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

(11) **EP 3 992 095 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.05.2022 Bulletin 2022/18

(21) Application number: **20204826.0**

(22) Date of filing: **30.10.2020**

(51) International Patent Classification (IPC):
B65C 9/18 *(2006.01)* ***B65C 9/40*** *(2006.01)*
B65C 9/42 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65C 9/1819; B65C 9/42; B65C 2009/1838

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Sidel Participations**
76930 Octeville-sur-Mer (FR)

(72) Inventors:
- **FERRI, Marco**
  46100 Mantova (IT)
- **ANDREATO, Cristian**
  46100 Mantova (IT)

(74) Representative: **Sidel Group**
c/o Sidel Participations
Avenue de la Patrouille de France
76930 Octeville-sur-mer (FR)

(54) LABELLING MACHINE AND METHOD FOR APPLYING LABELS ONTO ARTICLES ADAPTED TO CONTAIN A POURABLE PRODUCT

(57) There is described a labelling machine (1) for applying labels (2) obtained from a web (4) of labelling material onto articles (3) adapted to contain a pourable product, and comprising: a conveyor device (6) configured to advance a plurality of articles (3) along a conveying path (P); a cutting device (10) configured to cut a sequence of single labels (2) from the web (4) of labelling material, the labels (2) being initially joined together to form said web (4); a label transfer device comprising a vacuum drum (11) configured to sequentially receive, on an outer lateral surface (11a) thereof, the labels (2) cut by the cutting device (10), to retain the labels (2) onto the outer lateral surface (11a) by means of vacuum suction, and to transfer them to the conveyor device (6); a tension sensor (15) arranged operatively upstream of the cutting device (10) and configured to detect a physical quantity correlated with a tension of the web (4) and to generate a signal (W) correlated with the detected physical quantity; and a control unit (16) configured to receive the signal (W) generated, in use, by the tension sensor (15) and to control the vacuum suction of the vacuum drum (11) based on the signal (W) received from the tension sensor (15).

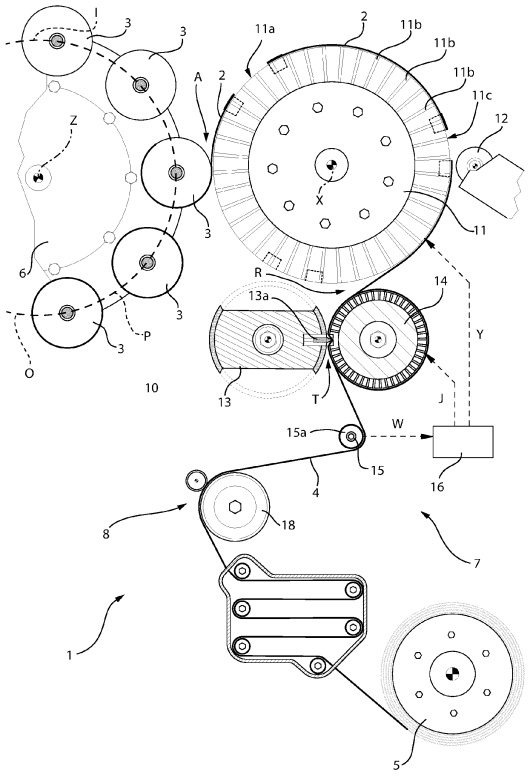

FIG. 1

EP 3 992 095 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a labelling machine for applying labels onto articles, such as bottles, containers or the like, adapted to contain a pourable product, preferably a pourable food product.

[0002] The present invention also relates to a method for applying labels onto articles, such as bottles, containers or the like, adapted to contain a pourable product, preferably a pourable food product.

BACKGROUND ART

[0003] Labelling machines are known, which are commonly used to prepare, transport and apply labels onto articles, such as bottles, containers, or the like destined to be filled with a pourable product, in particular a pourable food product.

[0004] A prior art labelling machine comprises a conveyor device for conveying said plurality of containers. The labelling machine comprises an advancement device for advancing a web of labelling material through a cutting station, according to an advancement direction, and up to a transfer drum. The labelling machine comprises a cutting device for cutting sequentially the advancing web at the cutting station, to obtain sequentially a plurality of labels not joined to each other, the labels being initially joined together to form said web. The transfer drum is being configured, by means of a suction system acting on an outer lateral surface of the transfer drum and the transfer drum rotating on itself, for sequentially receiving the labels from the cutting device, angularly spacing around said axis the received labels from each other, and transferring the spaced labels to apply them onto respective conveyed containers. It is known in the field an initial sliding of the leading end portion of each label along (namely over or onto) a sliding portion of the outer lateral surface of the transfer drum, as soon as it is grasped by the suction action of the transfer drum, i. e. when the label is still attached to the web of labelling material at its trailing end portion and has not yet been cut by the cutting device.

[0005] This is due to the fact that the web and the transfer drum necessarily have different peripheral velocities, namely the web is slower than the transfer drum. In particular, the initial sliding is necessary in order to provide for a pitch of the labels to be transferred by the transfer drum that matches the pitches of the articles being advanced by the carousel.

[0006] Necessarily, such pitch has to be larger than the pitch of the labels still joined and forming the web, hence the difference in velocities between the web (namely the unwinding rollers) and the transfer drum.

[0007] The sliding of the label stops as soon as the label is cut at its trailing end portion, thereby being fully transferred onto the transfer drum.

[0008] In light of the above, the transfer drum is configured to space the labels received onto its outer lateral surface by making the leading end portion of each received label to slide over the respective sliding portion.

[0009] Furthermore, since the transfer drum is faster than the web of labelling material when this latter is received thereon, there is a risk of stretching the web itself.

