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(54) **MACHINE FOR MANUFACTURING RODS**

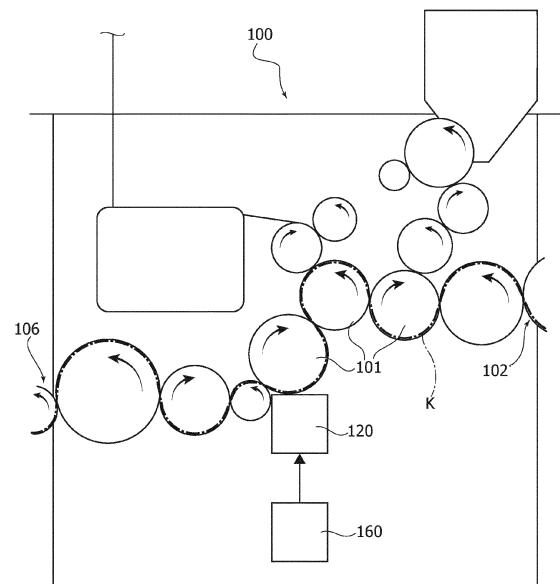
(57) Described herein is a machine (100) for manufacturing rods, in particular rods for the production of smoking articles, comprising:

- a succession of rotary drums (101), each having on a respective lateral surface a plurality of seats for housing the rods and being configured to move the rods, as a result of their rotation, along a feed path (K), according to an orientation such that the rods are oriented with their own longitudinal axis set in a direction transverse to the feed path (K); and

- a cutting station (120) positioned along the feed path (K), comprising a rotary cutting blade (122), configured to cut the rods that advance along the feed path (K) so as to divide each of them into at least two parts, wherein said cutting blade (122) is made of hard metal.

The cutting station (120) further comprises a sharpening unit (140), which includes at least one sharpening member (141, 142) configured to sharpen said cutting blade (122).

FIG. 1



Description

[0001] The present invention relates to a machine for manufacturing rods, for example rods for the production of smoking articles.

[0002] In particular, the present invention regards a machine of the type comprising:

- a succession of rotary drums, each having on a respective lateral surface a plurality of seats for housing the rods and being configured to move the rods, as a result of their rotation, along a feed path, according to an orientation such that the rods are oriented with their own longitudinal axis set in a direction transverse to the feed path; and
- a cutting station positioned along the feed path, comprising a rotary cutting blade, configured to cut the rods that advance along the feed path so as to divide each of these into at least two parts.

[0003] For a machine of the type referred to above there is felt the need to guarantee that the cutting blade used is in a condition to ensure precise and faultless cutting of the rods.

[0004] In this connection, for cutting blades made of steel it is known to carry out an operation of sharpening of the steel blades continuously during operation of the machine.

[0005] This sharpening operation performed on the machine presents the drawback of subjecting the rods and the manufacturing machine itself to the sparks generated by the sharpening operation. This drawback can be mitigated through the use of particular steels that are less liable to generate sparks for the production of the cutting blades.

[0006] The introduction of cutting blades made of hard metal has made it possible to eliminate the need for carrying out continuous sharpening during operation of the machine.

[0007] In fact, blades made of hard metal are able to keep a suitable cutting edge for millions of cycles. At the end of a cycle of service life of the cutting blade it is known to provide for replacement of the worn cutting blade with a new blade, or else carry out a sharpening operation at purposely provided machining stations separate from, and completely independent of, the machine after prior dismantling of the cutting blade from the machine.

[0008] In this context, the present invention proposes a solution that is improved over the prior art, in particular that will enable control and management of the cutting blades used on the machine that is simpler, more efficient, and more reliable.

[0009] In general, the present invention regards a manufacturing machine according to claim 1, and a method for manufacturing rods according to claim 12.

[0010] The claims form an integral part of the teaching provided herein.

[0011] Further characteristics and advantages of the

present invention will emerge clearly from the ensuing description, with reference to the annexed drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a schematic illustration of an example of the manufacturing machine described herein;
- Figure 2 illustrates an example of a cutting station for the machine described herein; and
- Figures 3 and 4 are, respectively, a front view and a side view of a sharpening unit of the cutting station of Figure 2.

