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

(11) EP 2 628 683 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.08.2013 Bulletin 2013/34

(51) Int Cl.:
B65B 31/02 *(2006.01)* ***B65B 9/067*** *(2012.01)*

(21) Application number: **13155551.8**

(22) Date of filing: **15.02.2013**

(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

(30) Priority: **16.02.2012 IT TO20120135**

(71) Applicant: **CARLE & MONTANARI - OPM S.p.A.**
Rozzano (MI) (IT)

(72) Inventor: **Abluton, Aldo**
14100 Asti (IT)

(74) Representative: **Boggio, Luigi et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(54) Process and machine for treating capsules transferred to a packaging machine

(57) Process and machine for treating capsules (2); a film (6) is wound around a line of capsules (2) so as to form a packaging tube, while the capsules (2) are transferred in a line; before reaching the packaging tube, the capsules (2) pass through a tunnel (17), wherein a protective atmosphere is formed.

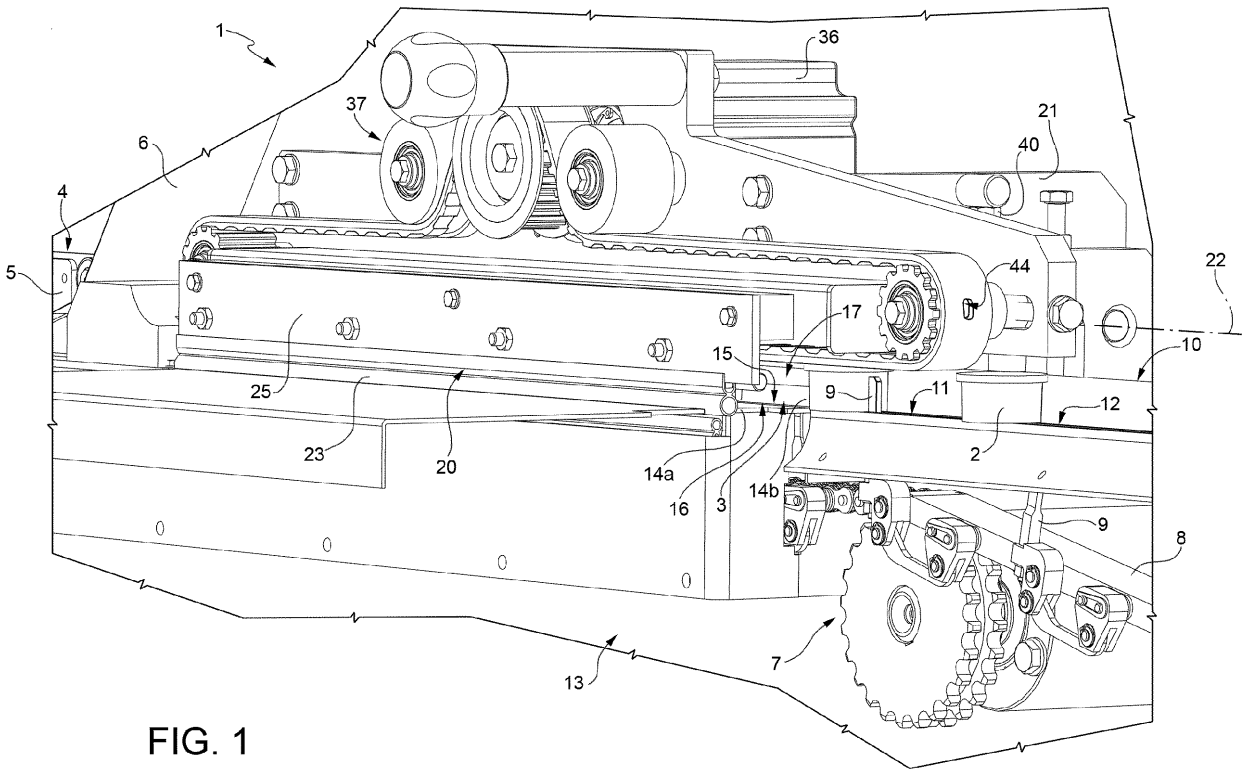

FIG. 1

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Description

[0001] The present invention relates to the treatment of capsules transferred to a packaging machine. More precisely, the present invention relates to capsules that are filled with a food product powder, for example coffee, tea or other soluble products, and which will then be used in machines for preparing hot or cold beverages.

