding wheel 105 to perform the dressing action when it passes over the diamond 106.

[0041] During machine operation, the cutting face 107 of the diamond 106 gradually wears as a result of the dressing action and must be raised so that it contacts the grinding wheel 105 sufficiently each time the grinding wheel 105 is passed over the diamond 106. An adjustment apparatus 200 is arranged to help an operator raise the diamond 106 when it is determined that the diamond 106 has worn down. The adjustment apparatus 200 has a stopper 208 and a housing 210 for the diamond 106 with a clamp 211 that holds the mounted diamond 106 in position.

[0042] Figure 2a illustrates the arrangement of the adjustment apparatus 200 while the cutting machine 100 is in operation. The stopper 208 is in a retracted position and the cutting face of the cutting face 107 of the diamond 106 is free from obstruction. As the grinding wheel 105 carries out traverses parallel to the axis of rotation of the rotatable drum 101, it is periodically dressed when it passes over the diamond 106 at the end of each traverse.

[0043] Figure 2b illustrates the arrangement of the adjustment apparatus such that the operator (not shown) can perform the adjustment operation to raise the diamond 106. The stopper 208 is in an extended position such that it is positioned directly above the cutting face of the diamond 106. In use, to perform the adjustment operation, the cutting machine 100 must be first be turned off for safety to reduce the risk of harm to the operator by the sharp edges of the knives 102 and moving parts in the cutting machine 100 (e.g. the movement of the rotatable drum 101 and grinding wheel 105). The stopper 208 will then be moved from the retracted position (Figure 2a) to the extended position (Figure 2b) and the operator will insert a feeler gauge (not shown) between the stopper 208 and the diamond cutting face 107. The operator will then release the clamp 211 on the diamond housing 210 and will raise the diamond 106 until the cutting face 107 contacts the feeler gauge. The diamond 106 will then be re-clamped in this adjusted position, the feeler gauge removed and the stopper 208 retracted so that the cutting face of the diamond 106 is not obstructed. The cutting machine 100 may then be restarted.

[0044] The stopper 208 and feeler gauge (not shown) provide the datum or reference point for the optimum position of the diamond hence the accuracy of the diamond adjustment is related to the accuracy of the position of the stopper 208 and the skill of the operator.

[0045] Referring to Figures 3 and 4, there is shown an adjustment apparatus 300 for adjusting the position of a diamond 106 on a cutting machine 100 according to an embodiment of the present invention.

[0046] The adjustment apparatus comprises a position sensor 320 and a device 322 arranged to adjust the position of the diamond 106 (i.e. move the diamond 106). The position sensor 320 is arranged on an arm 324 which is attached to a wheel 325 that can be rotated through 90° such that it can be moved from an idle configuration (Figure 3) where the position sensor 320 is remote from

the diamond 106, to a sensing configuration (Figure 4) where the position sensor 320 is directly above, but not in contact with the diamond 106.

[0047] The position sensor 320 comprises an air gauge 326. The air gauge 326 comprises a first orifice and a second orifice and a regulated air supply that is arranged to flow from the first to the second orifice. In the sensing configuration, the second orifice will be located proximal the diamond cutting face 107.

[0048] In use, the position sensor 320 will determine the position of the diamond cutting face 107 by determining the pressure difference across the second orifice on the air gauge 326 which is proportional to the distance between the second orifice and the diamond cutting face 107. The position sensor 320 may further comprise a transducer to sense this pressure difference. The air gauge 326 can sense the position of the diamond 106 to a high accuracy between 0.005 mm and 0.001 mm and allows the position of the diamond 106 to be sensed without making physical contact. This eliminates possible errors due to dirt contamination or due to deformation of the measuring system caused by contact forces (as would be the case with the adjustment apparatus 200).