[0012] In the ensuing description various specific details are illustrated aimed at enabling an in-depth understanding of the embodiments. The embodiments may be provided without one or more of the specific details, or with other methods, components, or materials, etc. In other cases, known structures, materials, or operations are not illustrated or described in detail so that various aspects of the embodiment will not be obscured.

[0013] The references used herein are provided merely for convenience and hence do not define the sphere of protection or the scope of the embodiments.

[0014] As mentioned at the start, the present invention regards a machine for manufacturing rods, in particular rods for the production of smoking articles. For instance, the machine described herein may be used for the production of sticks or lengths consisting of tobacco, filter material, paper, etc.

[0015] With reference to Figure 1, the machine described herein - designated in the figures as a whole by the reference number 100 - comprises a succession of rotary drums 101 for moving the rods, as a result of their rotation, along a feed path K, from an inlet 102 to an outlet 106.

[0016] In the aforesaid movement, the rods are oriented with their own longitudinal axis set in a direction transverse to the feed path K.

[0017] In particular, the drums 101 each have, on the respective outer lateral surface, a plurality of seats (not illustrated) for housing the rods, which extend along the periphery of the drum, about the axis of rotation thereof, and in which the rods are received, setting themselves parallel to the axis of rotation of each single drum.

[0018] The manufacturing machine 100 further comprises a cutting station 120, positioned along the feed path K and having the function of cutting the rods that advance along the path itself so as to divide each of them into at least two parts.

[0019] With reference to Figure 2, the cutting station 120 comprises a rotary cutting blade 122, rotatable an axis of rotation I parallel to the axes of rotation of the drums 101. A rotary motor 124 is configured to drive the cutting blade 122 in rotation.

[0020] In one or more preferred embodiments like the one illustrated, the cutting blade 122 is in the form of a sharpened disk comprising a peripheral circular cutting

edge 122A.

[0021] In a way in itself known, the cutting blade 122 is positioned at a point of the feed path K in such a way that the cutting edge 122A will pass, in a transverse direction, right through each rod moved along the feed path K as a result precisely of the movement of advance of the rod along the path K itself.

[0022] According to an important characteristic of the solution described herein, the cutting blade 122 is made of hard metal (cemented carbide), i.e., a sintered composite metal containing a metal carbide and a binder metal.

[0023] The hard metal may have one of the following formulations: WC-Co, (W-Ti)C-Co, (W-Ti-Ta-Nb)C-Co. The percentage of cobalt may range between 3% and 25%.

[0024] According to a further important characteristic of the solution described herein, the cutting station 120 comprises a sharpening unit 140 for sharpening the cutting blade 122 in its position P along the feed path K.

[0025] The sharpening unit 140 preferably comprises two sharpening disks 141, 142, positioned on opposite sides of the rotary cutting blade 122, that rotate about respective axes of rotation I1, I2 set alongside one another and inclined, with respect to the axis of rotation I of the cutting blade 122, according to opposite angles.

[0026] In a way in itself known, the two sharpening disks 141, 142 are configured to operate, respectively, on the opposite sides of the cutting edge 122A, via removal of material, so as to generate two new sides parallel to the previous ones and consequently a new cutting edge 122A.

[0027] In one or more preferred embodiments like the one illustrated, the two sharpening disks 141, 142 are formed by grinding wheels, preferably resin-bonded diamond wheels. On the other hand, the basic structure of the grinding wheels may be made of aluminium, steel, an aluminium and resin composite, etc. Preferably, the grain size of the diamond wheels is comprised in the range D91-D151 (according to the classification FEPA - Fédération Européenne des Fabricants de Produits Abrasifs).

[0028] In one or more preferred embodiments like the one illustrated, the two sharpening disks 141, 142 are driven in rotation, about their respective axes I1, I2, by respective rotary motors 151, 152. For execution of the sharpening operation, the two disks 141, 142 may for example be driven at a substantially constant velocity of revolution comprised in the range of 2400-4800 rpm.

[0029] In one or more preferred embodiments like the one illustrated, the cutting station 120 comprises an actuator 154 for moving the two sharpening disks 141, 142 between a respective resting position, in which the two disks 141, 142 are set at a distance from, and not in contact with, the cutting blade 122, and a working position, in which the two disks 141, 142 are in contact with the cutting blade 122 and can carry out sharpening thereof.