[0002] Typically, said capsules are packaged in groups of two within a sealed envelope, made of plastic material. Said envelope may be produced by packaging machines of the type generally known by the term "flow-pack". As known, in said machines, the capsules to be packaged are transferred in a line and in positions spaced from one another within a packaging tube, which is formed by winding a continuous film of plastic material around the line of capsules and by heat-sealing a longitudinal edge of said film. The packaging tube, while advancing with the capsules, is then heat-sealed crosswise and cut to form the various packages. During packaging, nitrogen or another gas is blown into the packaging tube, so as to reduce the amount of oxygen and form a protective atmosphere inside the envelope around the capsules.

[0003] Currently, the advancement speed of the capsules is around 130 products per minute, but the tendency is to increase the transfer and packaging speed. However, increasing the packaging speed, there is an actual risk of not having enough time to create an optimal protective atmosphere within the envelopes. Therefore, it is necessary to adopt methods that make it possible to always provide a protective optimum condition despite the increase in speed.

[0004] The purpose of the present invention is to provide a process for treating capsules transferred to a packaging machine, which allows to fulfill the need referred to above and that is relatively simple.

[0005] According to the present invention, a process for treating capsules transferred to a packaging machine, as defined in claim 1 is provided.

[0006] According to the present invention a machine for treating capsules transferred to a packaging machine, as defined in claim 9 is also provided.

[0007] The invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting embodiment, wherein:

- Figure 1 shows, in perspective and with parts removed for clarity, a preferred embodiment of the machine for implementing the process for treating capsules transferred to a packaging machine, according to the present invention;
- Figure 2 illustrates, on an enlarged scale, a cross section of the machine of Figure 1;
- Figure 3 is a perspective view from below of a movable unit of the machine of Figure 1; and
- Figure 4 illustrates, on an enlarged scale and according to a different perspective, an outlet of the machine of Figure 1.

[0008] In Figure 1, the reference number 1 indicates a machine for forming a protective atmosphere around capsules 2 which are transferred in a line along a longitudinal horizontal track 3 towards a packaging machine 4 (partially illustrated), of the type called "flow-pack". The machine 4 comprises a device 5 that forms a packaging tube by winding a continuous film 6 of plastic material around the line of capsules 2 and by heat-sealing a longitudinal edge of the film 6. The packaging tube is then heat-sealed crosswise and cut during its longitudinal advancement, so as to form packages in series.

[0009] The machine 1 comprises a conveyor 7 (partially illustrated) having a ring-like transport member 8 (defined by a chain or a belt), which is wound on toothed pulleys (driving and driven) and supports a plurality of pusher teeth 9, colloquially referred to as "porters". The teeth 9 are vertical and are coupled, each, to a respective capsule 2, as the capsules 2 arrive in a line by a conveyor 10 (partially illustrated). The teeth 9 are spaced, along the annular path of the organ 8, with the same pitch between the capsules 2 at the end of the conveyor 10. During the operation of the member 8, the teeth 9 are inserted from below through a vertical slit 11 of the conveyor 10 so as to protrude above a surface 12 on which the capsules 2 slide. The conveyors 10 and 7 are controlled in a synchronized manner, so as to:

- allow each tooth 9 to protrude above the surface 12 immediately after the passage of a respective capsule 2, so as to rest on the tooth 9 against a rear edge of the capsule 2 itself; and
- provide the same travel speed that the capsules 2 have at the end of the conveyor 10 to the teeth 9.

[0010] In this way, the teeth 9 push the capsules 2, together with the conveyor 10 first, and then alone, so as to continue to transfer the capsules 2 with the same speed.

[0011] The machine 1 comprises a fixed structure 13 (partially illustrated), in turn comprising two walls 14a, 14b having a top surface 15 that is coplanar with the surface 12 and which supports the capsules 2 during the transfer thereof. The walls 14a, 14b are separated by a slit 16, which is aligned with the slit 11 to be engaged by the teeth 9 while the latter push the capsules 2. The surface 15 is the base of a tunnel 17 wherein a protective atmosphere is formed and wherein the capsules 2 pass before arriving to the device 5.

