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(71) Applicant: **G.D S.p.A.**
40133 Bologna (BO) (IT)

(72) Inventor: **MENGOLI, Fausto**
Bologna (IT)

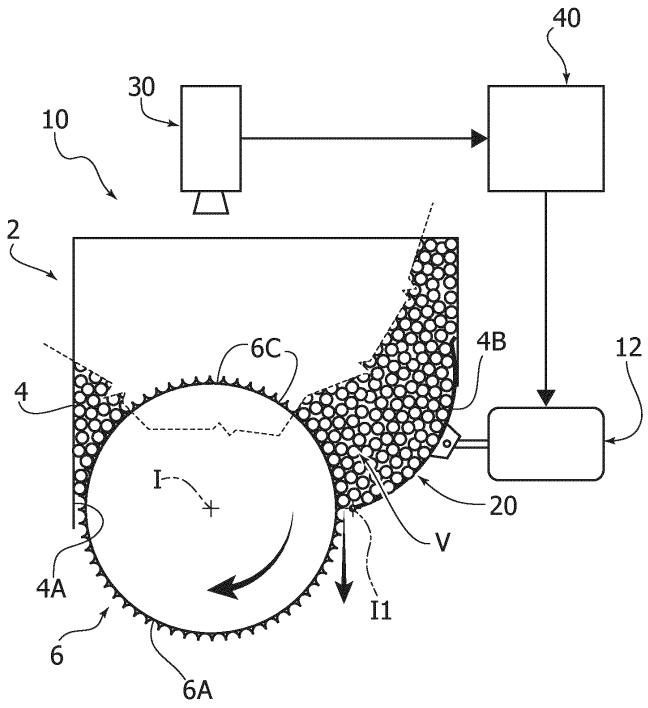
(74) Representative: **Buzzi, Notaro & Antonielli d'Oulx S.p.A.**
Corso Vittorio Emanuele II, 6
10123 Torino (IT)

(54) FEED SYSTEM FOR FEEDING RODS TO A PRODUCTION LINE FOR THE MANUFACTURE OF ARTICLES

(57) Described herein is a feed system (10) for feeding rods to a production line for the manufacture of articles, in particular rods for the production of smoking articles, comprising:
- a hopper (2) comprising a container (4) for receiving a load of rods and provided with a bottom opening (4A); and
- a pick-up roller (6) rotatably mounted underneath said container (4) so that it is partially inserted in said container (4) through said bottom opening (4A).

The system is characterized in that it further comprises a pressure member (20) configured for pressing the rods contained in said container (4) against said pick-up roller (6).

FIG. 1



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Description

[0001] The present invention regards a feed system for feeding rods to a production line for the manufacture of articles, in particular rods for the production of smoking articles, comprising:

- a hopper comprising a container for receiving a load of rods and provided with a bottom opening; and
- a pick-up roller rotatably mounted underneath said container so that it is partially inserted in said container through said bottom opening.

[0002] Such a feed system is for example used in the production of cigarettes for feeding filter rods to a machine for the production and assembly of lengths of filter.

[0003] In the context of use of a system of this type there is at times the need to empty the hopper completely, for example to fill it with rods of a different format or else to enable maintenance operations on the system.

[0004] Today, emptying of the hopper is carried out mostly manually, since the pick-up roller of the system is not able to pick up all the rods contained inside the hopper, but, instead, always leaves a residual amount of rods.

[0005] In this context, the present applicant has set itself the target of overcoming the aforesaid drawback and hence providing a feed system of the type referred to above that is able to carry out automatically complete emptying of its hopper.

[0006] The above object is achieved by means of a feed system according to claim 1.

[0007] The present invention moreover regards a method according to claim 7.

[0008] The claims form an integral part of the teaching provided herein.

[0009] 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 the feed system described herein according to a preferred embodiment; and
- Figure 2 represents the feed system of Figure 1 in a different operating condition.