[0049] The position sensor 320 will then communicate the determined position of the diamond 106 to the device 322 which will respond by raising the diamond 106 such that the cutting face 107 is in the optimum position to dress the grinding wheel 105. The method of sensing and re-positioning of the diamond 106 is fully automated and can be programmed to work continuously or periodically as desired by the operator. The adjustment apparatus 300 further comprises a diamond housing 310 and two spring clamps 328. The spring clamps 328 are orientated substantially perpendicular to the direction of adjustment of the diamond 106. The spring clamps 328 hold the diamond 106 securely in the housing 310 whilst still allowing the diamond to be moved in the desired direction i.e. to be raised or lowered relative to the housing 310.

[0050] The device 322 arranged to position the diamond 106 is comprised of a stepper motor 330 and a worm and wheel mechanism 332 (see Figure 5). The worm and wheel mechanism 330 is housed in an outer casing 334 to prevent damage to the mechanism.

[0051] Referring to Figure 5, there is shown part of the adjustment apparatus 300 comprising the device 322 arranged to position the diamond 106. The outer casing 334 of the device 322 has been removed and the worm and wheel mechanism 332 is shown. In use, the rotational movement of the stepper motor 330 is translated to horizontal movement of the diamond 106. The stepper motor 330 turns a worm 336 which meshes with a worm-wheel 338 which is internally machined with a helical spiral. This spiral engages with an equivalent spiral machined on the exterior of a rod (not shown) which pushes against the underside of the diamond 106. The worm-wheel 338 and rod therefore act as a screw-jacking mechanism which locates the position of the diamond 106. The diamond 106 is raised in a direction away from the adjustment apparatus 300. Use of a stepper motor 330 allows the device 322 to adjust the position of the diamond 106 with great sensitivity and a high degree of accuracy typically between 0.005 mm and 0.001 mm.

[0052] The combined sensitivity and accuracy of the position sensor 320 and the device 322 used to position the diamond 106 is directly linked to the quality of the cut material produced by the cutting machine 100. The described embodiment of the adjustment apparatus 300 allows the diamond 106 to be maintained in the optimum position on the cutting machine and results in material cut to a very high accuracy and quality.

[0053] The adjustment apparatus 300 may further comprise a proximity switch which confirms movement of the diamond 106 during the adjustment process and provides signals to enable diamond life monitoring via human-machine interface (HMI).

[0054] The adjustment apparatus 300 may further comprise a winding mechanism arranged to move the diamond 106 in and out of the diamond housing 310 such that the diamond 106 can be replaced when it has become too worn. The winding mechanism may be operated manually or may be automated.

[0055] The adjustment apparatus 300 may further comprise an accelerometer arranged to confirm contact between the grinding wheel 105 and the diamond 106. The accelerometer is mounted on the diamond housing 310, and detects vibration caused by the contact between the grinding wheel 105 and the diamond 106.

[0056] Although the embodiments of the present invention relate to an adjustment apparatus and a method of adjusting the position of a diamond on a tobacco cutting machine, it will be appreciated that the invention may be used to adjust the position of a diamond on a cutting machine used for processing any other material in any other industry.

[0057] It will be appreciated that any type of position sensor may be used. A position sensor that does not come into contact with the cutting face of the diamond when in the sensing position will provide the same advantages as an air gauge, laser or optical sensing apparatus as herein described.

[0058] The position sensor may communicate directly with the device arranged to adjust the position of the diamond or there may be an intermediate communication step, for example, via a processor. The amount that the diamond is to be adjusted may be determined by the position sensor which communicates to the device or may be determined by the processor or by the device itself in response to the position communication received from the position sensor or processor.

[0059] The overall operation of the adjustment apparatus may be controlled by the control device which may have a human machine interface (HMI). There may be functions on the control device for the operator to override and alter one or all of the adjustment steps performed by the adjustment apparatus.

Claims

1. An adjustment apparatus for adjusting the position of a diamond in a cutting machine, the diamond (106) comprising a cutting face (107) and the apparatus comprising:

   a position sensor (320) for determining the position of the diamond cutting face (107) and a device (322) arranged to adjust the position of the diamond, wherein
   the position sensor (320) is arranged to communicate the position of the diamond cutting face (107) to the device (322) and the device is arranged to adjust the position of the diamond (106) by a predetermined amount in response to the communication from the position sensor (320).