[0012] As shown in Figures 1 and 3, besides surface 15, the tunnel 17 is defined by a unit 20, which rests on the walls 14a, 14b and is movable with respect to the structure 13 so that it can be moved away from the track 3. In particular, the unit 20 comprises an arm 21 hinged to the structure 13 around a horizontal axis 22. To ensure the fluid-tight seal of the tunnel 17, gaskets 23 are provided between the walls 14a, 14b and the unit 20. In particular, the gaskets 23 are parallel to the track 3 and are fitted on the lower edge of two walls 25, 26 substan-

tially vertical, defining the sides of the tunnel 17.

[0013] With reference to Figures 2 and 3, the unit 20 comprises a supporting member 27, defined in particular by a vertical plate and fixed, on one hand, to the arm 21 and, on the other, to a box-shaped structure 28. The structure 28 defines a manifold 29, which is longitudinally elongated and communicates with a gas source or a vacuum source through a pipe 30 (partially shown). The base of the structure 28 has one or more slits 32, to put in communication the manifold 29 with the tunnel 17, and is covered at the bottom by a portion of a belt 34, forming part of a distributor device 35.

[0014] With reference to Figure 3, the device 35 is supported by the member 27 and comprises: a motor 36, arranged for example on the side of the arm 21; and a pulley driving system 37, on which the belt 34 is wound. The system 37 is arranged on the side of the structure 28, is operated by the motor 36, and is configured so as to be able to adjust the tension of the belt 34. In particular, one of the driven pulleys of the system 37 has an adjustable position with respect to member 27.

[0015] The belt 34 forms an annular path around the structure 28 and passes through the tunnel 17 above the track 3. As can be seen in the cross section of Figure 2, during the passage through the tunnel 17, the distance of the belt 34 from the surface 15 is substantially equal to the height of the capsules 2, therefore the belt 34 rests against a top face 39 of the capsules 2. Said distance is adjustable by a screw system 40 (partially illustrated in Figure 1) that defines a support point for the unit 20 when it is lowered.

[0016] The belt 34 comprises two lateral bands 41, which are toothed, mesh with the pulleys of the system 37, and slide on the base of the structure 28 on opposite sides of the slits 32. The belt 34 also comprises an intermediate region 42, which has a smaller height so as to remain spaced from the base of the structure 28, is aligned with the slits 32, and has a plurality of holes 44. The holes 44, in use, direct respective gas flows towards the track 3 so as to form the protective atmosphere directly around the capsules 2.

[0017] The holes 44 are spaced from one another along the belt 34 by an equal pitch (or sub-multiple) with respect to that between the teeth 9, and therefore to that between the capsules 2. Furthermore, the motor 36 is controlled so as to synchronize the belt 34 with the member 8 and arrange each hole 44 on a respective face 39: therefore, when feeding a gas (e.g. nitrogen) in the manifold 29, such gas tends to enter the capsules 2, through an appropriate filter arranged at the face 39, so as to reduce the oxygen concentration around the food product.

[0018] With reference again to Figure 2, the tunnel 17 houses two guides 50, 51, which laterally delimit the track 3 so as to guide the capsules 2. In particular, the guide 50 is fixed to the wall 25, while the guide 51 is fixed to the wall 14b, in an intermediate position between the wall 26 and the slit 16.

[0019] Below the walls 14a, 14b, the machine 1 has a chamber 52, which is crossed by the member 8 and is defined, below and laterally, by a structure 53 arranged in a fixed position. The structure 53 is coupled in fluid-tight manner to the walls 14a, 14b by way of gaskets 54, and has one or more inlets 55 communicating with the gas source or with the vacuum source so as to form a protective atmosphere also in the chamber 52, which thus facilitates the formation of a protective atmosphere in the tunnel 17 thanks to the slit 16. In other words, the chamber 52 defines an additional manifold for gas entering into the tunnel 17 or for sucking air from the tunnel 17.

[0020] With reference to Figure 4, in order to avoid that the protective atmosphere of the tunnel 17 is immediately dispersed in the external environment, a structure 56 is provided as a junction between the tunnel 17 and the device 5. The structure 56 defines a duct 57 which puts into communication the outlet of the tunnel 17 with the packaging tube while the latter is formed. The base of the structure 56 defines an extension of the walls 14a, 14b and has a slit (not shown), which is aligned with the slit 16 to be engaged by the teeth 9 which push the capsules 2. The structure 56 also comprises: two lateral guides 60 adjacent to, and longitudinally aligned with, the guides 50, 51, for continuing the track 3; and a block 61 having a lower face which superiorly closes the duct 57. Preferably, the duct 57, in cross section, has a closed outer perimeter or with minimal spaces, except for the inlet thereof where the guides 60 are divergent and open said perimeter.