[0010] Hence, the suction action of the transfer drum has to be optimally controlled, in order to avoid stretching of the web and thus of the label itself.

[0011] It is also known in the field that the blade member is subject to wear.

[0012] Although the known labelling machines, and in particular the known labelling modules, work satisfyingly well, a need is felt in the industry to further improve such labelling machines, in particular as to optimize the control of the suction action of the transfer drum and as to improve the wear control of the blade member.

DISCLOSURE OF INVENTION

[0013] It is therefore an object of the present invention to provide a labelling machine which is designed to meet at least one of the above-mentioned needs in a straightforward and low-cost manner.

[0014] This object is achieved by a labelling machine as claimed in claim 1.

[0015] It is a further object of the present invention to provide a method for applying labels onto articles which is designed to meet at least one of the above-mentioned needs in a straightforward and low-cost manner.

[0016] This object is achieved by a method for applying labels onto articles as claimed in claim 10.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic top view, with parts removed for clarity, of a labelling machine according to the present invention; and

Figures 2 is an enlarged-scale, schematic top view of a particular of the labelling machine of Figure 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0018] With reference to Figure 1, number 1 indicates as a whole a labelling machine configured to apply labels 2 onto articles 3, such as bottles, receptacles, or the like, destined to contain a pourable product, in particular a pourable food product, such as still or sparkling water, juice, milk, soft drinks, beer, wine, or the like.

[0019] According to this non-limiting embodiment shown, labels 2 applied by labelling machine 1 are glued labels, i.e. strips of labelling material that are cut at predetermined lengths, from a web 4 of labelling material,

and to which glue is applied according to a manner that will be described in the following.

[0020] Preferably, web 4 of labelling material is wound around one or more storage units, such as reels 5 (only one reel is shown in Figure 1), and is progressively unwound, in use, off reel 5.

[0021] As visible in Figure 1, labelling machine 1 essentially comprises:

- a conveyor device, preferably a rotary carousel 6 rotatable around a fixed axis, in particular a vertical axis Z, and configured to advance a plurality of articles 3 along a conveying path P, in the example shown an arc-shaped, horizontal path;
- an input station I, at which articles 3 to be labelled are fed to carousel 6;
- an output station O, at which labelled articles 3 exit from carousel 6; and
- a labelling module 7 (only partially and schematically shown), arranged peripherally relatively to carousel 6 and configured to feed a plurality of labels 2 to the carousel 6 itself at an application station A, in order to apply labels 2 to respective articles 3.

[0022] In detail, labelling module 7 comprises:

- at least one of the above-mentioned reels 5 for storing web 4;
- a conveying system 8 configured to advance web 4 along an advancement path, from a storage station defined by reel 5 towards a cutting station T at which web 4 is sequentially cut, and comprising a plurality of unwinding rollers which support, in use, web 4 progressively unwound, in use, from reel 5 and guide it along the advancement path;
- a cutting device 10 configured to cut a sequence of single labels 2 from web 4, in the form of strips having equal length, the labels 2 being initially joined together to form web 4; and
- a label transfer device comprising a rotary vacuum drum 11 rotatable around a fixed axis, preferably a vertical axis X, arranged peripherally to carousel 6 and configured to sequentially receive, on an outer lateral surface 11a thereof, labels 2 cut by the cutting device 10, to retain such labels 2 onto outer lateral surface 11a by means of vacuum suction, and to transfer such labels 2 to carousel 6.

[0023] According to this preferred embodiment, labelling module 7 further comprises a gluing device 12 arranged peripherally to vacuum drum 11 operatively downstream of cutting device 10 and configured to apply a predetermined amount of glue onto at least one portion of each label 2, sequentially.

[0024] As visible in Figure 1, vacuum drum 11 sequentially receives, in use and at a receiving station R, a free end portion of web 4 defining a leading end portion of each label 2, retaining the same onto outer lateral surface 11a.

[0025] Preferably, vacuum drum 11 has a substantially cylindrical configuration. Accordingly, outer lateral surface 11a has a substantially cylindrical shape and labels 2 are conveyed circumferentially from receiving station R to application station A, along a direction of rotation of vacuum drum 11.

[0026] Furthermore, vacuum drum 11 is rotatably mounted around axis X onto a stationary distributor element (not shown) carried by labelling module 7.

[0027] In detail, the distributor element comprises first air passages (not shown) connected to a vacuum source (not shown). Vacuum drum 11 is, in turn, provided with second air passages 11b, which are configured to selectively communicate with the first air passages at certain angular positions assumed by vacuum drum 11, as this latter rotates about axis X, and end into a plurality of vacuum ports 11c formed through outer lateral surface 11a.

[0028] In practice, depending on the angular position relative to axis X assumed by vacuum drum 11, vacuum ports 11c are put in fluid communication, by means of the first air passages and second air passages 11b, with the vacuum source. When this happens, a vacuum suction is applied on each label 2, which retains this latter onto outer lateral surface 11a.

[0029] In light of the above, vacuum drum 11 retains, in use, labels 2 onto outer lateral surface 11a by means of vacuum suction.

[0030] Preferably, the above-mentioned free end portion of web 4 is configured to slide onto outer lateral surface 11a for a certain angle as soon as it is grasped by the vacuum suction of the vacuum drum 11, i.e. when the respective label 2 is still attached to web 4 at its trailing end portion and has not yet been cut by cutting device 10.

[0031] This initial sliding is well-known in the industry and is due to the fact that web 4 and vacuum drum 11 necessarily have different peripheral velocities, namely web 4 is slower than vacuum drum 11. In particular, the initial sliding is necessary in order to provide for a pitch of labels 2 to be transferred by vacuum drum 11 that matches the pitches of the articles 3 being advanced by carousel 6.