2. An apparatus according to claim 1, wherein the position sensor (320) is arranged to determine and communicate the position of the diamond cutting face (107) when in a sensing configuration.

3. An apparatus according to claim 1 or 2, wherein the position sensor comprises an air gauge (326).

4. An apparatus according to claim 3, the air gauge (326) comprising a regulated air supply arranged to flow from a first orifice to a second orifice, wherein the second orifice is located proximal the diamond cutting face (107) when in the sensing configuration and wherein a pressure difference across the second orifice is sensed by a transducer and is proportional to the distance between the second orifice and the diamond cutting face (107).

5. An apparatus according to claim 1 or 2, wherein the position sensor comprises a laser.

6. An apparatus according to claim 1 or 2, wherein the position sensor comprises an optical sensing apparatus.

7. An apparatus according to any preceding claim, wherein the sensing configuration of the position sensor (320) when sensing the position of the diamond cutting face (107) is contactless.

8. An apparatus according to any preceding claim, wherein the position sensor (320) determines the position of the diamond cutting face (107) with an accuracy between 0.005 mm and 0.001 mm.

9. An apparatus according to any preceding claim, wherein the diamond (106) is housed within a cutting machine and is fixed to a static part of the cutting machine.

10. An apparatus according to any preceding claim, wherein the device (322) arranged to adjust the position of the diamond (106) comprises a stepper motor (330).

11. An apparatus according to any preceding claim, wherein the device (322) is arranged to adjust the position of the diamond (106) with an accuracy between 0.005 mm and 0.001 mm.

12. An apparatus according to any preceding claim, wherein the position of the diamond is adjusted substantially along an adjustment axis that extends in a direction from the diamond cutting face (107) to the position sensor (320).

13. An apparatus according to any of claims 2-12, wherein the apparatus further comprises an arm (324) arranged to move the position sensor (320) from the sensing configuration, to an idle configuration where it is remote from the vicinity of the diamond cutting face (107).

14. An apparatus according to any of claims 2-13, wherein the arm (324) is arranged on a rotating wheel (325), wherein the rotating wheel rotates about an axis substantially perpendicular to the diamond adjustment axis.

15. An apparatus according to claim 13 or 14, wherein when the position sensor (320) in the sensing position determines that the diamond cutting face (107) is at an optimal position, the position sensor is moved from the sensing position to the idle position by the arm (324).

16. An apparatus according to any preceding claim arranged to adjust the position of a diamond (106) on a tobacco cutting machine (100).

17. A method of adjusting the position of a diamond (106) in a cutting machine, the diamond (106) comprising a cutting face (107), the method comprising:

   providing a position sensor (320) for determining the position of the diamond cutting face (107);
   arranging the position sensor (320) proximal said diamond (106);
   providing a device (322) for adjusting the position of the diamond (106);
   determining the position of said diamond cutting face (107) with the position sensor (320);
   communicating the position of the diamond cutting face (107) to the device (322);
   adjusting the position of the diamond (106) by a predetermined amount with the device (322).

18. A method according to claim 17, wherein the position

of the diamond (106) is adjusted by a predetermined amount in response to the position of the diamond cutting face (107) communicated by the position sensor (320).