[0021] The ends 62, 63 of the block 61 are close to the belt 34, at one of the pulleys of the system 37, and respectively to the film 6, at its inlet into the device 5, so as to leave as little space as possible and limit the leakage from the duct 57. In particular, the ends 62, 63 have a shape that is the negative of the path of the belt 34 and of the path of the film 6. The film 6, before being folded by the device 5 to form the packaging tube, rests on the faces 39 of the capsules 2 as an extension of the lower face of the block 61. Preferably, the structure 56 is carried by the machine 4, but could possibly be carried, in part or completely, by the machine 1.

[0022] From the foregoing it is evident that the above process and the machine 1 allow to form a protective atmosphere in the packages of the capsules 2 in an effective manner, also if the transfer and packaging speed is increased, as the protective atmosphere is already formed before entering the capsules 2 in the packaging tube. In particular, the capsules 2 are not slowed down or stopped in the transfer towards the machine 4, and the gas is blown directly towards the track 3. Thanks to the device 35, it is possible to generate gas flows which move together with the capsule 2, and therefore direct said flows directly on the filters of the capsules 2, so as to reduce the percentage of oxygen surrounding the food product.

[0023] The chamber 52 contributes in maintaining the protective atmosphere of the tunnel 17, since it avoids a

direct communication between the slit 16 and the external environment and performs a function of manifold for supplying gas to the tunnel 17.

[0024] The solution is then relatively simple to be made, to be assembled and disassembled. In particular, the capability to move the unit 20 enables easy assembly and maintenance operations of the machine 1.

[0025] From the above it is, finally, clear that to the process and to the machine 1 described above with reference to the attached figures modifications and variants can be applied without departing from the scope of protection of the present invention, as defined in the appended claims.

[0026] In particular, the device 35 may be absent if the pressure in the tunnel 17 would be sufficiently high to avoid directing the gas on the capsules 2. Moreover, the unit 20 could have different structural characteristics with respect to those illustrated; and/or holes 44 may be configured as tubes or as another type of channel, and transported along the track 3 for blowing gas into the capsules 2; and/or the channels for bringing and/or forming the protective atmosphere inside the tunnel 17 might have a configuration and/or position different from what illustrated by way of example.

Claims

1. A process for treating capsules (2), comprising the steps of:

   - transferring a line of capsules (2);
   - winding a film (6) around said capsules (2) during the transfer thereof, so as to form a packaging tube;

   characterised in that, before reaching said film (6), said capsules (2) pass through a tunnel (17); and **characterised by** forming a protective atmosphere in said tunnel (17).

2. The process according to claim 1, **characterised in that** said capsules (2) pass through a duct (57), which extends from the outlet of said tunnel (17) to said packaging tube.

3. The process according to claim 1 or 2, **characterised in that** said protective atmosphere is formed by introducing gas in said tunnel (17).

4. The process according to claim 3, **characterised by** directing said gas towards said capsules (2) through respective channels (44) which are advanced at the same transfer speed of said capsules (2).

5. The process according to claim 4, **characterised in that** said gas is directed on a top face (39) of said capsules (2).

6. The process according to claim 5, **characterised in that** said channels (44) are made in a belt (34).

7. The process according to claim 6, **characterised in that** said belt (34) rests on the top faces (39) of said capsules (2).

8. The process according to any of claims 3 to 7, **characterised by** introducing said gas in said tunnel (17) through a longitudinal slit (16), which separates two walls (14a, 14b) defining a surface (15) on which said capsules slide.

9. A machine for treating capsules, for carrying out the process according to any of the preceding claims, the machine (1) comprising:

   - a fixed structure (13);
   - guide means (50, 51) defining a track (3) for guiding a line of capsules (2);
   - conveying means (7) for transferring said capsules along said track (3);
   - a tunnel (17) engaged by said track (3);
   - channelling means (29, 44, 52) communicating with said tunnel (17) to form a protective atmosphere in said tunnel (17).

10. The machine according to claim 9, **characterised by** comprising a junction (56), which extends from the outlet of said tunnel (17) and defines a duct (57).