[0032] Necessarily, such pitch has to be larger than the pitch of labels 2 still joined and forming the web 4, hence the difference in velocities between web 4 and vacuum drum 11.

[0033] The sliding of the free end portion of web 4 stops as soon as the relative label 2 is cut at its trailing end portion, thereby being fully transferred onto vacuum drum 11.

[0034] In light of the above, vacuum drum 11 is configured to space labels 2 received onto its outer lateral surface 11a by making the leading end portion of each received label 2 to slide over outer lateral surface 11a for a certain angle.

[0035] Since, for the above reasons, vacuum drum 11 is faster than web 4 of labelling material when this latter

is received onto outer lateral surface 11a, there is a risk of stretching the web 4 itself.

[0036] Labelling machine 1, and in particular labelling module 7, further comprises a tension sensor 15 arranged operatively upstream of cutting device 10, more specifically upstream of cutting device 10 relative to the advancement path of web 4, and configured to detect a physical quantity correlated with a tension of web 4 and to generate a signal W correlated with the detected physical quantity.

[0037] Moreover, labelling machine 1, and in particular labelling module 7, comprises a control unit 16 configured to receive signal W generated, in use, by tension sensor 15.

[0038] According to an aspect of the present invention, control unit 16 is configured to control the vacuum suction of the vacuum drum 11 based on the signal W received from tension sensor 15.

[0039] In particular, control unit 16 is configured to send a signal Y correlated to signal W to vacuum drum 11, in order to control the intensity of the vacuum suction applied by this latter.

[0040] In other words, the amount or intensity of vacuum suction imparted on web 4 (and on labels 2) by vacuum drum 11 through vacuum ports 11c is advantageously controlled, in use, by control unit 16 based on the detection of tension sensor 15, and, therefore, based on the current tensioning of web 4 along the web advancement path.

[0041] This is particularly advantageous as to avoid a possible stretching of web 4, and therefore of labels 2, when the free end portion of web 4 is grasped by the vacuum suction of vacuum drum 11.

[0042] In fact, by controlling the vacuum suction of vacuum drum 11 based on the tension of web 4, it is possible to calibrate such vacuum suction in order to avoid an otherwise too strong vacuum suction which could lead to a stretching of web 4, due to the above-mentioned difference in velocities.

[0043] For example, in use, if tension sensor 15 detects a high tensioning of web 4, control unit 16 controls a reduction of the intensity of the vacuum suction of vacuum drum 11, thereby reducing or even virtually cancelling out the risk of stretching web 4.

[0044] On the contrary, if tension sensor 15 detects a low tensioning of web 4, control unit 16 controls an increase of the intensity of the vacuum suction of vacuum drum 11, thereby ensuring the proper tensioning of web 4 and an effective sliding of the same onto outer lateral surface 11a so as to maintain the predetermined pitch.

[0045] Preferably, tension sensor 15 is defined by a load cell, for example an annular load cell.

[0046] Preferably, tension sensor 15 is part of conveying system 8. For example, tension sensor 15 can be implemented in one roller 15a of the unwinding rollers defining conveying system 8. Accordingly, tension sensor 15 is configured to measure a force exerted by web 4, during its advancement, on roller 15a, specifically on a supporting shaft of roller 15a, and to correlate the measured force with a tension of the web 4.

[0047] As visible in Figure 2, cutting device 10 is arranged peripherally to vacuum drum 11 at receiving station R and is configured to cut web 4 sequentially at the trailing end portion of each label 2, so as to produce labels 2 which extend from the leading end portion to the trailing end portion.

[0048] In detail, cutting device 10 is of the rotary-type and comprises:

- a first rotary element, in particular a first roller 13 rotatably mounted about a vertical axis, carrying a blade 13a and configured to convey blade 13a along a circular cutting path around the above-mentioned axis and cyclically at cutting station T; and
- a second rotary element, in particular a second roller 14 rotatably mounted about an axis preferably parallel to the axis of the first roller 13, arranged peripherally to the first roller 13 so as to be substantially tangent to the cutting path, and configured to support web 4 and convey web 4 towards cutting station T, at which web 4 is cyclically cut by blade 13a.

[0049] In greater detail, second roller 14 advances, in use, web 4 so that predetermined portions of web 4 configured to be cut are conveyed at cutting station T, at which blade 13a interacts with web 4 cutting this latter.

[0050] In practice, first roller 13 defines a support roller for blade 13a and second roller 14 defines a support roller for web 4.

[0051] In other words, web 4 is interposed, in use and at the cutting station T, between the first roller 13 and the second roller 14, the latter acting as an abutment roller for the blade 13a during the cutting operation.

[0052] Conveniently, second roller 14 is provided with dedicated vacuum passages 14b terminating each in one respective vacuum port 14c at an outer lateral surface 14a of the second roller 14 itself, to apply vacuum suction onto web 4 supported thereon.

[0053] Preferably, the vacuum system of second roller 14 is substantially identical to the vacuum system of vacuum drum 11.

[0054] In light of the above, the cutting operation comprises the step of supporting web 4 by applying a further vacuum suction thereon distinct from the vacuum suction applied by vacuum drum 11.

[0055] Advantageously, control unit 16 is configured to control the vacuum suction of second roller 14 based on the signal W received from tension sensor 15.

[0056] In particular, control unit 16 is configured to send a signal J correlated to signal W to second roller 14, in order to control the intensity of the vacuum suction applied by this latter.

[0057] In other words, the amount or intensity of vacuum suction imparted on web 4 by second roller 14 through vacuum ports 14c is advantageously controlled, in use, by control unit 16 based on the detection of tension

sensor 15, and, therefore, based on the current tensioning of web 4 along the web advancement path.