19. A method according to claim 17 or 18, wherein the method is performed while the cutting machine is in operation.

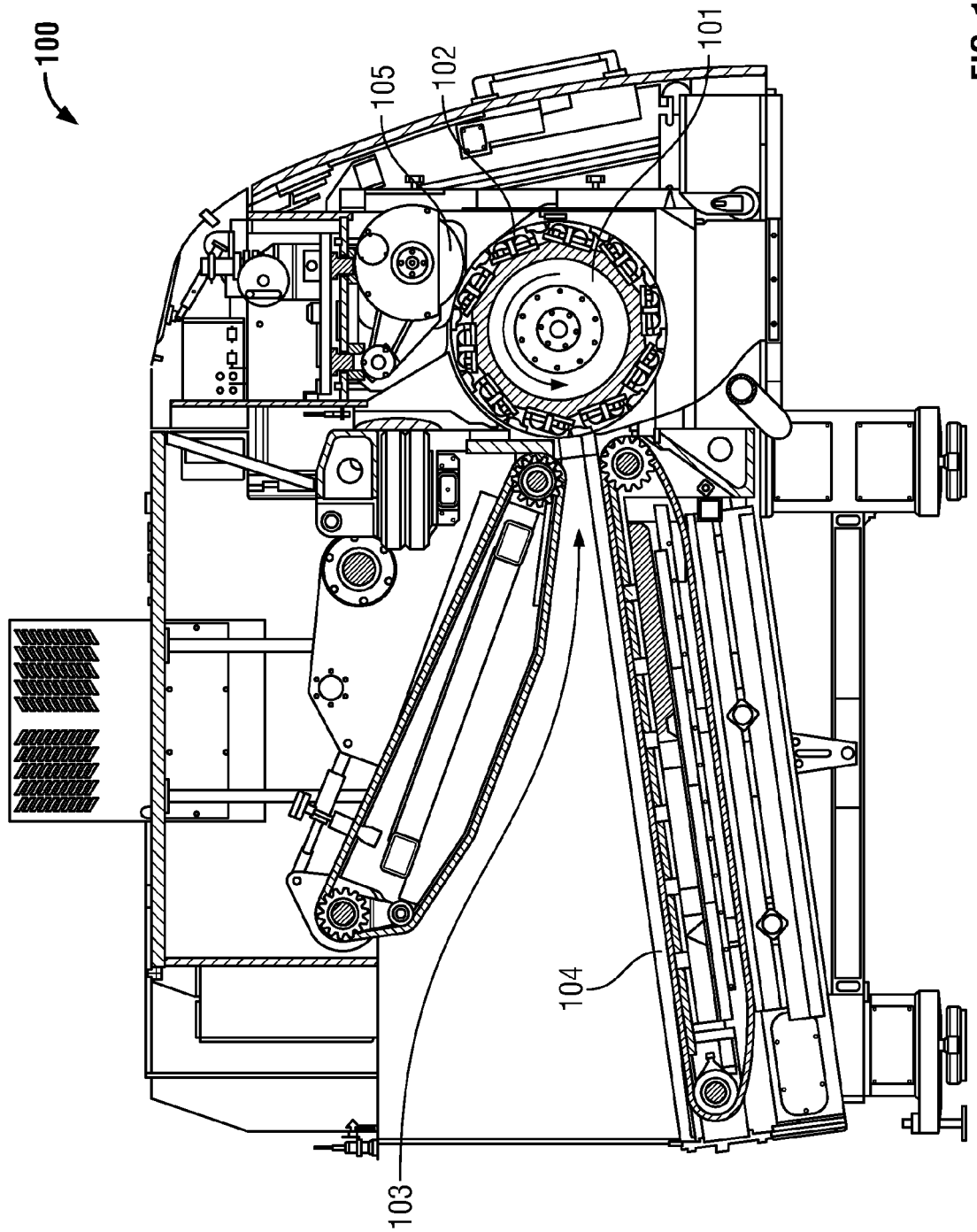

FIG. 1
(Prior Art)