[0010] In the ensuing description various specific details are illustrated aimed at enabling an in-depth understanding of the embodiments. The embodiments may be obtained 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.

[0011] The references used herein are provided merely for convenience and hence do not define the sphere of protection or the scope of the embodiments.

[0012] With reference to Figure 1, the feed system described herein - designated as a whole by the reference number 10 - comprises a hopper 2 that includes a container 4 for receiving a load of rods and is provided with a bottom opening 4A; and

- a pick-up roller 6 (for example, a drum), mounted underneath the container 4 rotatably about a horizontal axis of rotation I so as that it is partially inserted in the container 4 through the bottom opening 4A.

[0013] In a way in itself known, the pick-up roller 6 comprises a cylindrical lateral wall 6A made on the outer side of which are a plurality of housings 6C that border on one another and are distributed over the entire outer side of the lateral wall 6A (in the figures, for ease of representation, the housings 6C are represented only for a stretch of the wall 6A).

[0014] The housings 6C are prearranged for receiving exclusively rods oriented with their axes parallel to the axis of rotation I of the pick-up roller 6.

[0015] The housings 6C have a width D defined in the circumferential direction of the wall 6A, which is such that the single housing 6C can receive just one rod in the space comprised in the same dimension. On the other hand, the housings 6C extend longitudinally in directions parallel to the axis of rotation I and have a length suitable either for receiving a single rod or else for receiving two or more rods arranged in a row in the same longitudinal directions.

[0016] Preferably, the housings 6C present in the form of cavities with an approximately semicircular cross section.

[0017] In a way in itself known, during operation of the system, the pick-up roller 6 turns about the axis of rotation I according to a continuous motion of rotation and at a substantially constant rate, and the initially empty housings 6C that access the container 4 through the bottom opening 4A sooner or later each receive a respective rod while they cover the stretch inside the container 4 as a result of rotation of the pick-up roller 6 about the axis of rotation I.

[0018] The rods present in the container 4 move into the housings 6C and remain inside the latter during rotation of the pick-up roller 6, notwithstanding the centrifugal force that would tend to make them come out of the housings, mainly on account of the weight of the overlying rods, which acts on the rods in contact with the pick-up roller 6 by pressing them against it.

[0019] The pick-up roller 6 preferably withholds the rods by means of a certain degree of vacuum, i.e., a suction pressure that, however, is not sufficient to exert a tight hold on the rods, but just keeps them in place.

[0020] As mentioned at the start of the present description, in known feed systems the pick-up roller is not able to pick up all the rods present inside the hopper, and the reason lies in the fact that, below a given amount of rods

present in the hopper, the aforesaid action of pressure exerted by the rods themselves ceases.

[0021] To overcome this drawback, according to an important characteristic of the feed system described herein, the system 10 itself comprises a pressure member 20 configured for pressing the rods contained in the container 4 against the pick-up roller 6.

[0022] The action of pressure exerted by the pressure member 20 thus comes to make up for the action, described above, determined by the weight of the rods.

[0023] In one or more preferred embodiments like the one illustrated, the pressure member 20 is mobile to approach and move away from the pick-up roller 6, and is driven according to the above movement by an actuator 12.

[0024] In one or more preferred embodiments like the one illustrated, the pressure member 20 constitutes at least a portion 4B of the wall of the container 4, and its movement is such as to vary the containment volume V of the container itself. Incidentally, by "containment volume V" is meant the volume of the space available inside the container 4 for receiving the rods.

[0025] In other words, the pressure member 20 can be moved so as to reduce the containment volume V and consequently compact the rods against the pick-up roller 6.

[0026] In the example illustrated, the pressure member 20 is mounted in an articulated way about an axis of rotation I1 parallel to the axis of rotation I. In alternative embodiments, the pressure member 20 may, instead, be configured to move according to a movement of translation or else according to a movement of rototranslation.