[0058] This further control is particularly advantageous as it ensures a better management of the tension of web 4 during cutting.

[0059] Conveniently, control unit 16 is configured to simultaneously control the vacuum suctions of both vacuum drum 11 and second roller 14 based on the signal W received from tension sensor 15, so as to obtain a balance of both vacuum suctions correlated to signal W.

[0060] This balancing control is particularly advantageous as it ensures both an even better management of the tension of web 4 and a proper grasping and sliding of the free end of web 4 onto vacuum drum 11, preventing at the same time an undesired stretching thereof.

[0061] According to the preferred and non-limiting embodiment shown, second roller 14 has at least one recess 17 on its outer lateral surface 14a.

[0062] Accordingly, second roller 14 is configured to advance web 4 so that the predetermined portions to be cut cover one at a time at least part of recess 17. Blade 13a is movable, in use, through web 4 to engage recess 17 (cyclically) at cutting station T, in order to sequentially cut the predetermined portions at cutting station T.

[0063] Preferably, blade 13a is a serrated blade.

[0064] The Applicant has observed that the above-mentioned control based on signal W of tension sensor 15 is particularly effective in case second roller 14 is provided with recess 17 and in case blade 13a is a serrated blade.

[0065] According to a further aspect of the present invention, control unit 16 is configured to:

- calculate a time trend of the values of the physical quantity detected by tension sensor 15 based on the signals W received from tension sensor 15 for a given time span; and to
- correlate the calculated time trend with the wear of said blade 13a.

[0066] Conveniently, control unit 16 in further configured to emit a blade wear warning signal if the detected values of the physical quantity exceed a predetermined threshold value for a given time span.

[0067] In practice, control unit 16 is configured to monitor web tension values detected by tension sensor 15 for a given period of time and correlate such web tension values with a wear (usage) of blade 13a, so as to monitor or predict blade wear.

[0068] In fact, if the calculate time trend comprises a plurality of peaks in web tension values, this could be a signal of a non-nominal effort required by the blade 13a to cut web 4 and, therefore, an index of excessive wear of the blade 13a itself.

[0069] Hence, a simple and cost-effective system for monitoring and/or predicting the wear of blade 13a is obtained, which also function during production, thereby avoiding the need for an operator to check blade 13a between each production cycle.

[0070] As visible in Figure 1, conveying system 8 comprises a feed roller 18 arranged operatively upstream of cutting device 10, along the advancement path of web 4, and configured to be controlled at a predetermined angular velocity for unwinding web 4 from reel 5 and for feeding web 4 towards cutting station T.

[0071] In detail, feed roller 18 imparts a feeding velocity to web 4.

[0072] According to another aspect of the present invention, control unit 16 is configured to control the angular velocity of feed roller 18 based on signal W received from tension sensor 15.

[0073] In this way, a simple, effective and more efficient control of the tensioning of web 4 along the advancement path can be obtained, thereby avoiding web 4 to be too stretched or too loose.

[0074] According to a further aspect of the present invention, control unit 16 is configured to use the above-mentioned time trend to monitor the quality of the labelling material defining web 4.

[0075] More precisely, control unit 16 is further configured to emit a labelling material low quality warning signal if the detected values of the physical quantity correlated with the tension of web 4 are smaller than a minimum predetermined threshold value or larger than a maximum predetermined threshold value for a given time span.

[0076] In this way, a simple and effective monitoring of the quality of the labelling material can be obtained, even during the production cycle and without the need for stopping machine 1.

[0077] The operation of labelling machine 1 is described hereinafter with reference to a single label 2 to be treated/handled and starting from a condition in which a free end portion of web 4 defining the leading end portion of the label 2 to be treated/handled has been received onto outer lateral surface 11a at receiving station R.

[0078] In this condition, vacuum suction is applied both by vacuum drum 11, through vacuum ports 11c, and by second roller 14, through vacuum ports 14c.

[0079] At the same time, tension sensor 15 detects the physical quantity correlated with the tension of web 4 and generates a signal W. In the example shown, tension sensor 15 detects a force exerted by web 4 on roller 15a.

[0080] Control unit 16 receives signal W and controls the vacuum suctions of one or both of vacuum drum 11 and second roller 14.

[0081] Conveniently, control unit 16 monitors, as stated above, a wear of blade 13a and the quality of labelling material, and controls the angular velocity of feed roller 18.

[0082] The process is repeated/continued for each labelling cycle.

[0083] The machine 1 comprises an advancement device 8. The advancement device 8 is for advancing the web 4 through a cutting station T. The machine 1 comprises a transfer drum 11. The advancing of the web 4 occurs according to an advancement direction and up to

the transfer drum 11.

[0084] The machine 1 comprises a cutting device 10 for cutting sequentially the advancing web 4 at the cutting station T. The sequentially cutting is carried out to obtain sequentially a plurality of labels 2 not joined to each other.

[0085] The machine 1 comprises a transfer drum 11. The machine 1 comprises a first suction system. The first suction system comprises passages 11b located within the transfer drum 11 and ports 11c located on an outer lateral surface 11a of the transfer drum 11. The transfer drum 11 defines an axis X of the transfer drum 11. The lateral surface 11a of the transfer drum 11 extends angularly around the axis X of the transfer drum 11. Transfer drum 11 is configured for sequentially receiving the labels 2 from the cutting device 10, for sequentially angularly spacing around said axis X and from each other the received labels 2, and for sequentially transferring the spaced labels 2. The transferring is carried out to apply the labels 2 onto respective conveyed containers 3. Said receiving, spacing and transferring are carried out by means of a first suction action applied by the first suction system on the lateral surface 11a of the transfer drum 11. Said receiving, spacing and transferring are carried out also by means of the transfer drum 11 rotating on itself around the axis X. The first suction action is applied while the transfer drum 11 is rotating on itself.