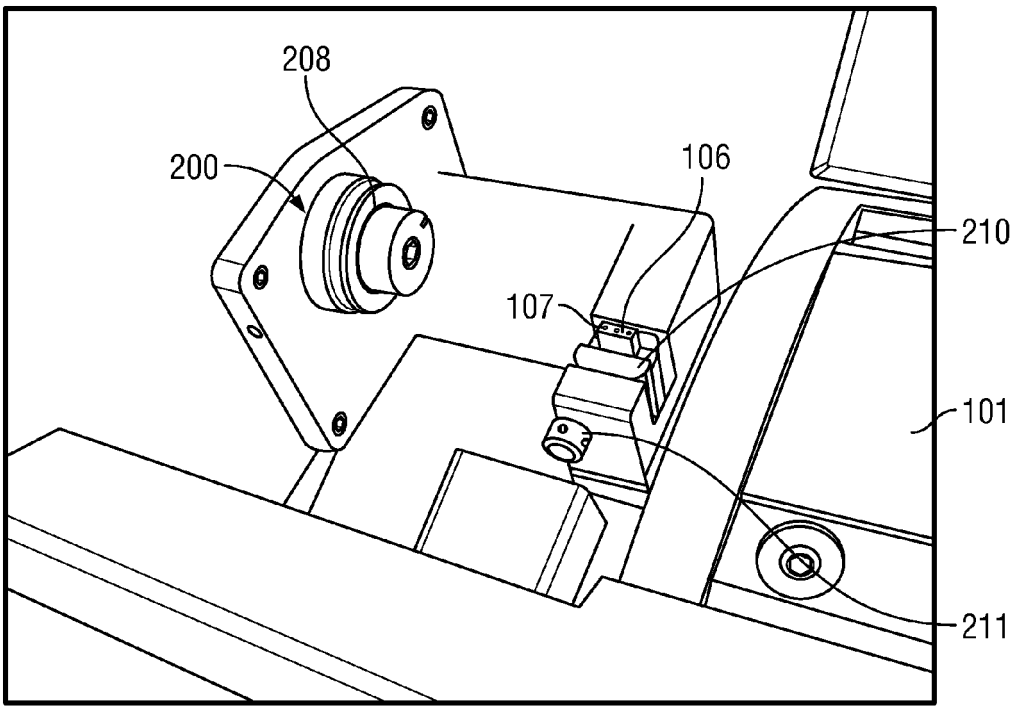

FIG. 2A
(Prior Art)

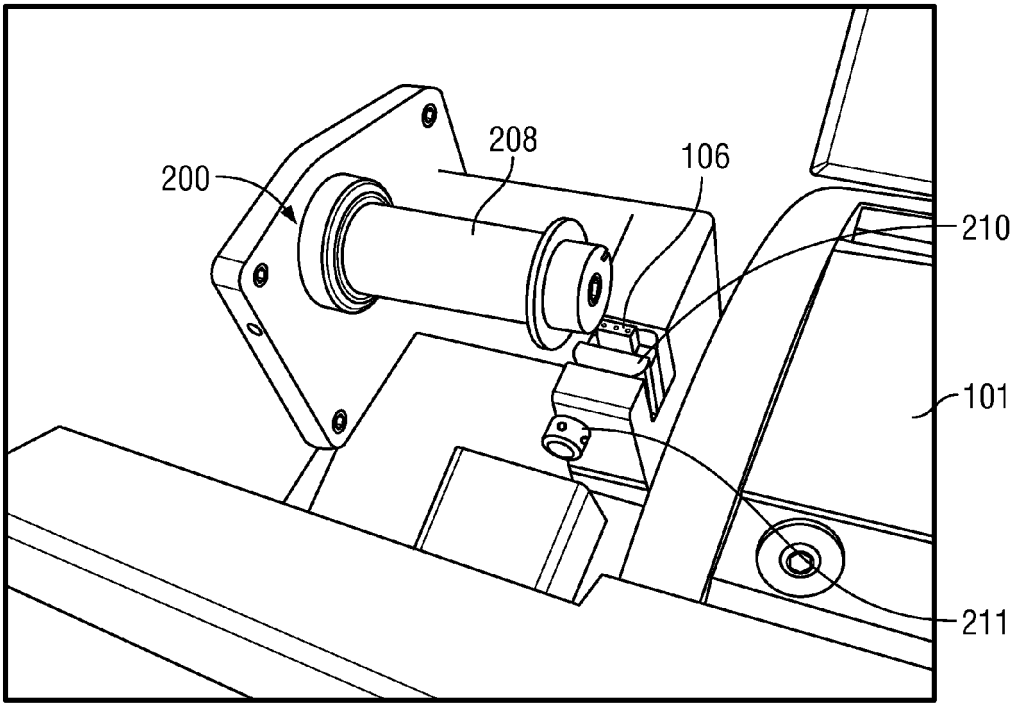

FIG. 2B
(Prior Art)