[0027] In an alternative embodiment, the pressure member 20 may, instead, be an accessory member of the hopper 2, distinct from the containment structure of the container 4, which can be parked outside the internal space of the container 4 and that moves into the container itself only to operate on the rods in the way referred to above.

[0028] Again it should be noted that the pressure member 20 does not necessarily have to be a mobile member that is driven according to a given movement, but, alternatively, may also be a deformable body, preferably inflatable, configured for reducing the containment volume V of the container 4 according to the same principles as those already described above.

[0029] In one or more preferred embodiments like the one illustrated, the feed system 10 comprises a control unit 40 configured for governing the actuator 12 as a function of a signal indicating a force exerted by the pressure member 20 in such a way that the force exerted by the pressure member 20 on the rods will remain within a pre-defined range of values.

[0030] In this way, the feed system 10 can guarantee that the rods are kept pressed against the pick-up roller 6, during operation of the system, via a force that is equal to or greater than a minimum value sufficient to withhold the rods inside the housings 6C and that is equal to or less than a maximum value selected so as to prevent any possible deformation due to squeezing of the rods.

[0031] In addition or as an alternative, the control unit 40 may be configured for governing the actuator 12 as a function of a signal indicating a position of the pressure member 20; for example, the control unit 40 may be configured for governing a step of approach of the pressure member 20 to the pick-up roller 4 as a function of a signal indicating the position of the member itself, and for governing, instead, the action of pressure of the pressure member 20 on the rods as a function of a signal indicating the force exerted thereby.

[0032] In one or more preferred embodiments, the feed system 10 may be configured to get the pressure member 20 to intervene only when the amount of rods present in the container 4 is no longer in itself sufficient to exert the aforesaid action of withholding of the lower layer of the rods inside the housings 6C of the pick-up roller 6.

[0033] For this purpose, in one or more preferred embodiments like the one illustrated, the feed system 10 comprises a sensor 30 for detecting a datum indicating the amount of rods present in the container 4, and the control unit 40 is configured for receiving data from the sensor 30 and for driving the pressure member 20 by way of the actuator 12 when the amount of rods present in the container is less than a minimum reference value.

[0034] The sensor 30 may, for example, be a video camera, a laser position sensor, etc.

[0035] As an alternative, the control unit 40 may be configured for operating the pressure member 20 on the basis of a signal indicating start of a step of emptying of the hopper.

[0036] In view of the foregoing, the person skilled in the sector will understand that, thanks to the action exerted by the pressure member 20, the feed system 10 described herein is able to empty the hopper 2 completely and automatically. This emptying operation may, for example, be started at a change of format of the rods or else when a maintenance operation is called for on the same system. In this situation, the rods that are picked up by the pick-up roller 6 can be sent on to a storage unit.

[0037] 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 feed system for feeding rods to a production line for the manufacture of articles, in particular rods for the production of smoking articles, comprising:

   - a hopper (2) comprising a container (4) for receiving a load of rods and provided with a bottom opening (4A); and

- a pick-up roller (6) rotatably mounted underneath said container (4) so that it is partially inserted in said container (4) through said bottom opening (4A);

said system being **characterized in that** it further comprises a pressure member (20) configured for pressing the rods contained in said container (4) against said pick-up roller (6).

2. The system according to claim 1, comprising a sensor (30) for detecting a datum indicating the amount of rods present in the container (4), and an actuator for driving said pressure member (20), wherein said system further comprises a control unit (40) configured to receive data from said sensor (30) and to govern said actuator (12), said control unit (40) being configured to drive said pressure member (20) by way of said actuator (12) when the amount of rods present in the container (4) is less than a minimum reference value.

3. The system according to claim 2, wherein said control unit (40) is configured to govern said actuator (12) as a function of a signal indicating a force exerted by said pressure member (20) or else as a function of a signal indicating a position in which said pressure member (20) is located.