[0086] The machine 1 comprises a tension sensor 15. The tension sensor 15 is located upstream of the cutting device 10 according to the advancement direction. for detecting a physical quantity correlated with a tension of the web 4 upstream of the cutting station T according to the advancement direction.

[0087] The machine 1 is configured to automatically and actively control the first suction system as a function of the detected physical quantity. This controlling of the first suction system is carried out at least to lower the risk of stretching and/or the risk of loosening the web 4.

[0088] The machine 1 is configured so that the detecting of the physical quantity comprises obtaining a time trend of the physical quantity so that the detected physical quantity comprises the detected time trend.

[0089] The cutting device 10 comprises a blade 13a. The cutting device 10 is configured for performing said sequentially cutting by cyclically moving the blade 13a through the cutting station T.

[0090] The second roller 14 can be considered a web tensioning roller. The machine comprises a second suction system. The second suction system comprises the dedicated passages 14b located within the tensioning roller 14 and the dedicated ports 14c located on the outer lateral surface 14a of the tensioning roller 14. The lateral surface 14a of the tensioning roller 14 extends angularly around the axis of the tensioning roller 14. The cutting device 10 comprises the tensioning roller 14, which is a part also of the advancement device 8. The tensioning roller 14 is configured for conveying and tensioning the web 4 at the cutting station T. Said conveying and tensioning are carried out by means of a second suction action applied by the second suction system on the lateral surface 14a of the tensioning roller 14. Said conveying and tensioning are carried out also by means of the tensioning roller 14 rotating on itself around the axis of the tensioning roller 14. The tensioning roller 14 in this way contributes to produce a correct position and tension of the web at the cutting station T, for the purpose of ensuring a correct cutting of the web 4.

[0091] The machine 1 is configured to automatically and actively control said first suction action applied by the first suction system and said second suction action applied by the second suction system, in relation to each other and simultaneously, as a function of the detected physical quantity.

[0092] This controlling of the second suction system and of the first suction system in relation to each other is carried out at least in such a way to simultaneously meet the need of having a correct tension for the cutting and the need to lower the risk of stretching and/or the risk of loosening the web 4.

[0093] The machine 1 is configured to automatically correlate the detected physical quantity with a current wear blade status of the blade 13a. The machine 1 is configured to emit a blade member wear warning signal if the physical quantity exceeds a predetermined threshold value. In this way the blade condition can be monitored in an efficient way.

[0094] The machine 1 is configured to automatically emit a blade member wear warning signal if the detected physical quantity exceeds said predetermined threshold value for a preestablished time spam. In particular the exceeding of a predetermined threshold for a preestablished time spam can be the sign of a peak in the time trend of the tension. This peak can be considered indicative of a too high level of wear of the blade 13a.

[0095] The tensioning roller 14 comprises at least one recess 17 on said outer lateral surface 14a of the tensioning roller 14. The cutting device 10 is configured so that the moving of the blade 13a through said cutting station T corresponds to the blade 13a engaging said recess 17 at the cutting station T. In this way the cutting occurs while the blade 13a is engaged in the recess 17, leading to an increase of the service life of the blade 13a. The second suction system allows a better controlling of the web tension during the cutting of the web 4, which is very important due to the engaging of the blade 13a in the recess 17 during the cutting. Therefore, by means of the machine controlling the first suction system and the second suction system and by means of a cutting device 10 provided with the recess 17 in which the blade 13a is cyclically engaged, the machine 1 can efficiently avoid stretching of the web while allowing an efficient use of a cutting device 10 which in turn is configured to increase the service life of the blade 13a.

[0096] The machine 1 is configured to emit a labelling material low quality warning signal if the detected quantity falls outside of a preestablished range for a predefined time spam. Indeed, it can be possible that there could be

some problems in the final outcome of the labelling method, although the settings of the machine 1 are all correct for the label format, the kind of glue, and the kind of containers 3. The tension of the web 4 I this connection can help in associating a possible problem to a possible deviation of the material with respect to its specifications.

[0097] The advancement device 8 comprises a feed roller 18 located upstream of the cutting device 10 according to the advancement direction. The advancement device 8 is configured so that angular speed of the feed roller 18 contributes to define the linear speed of the web 4 along the advancement path.

[0098] The machine 1 is configured to automatically and actively control said angular speed as a function of the detected physical quantity.

[0099] The machine 1 comprises a gluing device 12 for applying glue on each label 2 while the label 2 is received and/or transferred by the transfer drum 11 rotating on itself.

[0100] The advantages of labelling machine 1 and of the method for applying labels onto containers according to the present invention will be clear from the foregoing description.

[0101] Thanks to the above configuration, it is possible to avoid an excessive stretching (or loosening) of web 4, and therefore of labels 2, when the free end portion of web 4 is grasped by the vacuum suction of vacuum drum 11 and/or when web 4 is supported by second roller 14 for cutting thereof.

[0102] Furthermore the balancing of vacuum suctions of vacuum drum 11 and second roller 14 is particularly advantageous as it ensures both an even better management of the tension of web 4 and a proper grasping and sliding of the free end of web 4 onto vacuum drum 11, preventing at the same time an undesired stretching thereof.

[0103] Moreover, the Applicant has observed that the above-mentioned control based on signal W of tension sensor 15 is particularly effective in case second roller 14 is provided with recess 17 and in case blade 13a is a serrated blade.

[0104] In addition, the above configuration provides for a simple and cost-effective system for monitoring and/or predicting the wear of blade 13a is obtained, which also function during production, thereby avoiding the need for an operator to check between each production cycle.