11. The machine according to claim 9 or 10, **characterised by** comprising a movable member (34), which passes through said tunnel (17), is parallel to said track (3) and is operated synchronously with said conveying means (7) to advance at the same transfer speed of said capsules (2); said channelling means comprising a plurality of channels (44) borne by said movable member (34) and directed towards said track (3).

12. The machine according to claim 11, **characterised in that** said movable member is defined by a belt (34).

13. The machine according to claim 11 or 12, **characterised in that** said channels (44) are spaced from one another by an amount which is equal to the capsule pitch set by said conveying means (7).

14. The machine according to any of claims 9 to 13, **characterised in that** said channelling means comprise at least one manifold (29), which is elongated in a longitudinal direction.

15. The machine according to any of claims 9 to 14, **characterised in that** said fixed structure (13) comprises two walls (14a, 14b), which are separated by

a longitudinal slit (16) and define a resting surface for said capsules (2); said channelling means comprising a chamber (52) defined on the top by said walls (14a, 14b) and crossed over by a transport member (8), which is part of said conveying means (7).

16. The machine according to any of claims 9 to 15, **characterised in that** said tunnel (17) is defined on the top by a movable unit (20), which is coupled to said fixed structure (13) so as to be moved away from said track (3); gasket means being interposed between said fixed structure (13) and said movable unit (20).