4. The system according to any one of the preceding claims, wherein said pressure member (20) is mobile so as to approach or move away from said pick-up roller (6).

5. The system according to any one of the preceding claims, wherein said container (4) comprises a wall defining an internal containment volume (V) and wherein said pressure member (20) defines at least a portion (4B) of said wall and is mobile so as to vary said containment volume (V).

6. The system according to any one of the preceding claims, wherein said container (4) defines an internal containment volume (V) and wherein said pressure member (20) comprises a deformable body, preferably inflatable, for reducing said containment volume (V).

7. A method for feeding rods to a production line for the manufacture of articles, in particular rods for the production of smoking articles, comprising:

- providing a hopper (2) comprising a container (4) provided with a bottom opening (4A);
- arranging a load of rods inside said container (4);
- providing a rotatable pick-up roller (6) underneath said container (4) so that it is partially inserted in said container (4) through said bottom opening (4A); and
- via said pick-up roller (6), picking up the rods present in said container (4) and feeding them to a production line,

said method being **characterized in that** it further includes pressing, via a pressure member (20), the rods present inside said container (4) against said pick-up roller (6).

8. The method according to claim 7, comprising:

- detecting via a sensor (30) a datum indicating the amount of rods present in the container (4); and
- driving said pressure member (20) for pressing the rods present inside said container (2) against said pick-up roller (6) when the amount of rods present in the container (2) is less than a minimum reference value.

9. The method according to claim 7 or claim 8, comprising driving said pressure member (20) on the basis of a signal indicating a force exerted by said pressure member (20) or else as a function of a signal indicating a position in which said pressure member (20) is located.

10. The method according to claim 8, comprising:

- receiving a signal indicating a change of article;
- via said pick-up roller (6), picking up the rods from said container (4) until it is completely emptied; and
- sending said rods on to a storage unit.