[0105] Furthermore, by controlling the angular velocity of feed roller 18 based on tension sensor 15, a simple, effective and more efficient control of the tensioning of web 4 along the advancement path can be obtained, thereby avoiding web 4 to be too stretched or too loose.

[0106] Finally, the above configuration provides for a simple and effective monitoring of the quality of the labelling material, even during the production cycle and without the need for stopping machine 1.

[0107] Clearly, changes may be made to labelling machine 1 and the method as described herein without, however, departing from the scope of protection as defined in the accompanying claims.

Claims

1. A labelling machine (1) for labelling, by means of respective labels (2), a plurality of containers (3) adapted to contain a pourable product, said labelling machine (1) comprising:

   - a conveyor device (6) for conveying said plurality of containers (3);
   - an advancement device (8) for advancing a web (4) of labelling material through a cutting station (T), according to an advancement direction, and up to a transfer drum (11), the machine (1) comprising said transfer drum (11);
   - a cutting device (10) for cutting sequentially the advancing web (4) at the cutting station (T), to obtain sequentially a plurality of labels (2) not joined to each other, the labels (2) being initially joined together to form said web (4);
   the transfer drum (11) being configured, by means of a first suction system acting on an outer lateral surface (11a) of the transfer drum (11) and the transfer drum (11) rotating on itself around an axis (X) of the transfer drum (11), for sequentially receiving the labels (2) from the cutting device (10), angularly spacing around said axis (X) the received labels (2) from each other, and transferring the spaced labels (2) to apply them onto respective conveyed containers (3);
   - a tension sensor (15) for detecting a physical quantity correlated with a tension of the web (4) upstream of the cutting station (T) according to the advancement direction;

   wherein the machine (1) is configured to automatically and actively control said first suction system as a function of the detected physical quantity, to at least lower the risk of stretching and/or the risk of loosening the web (4).

2. Labelling machine (1) according to claim 1, wherein the machine (1) is configured so that the detecting the physical quantity comprises obtaining a time trend of the physical quantity so that the detected physical quantity comprises the detected time trend.

3. Labelling machine according to claim 1 or 2, wherein the cutting device (10) comprises:

   - a blade (13a), the cutting device (10) being configured for performing said sequentially cutting by cyclically moving the blade (13a) through the cutting station (T);
   - a web tensioning roller (14) which is a part of the advancement device (8) and which is con-

figured, by means of a second suction system acting on an outer lateral surface (14a) of the tensioning roller (14) and the tensioning roller (14) rotating on itself, for conveying and tensioning the web (4) at the cutting station (T);

wherein the machine (1) is configured to automatically and actively control said second suction system and said first suction system in relation to each other and simultaneously, as a function of the detected physical quantity, to at least lower the risk of stretching and/or the risk of loosening the web (4).

4. Labelling machine according to claim 3, wherein the machine (1) is configured to automatically emit a blade member wear warning signal if the physical quantity exceeds a predetermined threshold value.

5. Labelling machine according to claims 2 and 3, wherein the machine (1) is configured to automatically emit a blade member wear warning signal if the detected physical quantity exceeds a predetermined threshold value for a preestablished time spam.

6. Labelling machine according to any of claims 3 to 5, wherein:

- the tensioning roller (14) comprises at least one recess (17) on said outer lateral surface (14a) of the tensioning roller (14);
- the cutting device (10) is configured so that the moving of the blade (13a) through said cutting station (T) corresponds to the blade (13a) engaging said recess (17) at the cutting station (T).

7. Labelling machine (1) according to any of the previous claims, wherein the machine (1) is configured to emit a labelling material low quality warning signal if the detected quantity falls outside of a preestablished range for a predefined time spam.

8. Labelling machine according to any of the previous claims, wherein the advancement device (8) comprises one or more unwinding rollers for unwinding said web (4), said physical quantity being a force exerted by the web (4) on at least one (15a) of said rollers.

9. Labelling machine (1) according to any of the previous claims, wherein:

- the advancement device (8) comprises a feed roller (18) located upstream of the cutting device (10) according to the advancement direction, the advancement device (8) being configured so that an angular speed of the feed roller (18) contributes to define the linear speed of the web (4) along an advancement path;
- the machine (1) is configured to automatically and actively control said angular speed as a function of the detected physical quantity.

10. A labelling method for labelling, by means of respective labels (2), a plurality of containers (3) adapted to contain a pourable product, said method (1) comprising:

- conveying said plurality of containers (3);
- advancing a web (4) of labelling material through a cutting station (T), according to an advancement direction, and up to a transfer drum (11);
- by means of a cutting device (10), cutting sequentially the advancing web (4) at the cutting station (T), as to obtain sequentially a plurality of labels (2) not joined to each other, the labels (2) being initially joined together to form said web (4);
- by means of a first suction action applied on an outer lateral surface (11a) of the transfer drum (11), and by means of the transfer drum (11) rotating on itself around an axis (X) of the transfer drum (11), sequentially receiving the labels (2) from the cutting device (10), angularly spacing around said axis (X) the received labels (2) from each other, and transferring the spaced labels (2) to apply them onto respective conveyed containers (3) ;
- detecting a physical quantity correlated with a tension of the web (4) upstream of the cutting station (T) according to the advancement direction;
- automatically and actively controlling said first suction action as a function of the detected physical quantity, to at least lower the risk of stretching and/or the risk of loosening the web (4).

11. Labelling method (1) according to claim 10, wherein detecting the physical quantity comprises obtaining a time trend of the physical quantity so that the detected physical quantity comprises the detected time trend.