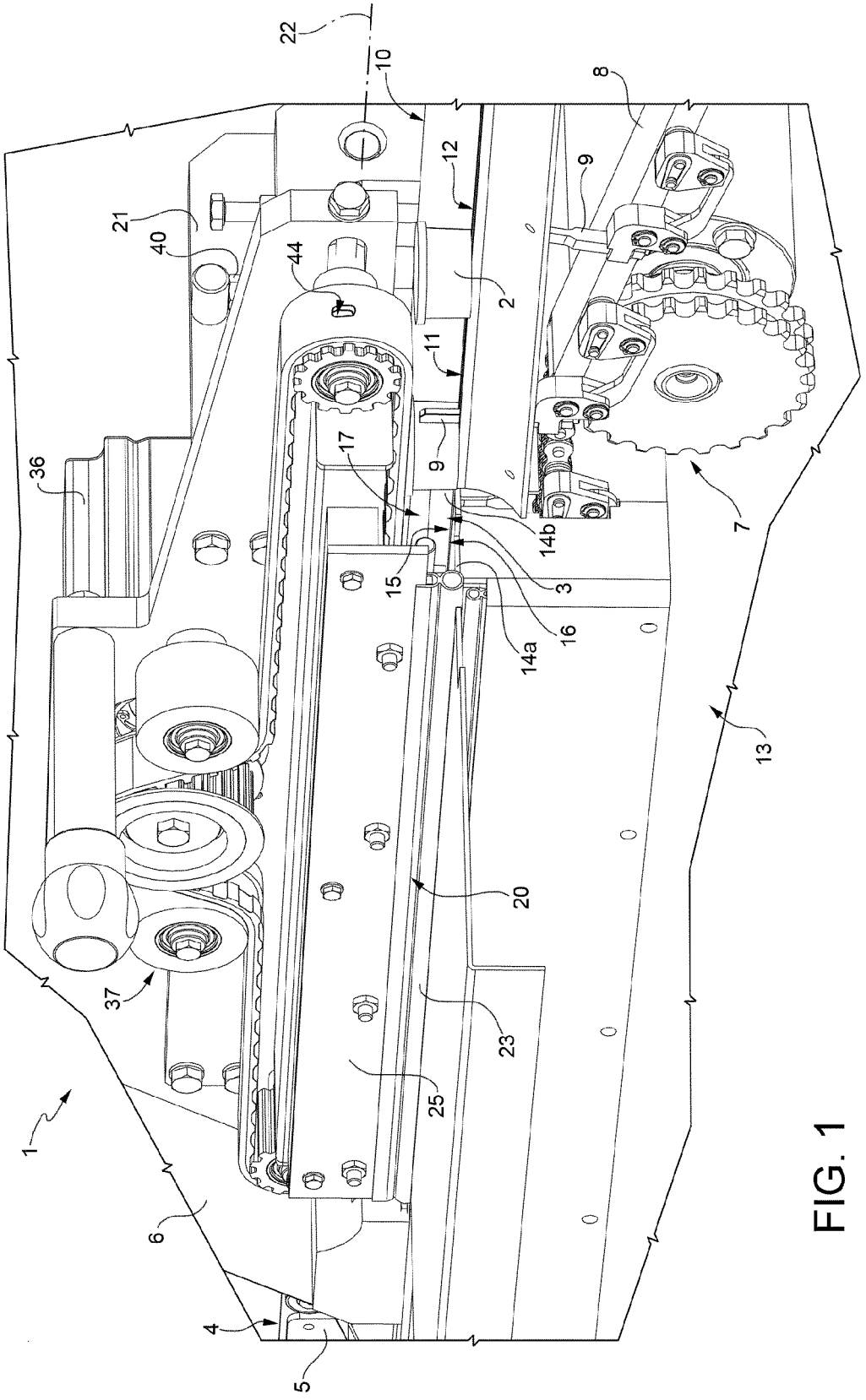

FIG. 1

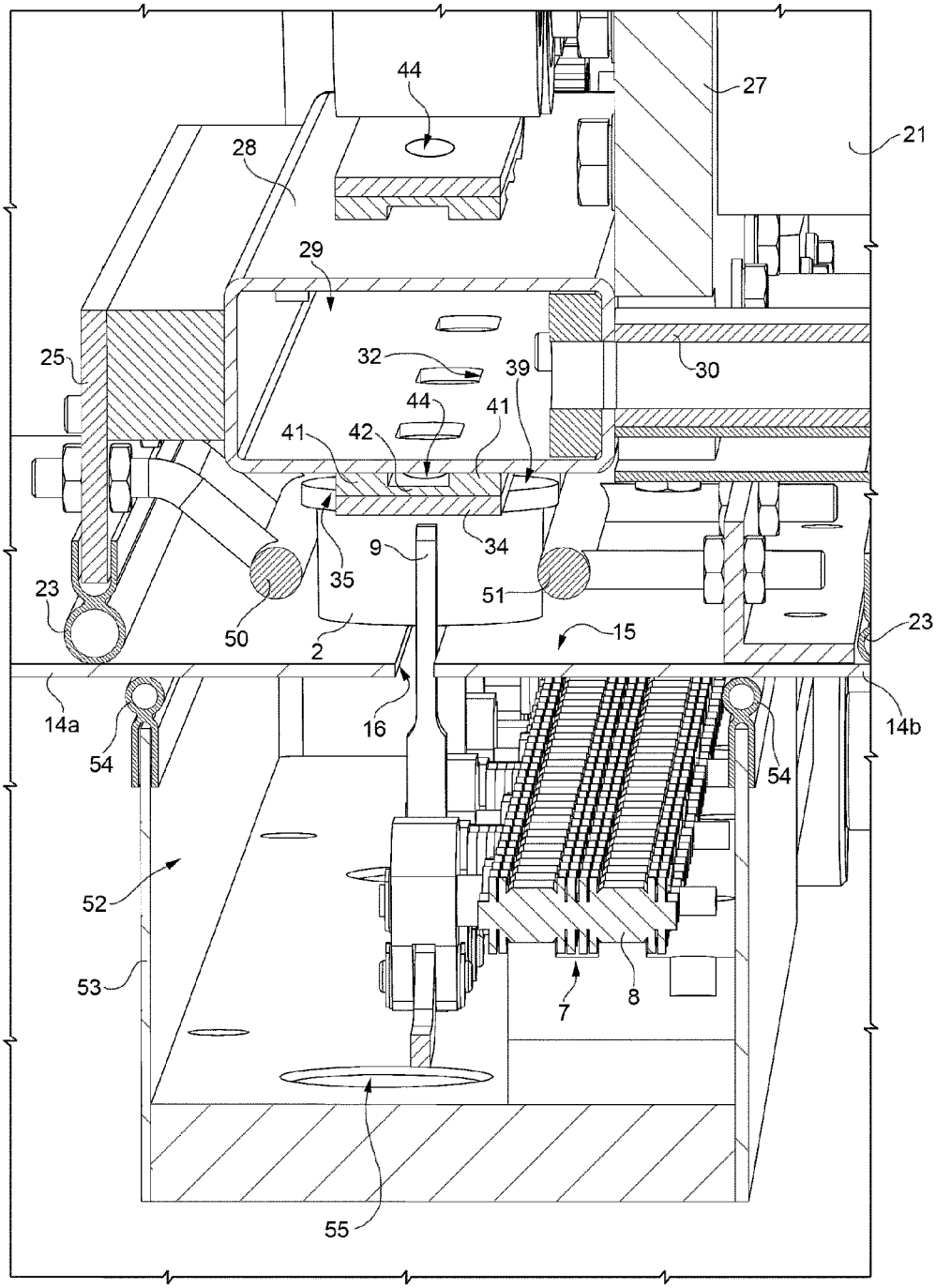
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FIG. 2