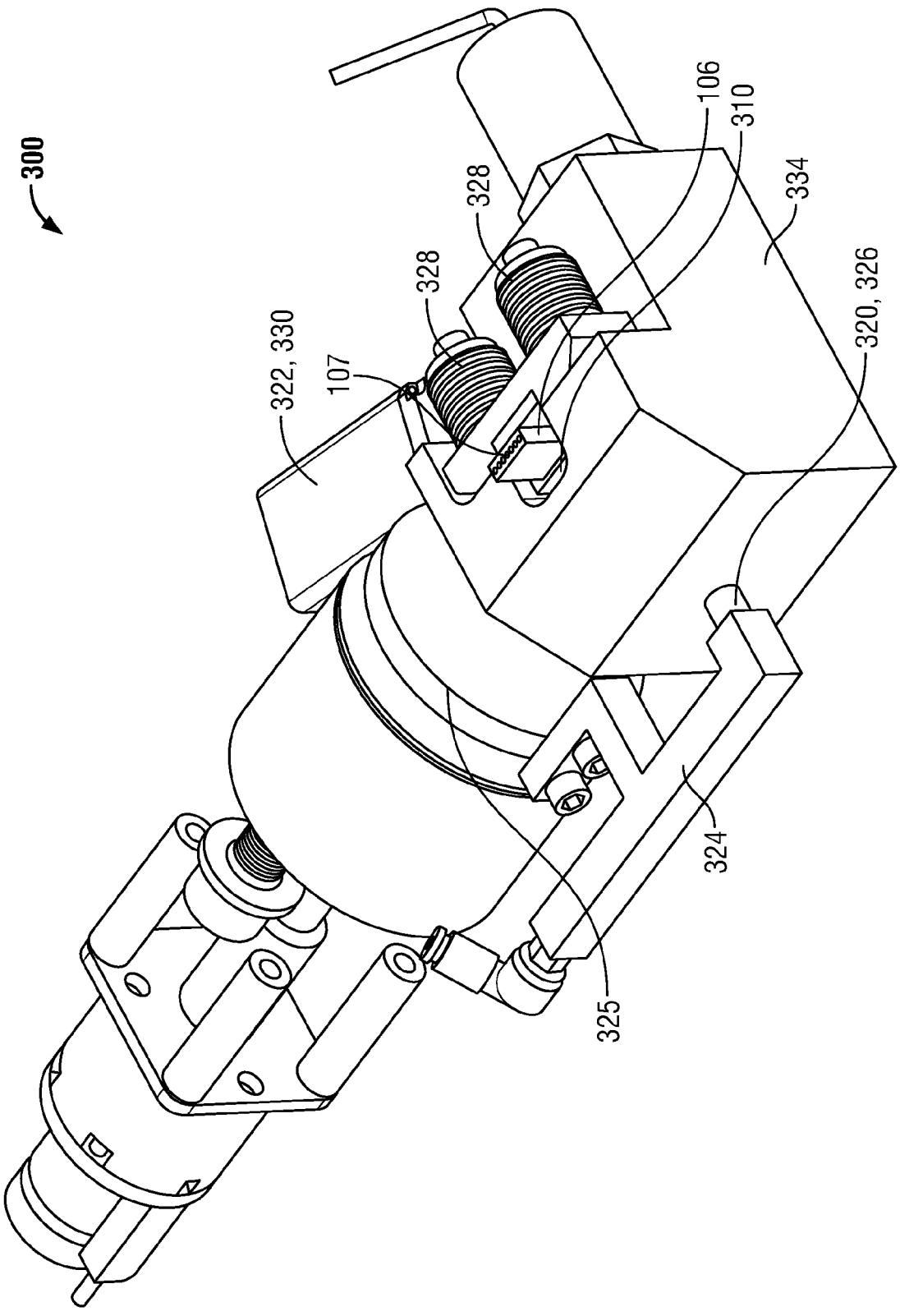

FIG. 3

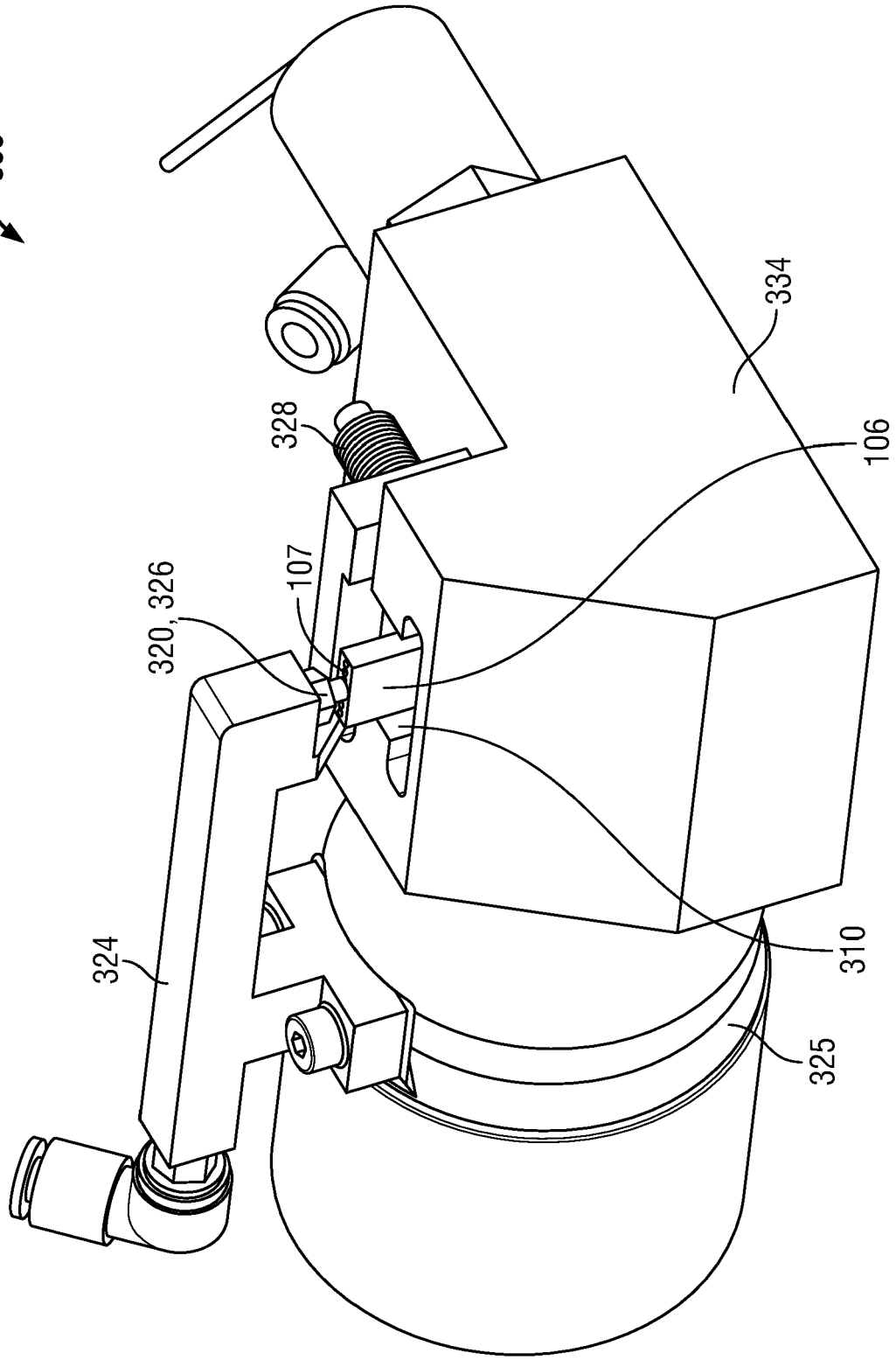

FIG. 4

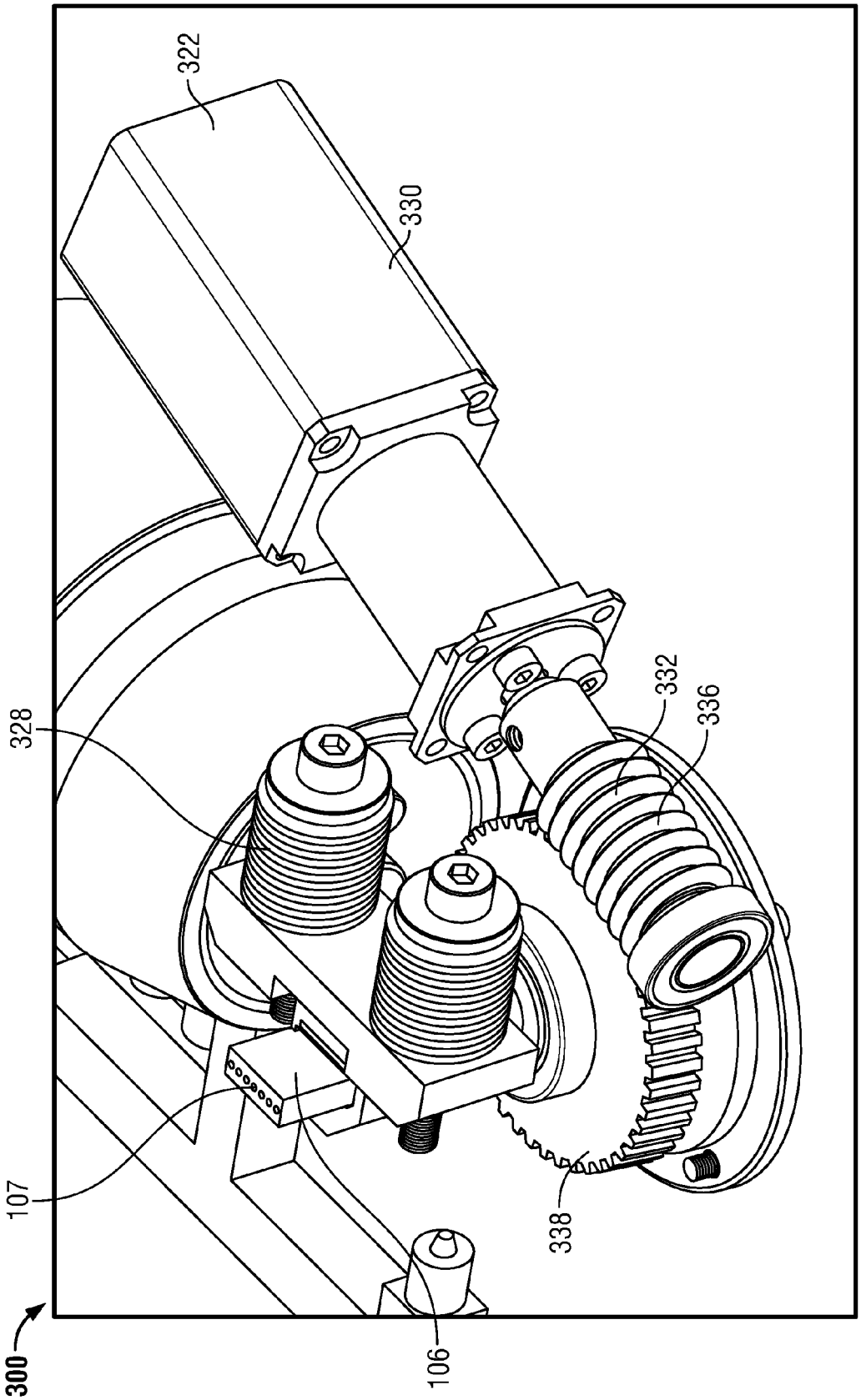

FIG. 5

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 5015

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
Munich	12 November 2015	Gelder, Klaus

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X : particularly relevant if taken alone
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