12. Labelling method according to claim 10 or 11, wherein:

- said sequentially cutting is carried out by cyclically moving a blade (13a) through the cutting station (T);
- during the sequentially cutting, by means of a second suction action applied on an outer lateral surface (14a) of a tensioning roller (14), and by means of the tensioning roller (14) rotating on itself, conveying and tensioning the web (4) at the cutting station (T);

wherein the method comprises automatically and actively control said second suction action and said first suction action in relation to each other and simultaneously, as a function of the detected physical quantity, to at least lower the risk of stretching and/or the risk of loosening the web (4).

13. Labelling method according to claim 12, wherein the machine is configured to automatically emit a blade member wear warning signal if the physical quantity exceeds a predetermined threshold value.

14. Labelling machine according to claims 11 and 12, wherein the machine (1) is configured to automatically emit a blade member wear warning signal if the detected physical quantity exceeds said predetermined threshold value for a preestablished time spam.

15. Labelling method according to any of claims 10 to 14, wherein:

- the tensioning roller (14) comprises at least one recess (17) on said outer lateral surface (14a);
- the moving of the blade (13a) through said cutting station (T) corresponds to the blade (13a) engaging said recess (17) at the cutting station (T).

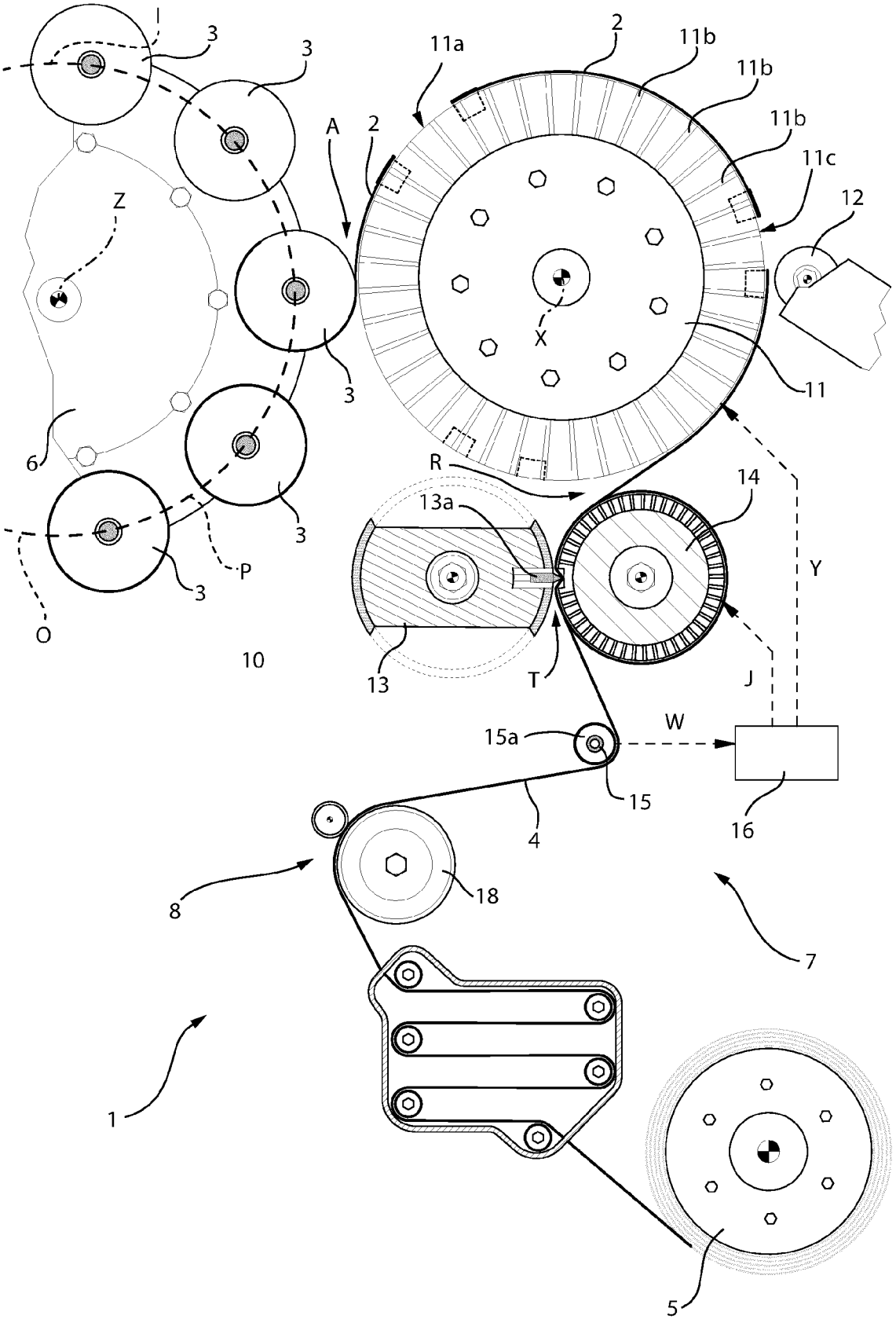
I
3
3
11a
2
11b
11b
11b
11c
12
A
2
Z
X
11
3
6
R
14
13a
3
P
3
Y
O
10
13
T
J
W
15a
15
16
4
8
18
7
1
5