FIG. 2

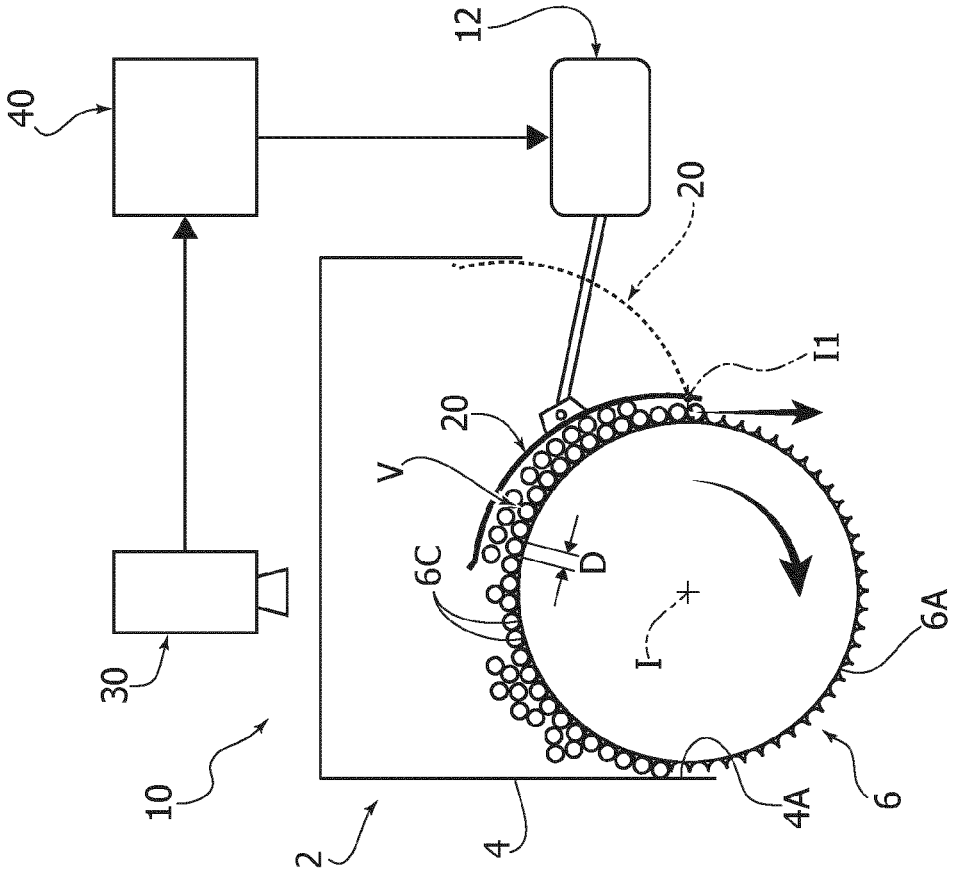
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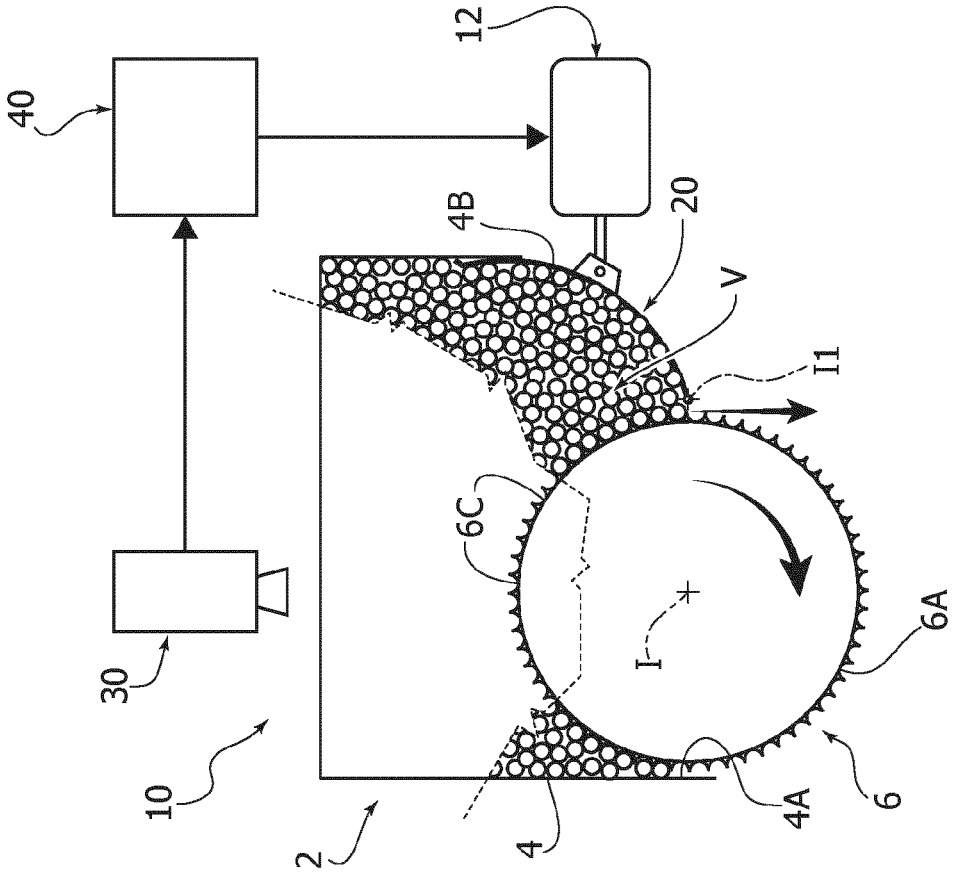
FIG. 1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EUROPEAN SEARCH REPORT

Application Number
EP 24 20 3779

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TECHNICAL FIELDS SEARCHED (IPC)

A24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 January 2025	Marzano Monterosso

CATEGORY OF CITED DOCUMENTS

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