[0030] In one or more preferred embodiments like the one illustrated, the two sharpening disks 141, 142 and the corresponding actuators 151, 152 are mounted on a mobile support 156, which is moved vertically by the actuator 154 between a lowered position corresponding to the aforesaid resting position of the sharpening disks 141, 142 and a raised position corresponding to the aforesaid working position. In one or more preferred embodiments like the one illustrated, the actuator 154 comprises an axially mobile vertical stem 157 and a rotary electric motor 158 operatively connected to the stem 157.

[0031] In one or more preferred embodiments like the one illustrated, the machine 10 comprises a control unit 160 configured for driving the actuator 154 in order to bring the sharpening disks 141, 142 from the resting position to the working position on the basis of a signal of start of a sharpening operation.

[0032] The aforesaid start signal may be generated by the control unit, or else by a further control unit, on the basis of data coming from a counter of the work cycles of the cutting blade 122 or else on the basis of data obtained from the detections made by one or more sensors on the cutting blade 122.

[0033] In the former case, the signal of start of a sharpening operation may be generated upon reaching of a total number of work cycles carried out by the machine 100 (or by the cutting blade 122) equal to a given threshold number. In the latter case, instead, the start signal may be generated at the moment when the data coming from the aforesaid sensors indicate a non-suitable state of the cutting blade 122.

[0034] The operation of sharpening of the cutting blade 122 may be carried out either in concomitance with a working cycle of the machine and when the machine is not operating, for example during interruption of a working cycle or else at the end of a working cycle and before start of a new cycle.

[0035] In a way in itself known, during the sharpening operation, the two sharpening disks 141, 142 turning about the respective axes of rotation I1, I2 are simultaneously moved in the direction of the cutting blade 122 according to a predefined pitch, to remove a given amount of material from the blade itself. The aforesaid movement can be driven by the same actuator 154 as the one described above.

[0036] The present applicant has been able to note that for a cutting blade made of hard metal as described above, excellent results from the standpoint of sharpening quality are obtained with a movement of advance of the two disks 141, 142 by a pitch comprised in the range of 0.01-0.03 mm.

[0037] In view of the foregoing, it now appears evident that the solution described herein is able to overcome completely the drawbacks of the prior art discussed at the start. In particular, the cutting blade made of hard metal makes it possible to avoid, during the sharpening operations, subjecting the rods being manufactured and the machine itself to the sparks that are, instead, gener-

ated in known solutions that use steel cutting blades. Moreover, provision of the sharpening unit 140 directly on board the machine, according to the solution described herein, enables an immediate start of a sharpening operation whenever required, without any need to take down the cutting blade from the machine. In this way, operation of the machine can benefit from a considerable saving of time as compared to the solutions of the prior art.

[0038] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even significantly, with respect to what has been illustrated herein purely by way of non-limiting example, without thereby departing from the scope of the invention, as defined by the annexed claims.

Claims

1. A machine (100) for manufacturing rods, in particular rods for the production of smoking articles, comprising:

- a succession of rotary drums (101), each having on a respective lateral surface a plurality of seats for housing the rods and being configured to move the rods, as a result of their rotation, along a feed path (K), according to an orientation such that the rods are oriented with their own longitudinal axis set in a direction transverse to the feed path (K); and
- a cutting station (120) positioned along the feed path (K), comprising a rotary cutting blade (122), configured to cut the rods that advance along the feed path (K) so as to divide each of them into at least two parts, wherein said cutting blade (122) is made of hard metal,

said cutting station (120) further comprising a sharpening unit (140), which includes at least one sharpening member (141, 142) configured to sharpen said cutting blade (122).

2. The machine according to claim 1, wherein said cutting station (120) comprises at least one actuator (154) for moving said at least one sharpening member (141, 142) between a resting position and a working position in which said at least one member can carry out sharpening of said cutting blade, said machine (100) comprising a control unit (160) configured to drive said actuator (154) so as to bring said sharpening member (141, 142) from said resting position to said working position on the basis of a signal of start of a sharpening operation.
3. The machine according to claim 1 or claim 2, wherein said sharpening unit (140) comprises a first sharpening disk (141) and a second sharpening disk (141),

which are set on opposite sides of said cutting blade (122) and are both mobile between a position away from said cutting blade (122), corresponding to said resting position, and a position in which said first and second disks (141, 142) are in contact with said cutting blade (122), corresponding to said working position.