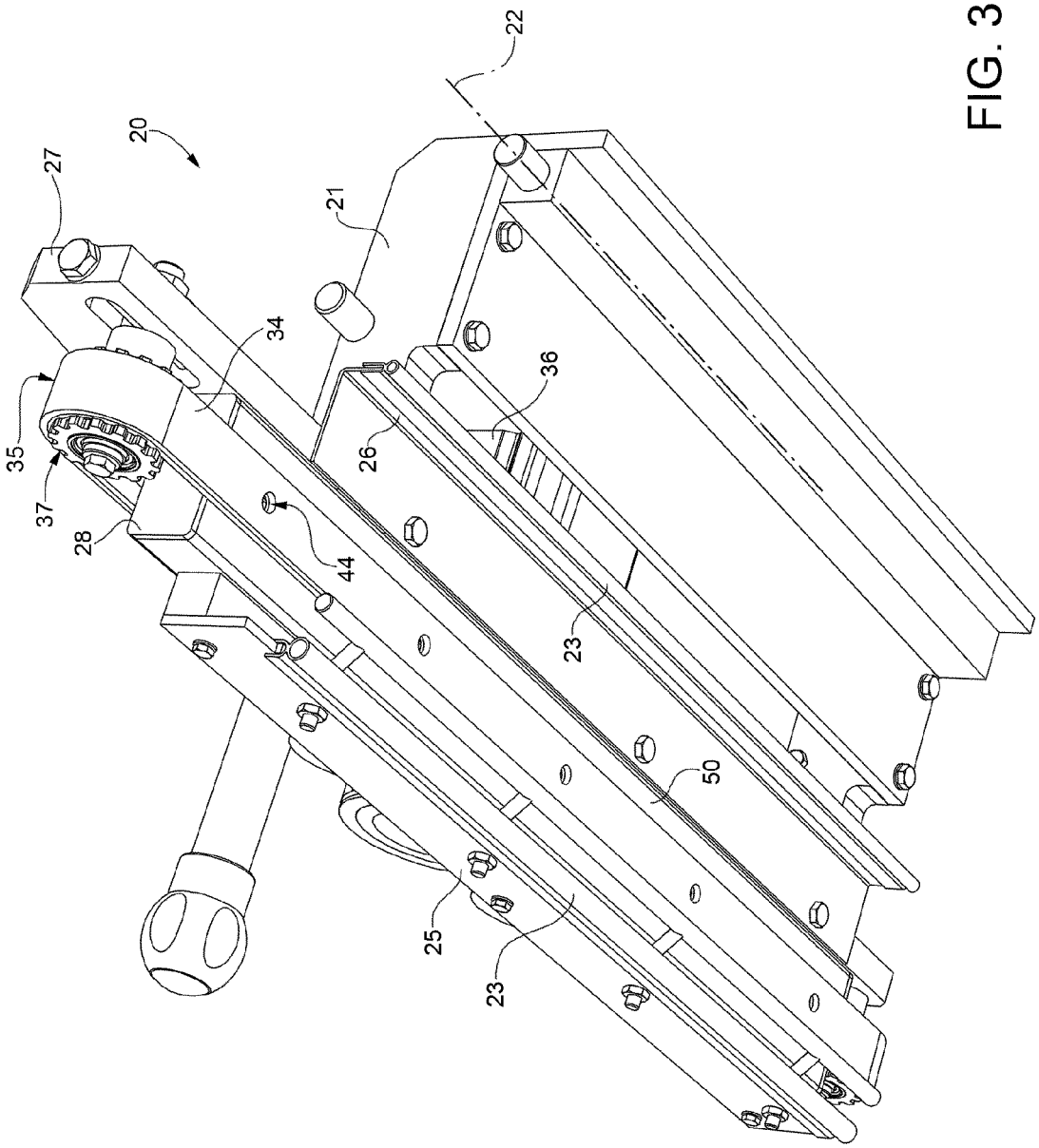

FIG. 3

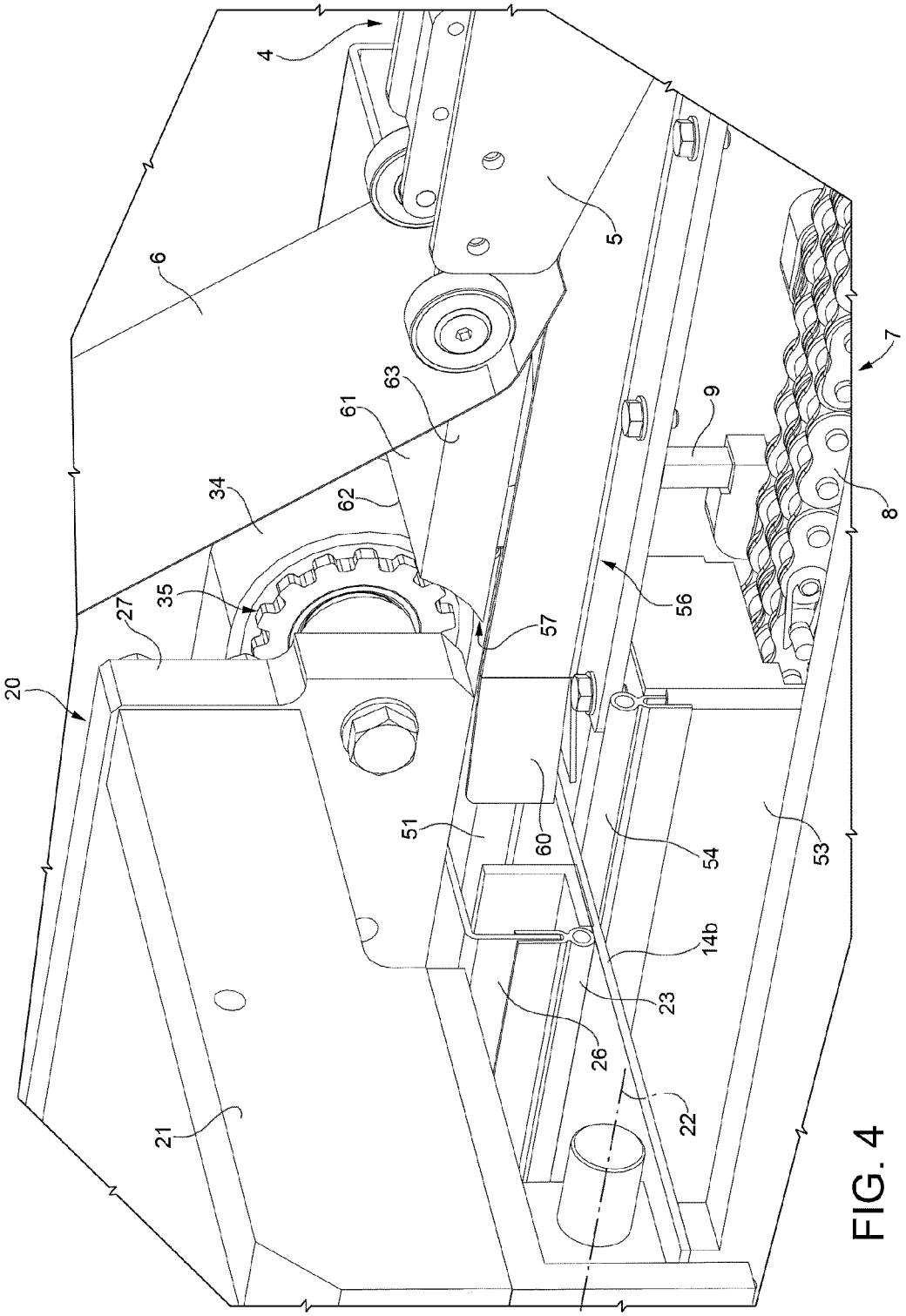

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 13 15 5551

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 2010/131063 A1 (AROMA SYSTEM SRL [IT]; RAPPARINI GINO [IT]) 18 November 2010 (2010-11-18) * figures *	1-16	INV. B65B31/02 B65B9/067
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TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 May 2013	Lawder, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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