4. The machine according to claim 3, wherein said first and second sharpening disks (141, 142) are rotatable about respective axes of rotation (I1, I2), which are inclined with respect to the axis of rotation (I) of said cutting blade (122) according to opposite angles.
5. The machine according to claim 4, comprising at least one rotary motor (151, 152) configured to drive said first and second sharpening disks (141, 142) in rotation.
6. The machine according to any one of the preceding claims, wherein said cutting blade (122) is a cutting disk comprising a peripheral circular cutting edge (122A).
7. The machine according to any one of the preceding claims, wherein said hard metal may have at least one of the following formulations: WC-Co, (W-Ti)C-Co, (W-Ti-Ta-Nb)C-Co.
8. The machine according to any one of the preceding claims, wherein said sharpening member (141, 142) is formed by a resin-bonded diamond grinding wheel.
9. The machine according to claim 2, wherein said control unit (160) is moreover configured to drive said actuator (154) so that it will move said sharpening member (141, 142) that is located in said working position in the direction of said cutting blade (122), according to a predefined pitch, to remove a given amount of material from said cutting blade.
10. The machine according to claim 8, wherein said predefined pitch is comprised in the range between 0.01 and 0.03 mm.
11. The machine according to any one of the preceding claims, comprising a rotary motor configured to drive said cutting blade in rotation.
12. A method for manufacturing rods, in particular rods for the production of smoking articles, via a machine according to any one of the preceding claims, comprising the steps of:
 - in a working cycle of the machine, feeding the rods on the succession of rotary drums (101) along the feed path (K), and, at the cutting station

(120), cutting the rods via the cutting blade (122) so as to divide each rod into at least two parts, said sharpening member (141, 142) being kept in said resting position; and

- during the same working cycle, or during an interruption of the working cycle, or else once the working cycle is through and before start of a new working cycle, bringing said sharpening member (141, 142) into said working position and sharpening said cutting blade (122) by way of said sharpening member (141, 142).

13. The method according to claim 12, wherein said sharpening step includes moving said sharpening member (141, 142) that is located in said working position in the direction of said cutting blade (122), according to a predefined pitch, to remove a given amount of material from said cutting blade (120).

14. The method according to claim 13, wherein said predefined pitch is comprised in the range between 0.01 and 0.03 mm.

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FIG. 1

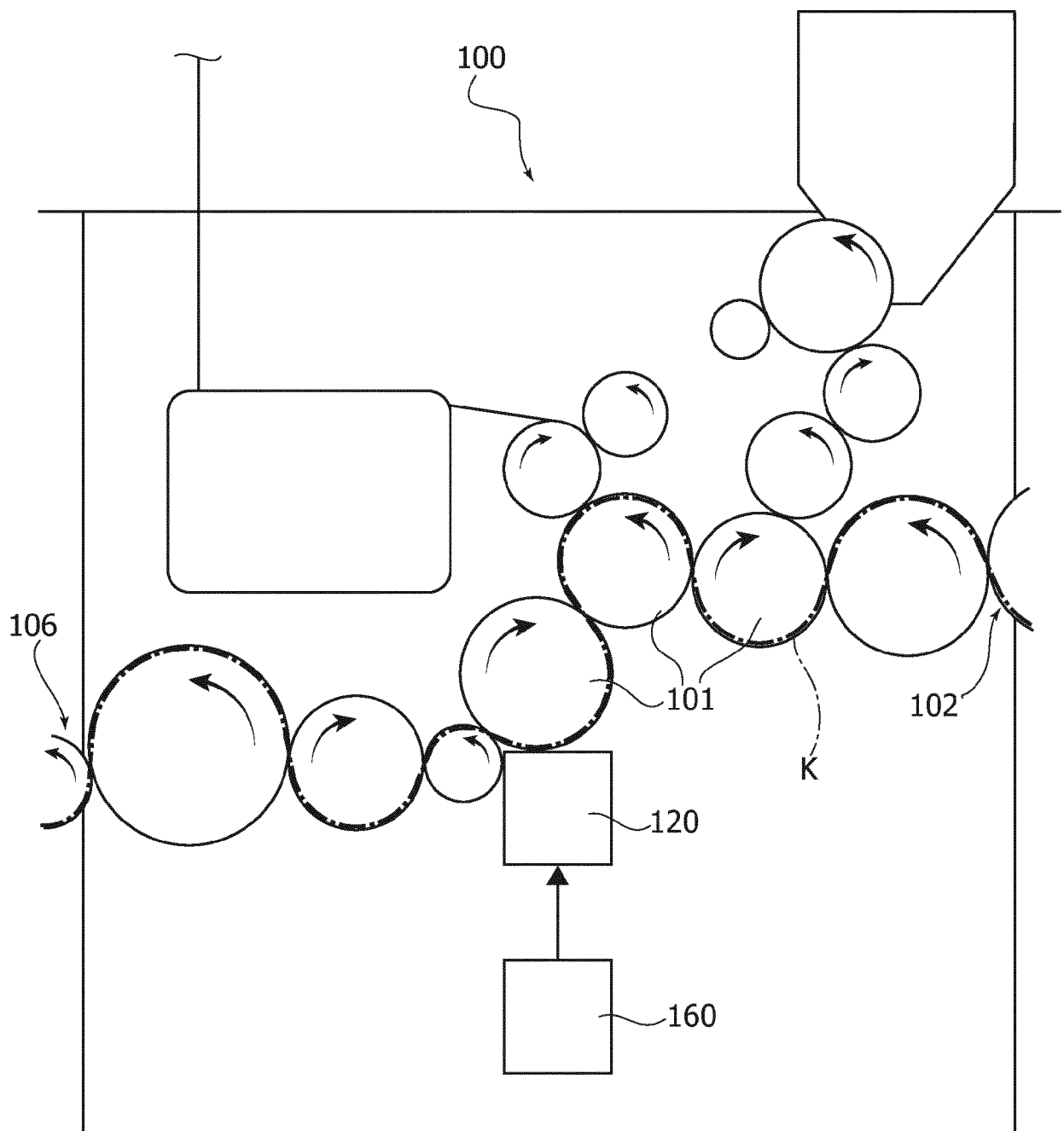
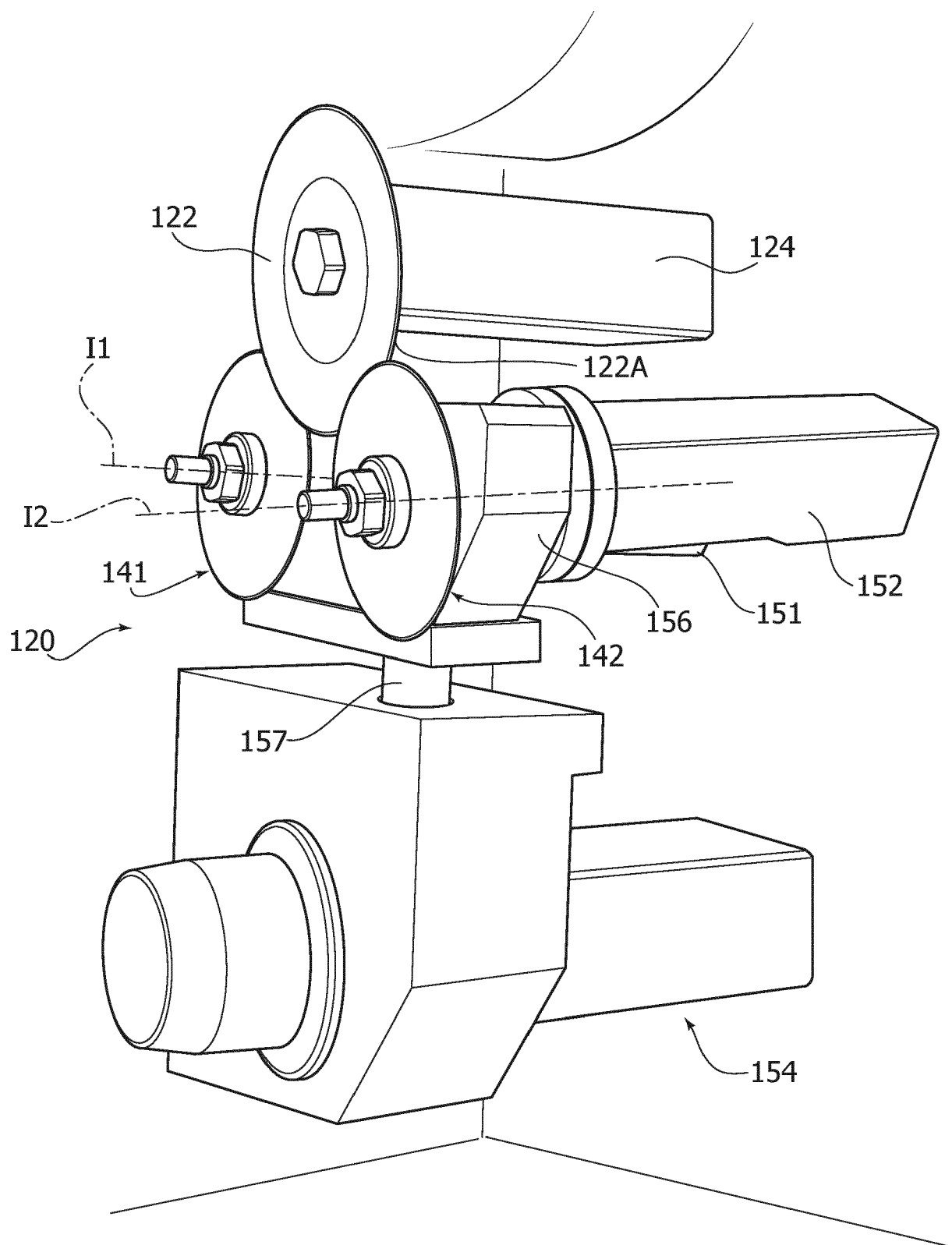
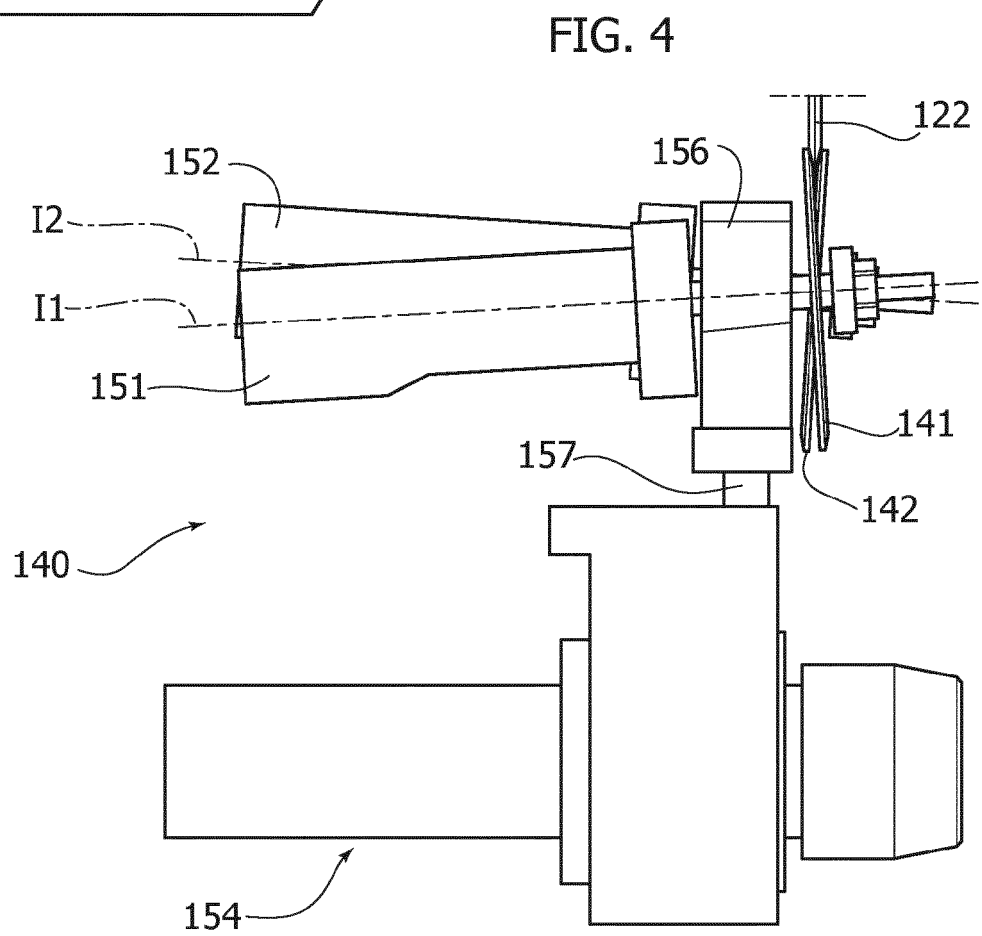
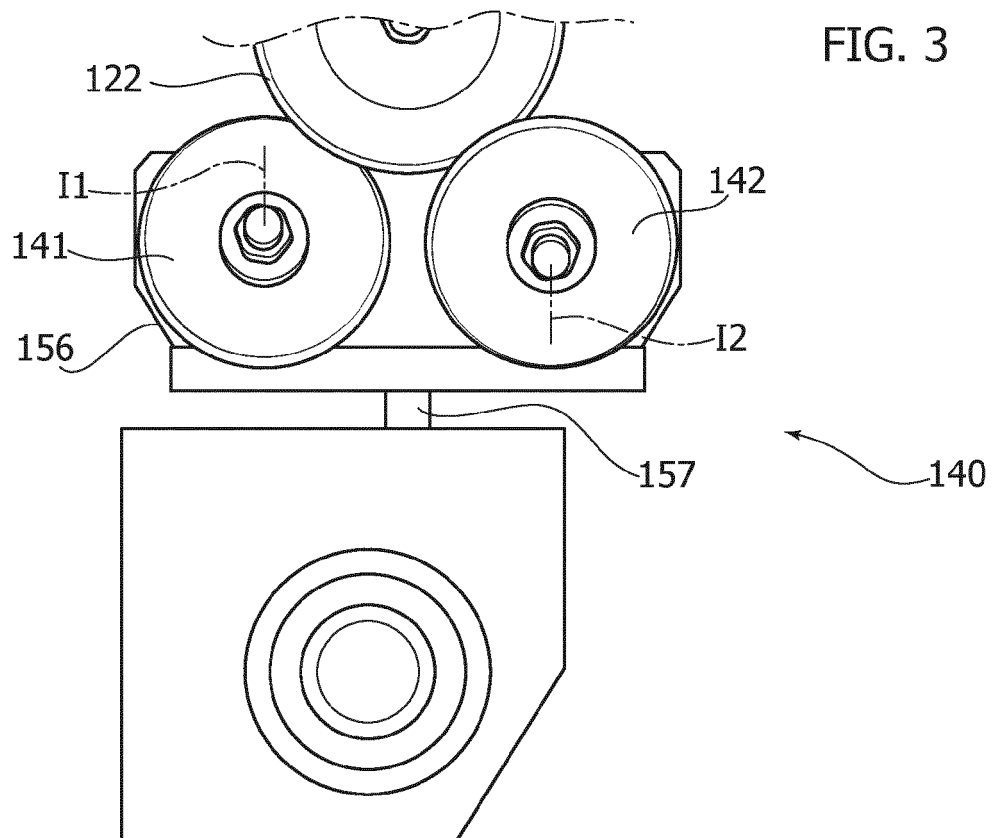


FIG. 2







EUROPEAN SEARCH REPORT

Application Number

EP 23 21 4246

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EPO FORM 1503 03.82 (P04C01)

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Y	* paragraph [0014] - paragraph [0015]; claims; figures *	2-5,9,10,13,14	ADD.
A	* paragraph [0020] - paragraph [0027] * -----	6	A24C5/30
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A	* paragraph [0035] - paragraph [0043]; claims; figures * * paragraph [0047] * -----	6	
			TECHNICAL FIELDS SEARCHED (IPC)
			A24D A24C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 May 2024	Examiner Marzano Monterosso
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT
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