FIG. 1

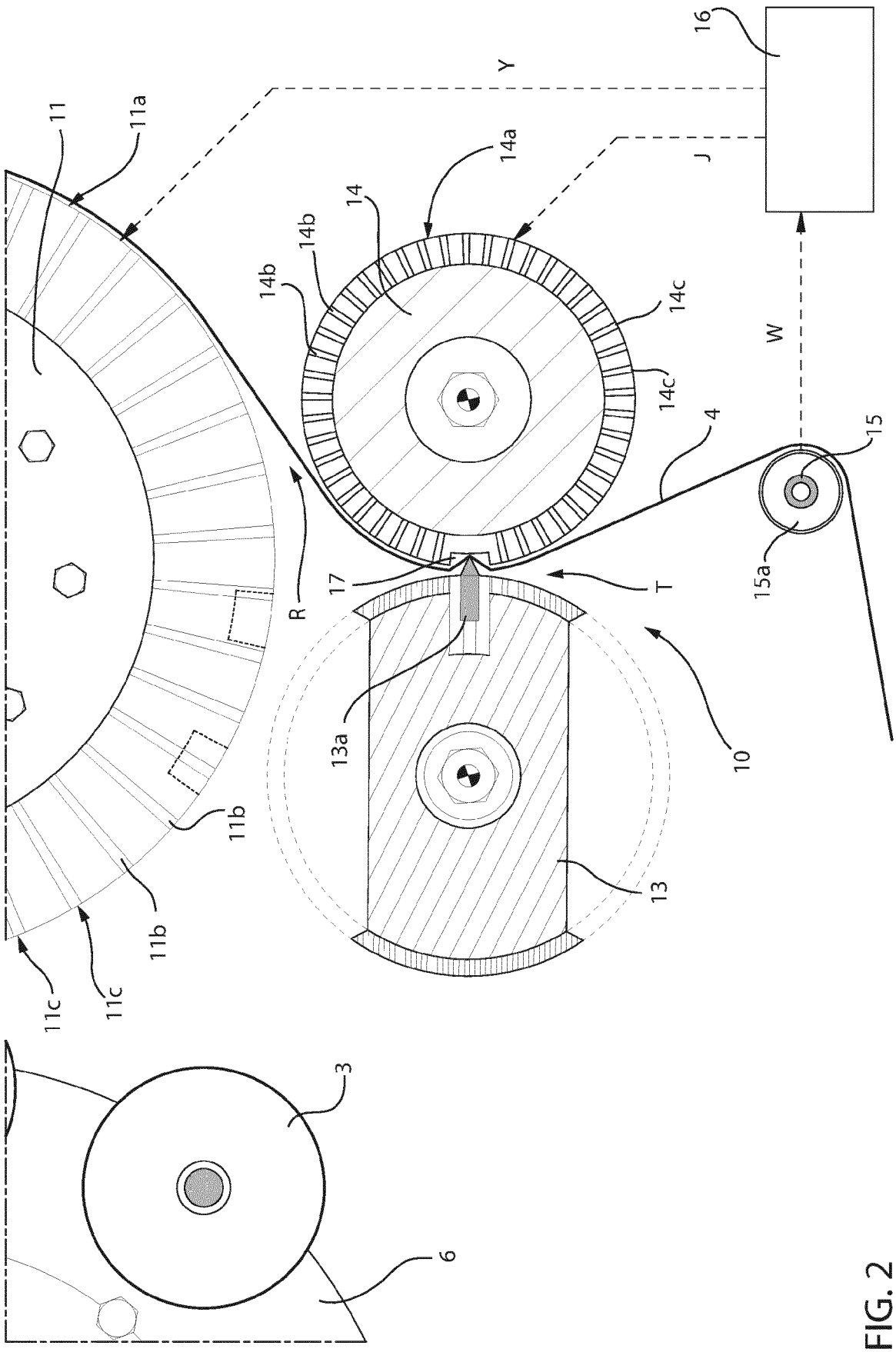
16
Y
J
11
11a
14a
14
14b
14b
14c
14c
W
4
15
15a
17
R
T
13a
10
11b
11b
13
11c
11c
3
6

FIG. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 20 20 4826

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	EP 3 604 149 A1 (SIDEL PARTICIPATIONS [FR]) 5 February 2020 (2020-02-05) * paragraph [0033] - paragraph [0037]; figure 1 *	1-15	INV. B65C9/18 B65C9/40 B65C9/42
A	EP 3 263 470 A1 (SIDEL PARTICIPATIONS [FR]) 3 January 2018 (2018-01-03) * paragraph [0077] - paragraph [0084]; figures 4,5-9 *	1-15	
A	US 5 486 253 A (OTRUBA SVATOBOJ [US]) 23 January 1996 (1996-01-23) * column 3, line 56 - column 4, line 11; figure 1 *	1-15	
A	WO 2019/121152 A1 (SIDEL PARTICIPATIONS [FR]) 27 June 2019 (2019-06-27) * page 12, line 16 - page 14, line 23; figure 1 *	1-15	
A	WO 2020/025333 A1 (SIDEL PARTICIPATIONS [FR]) 6 February 2020 (2020-02-06) * page 13, line 23 - page 15, line 9; figure 1 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B65C B67C
A	WO 2018/086712 A1 (SIDEL PARTICIPATIONS [FR]) 17 May 2018 (2018-05-17) * page 15, line 9 - page 18, line 15; figures 1A,1B *	1-15	
A	WO 2011/067148 A1 (PE LABELLERS SPA [IT]; BALLAROTTI MARIO [IT]) 9 June 2011 (2011-06-09) * page 2, line 23 - page 3, line 5; figure 1 *	1-15	
A	WO 01/17858 A1 (B & H MFG CO INC [US]) 15 March 2001 (2001-03-15) * page 7, line 14 - line 28; figure 6 *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 March 2021	Mendão, João

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 20 4826

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-03-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3604149 A1	05-02-2020	CN 110789801 A	14-02-2020
		EP 3604149 A1	05-02-2020
		US 2020039677 A1	06-02-2020
EP 3263470 A1	03-01-2018	CN 107539550 A	05-01-2018
		EP 3263470 A1	03-01-2018
		US 2017369197 A1	28-12-2017
US 5486253 A	23-01-1996	AU 712021 B2	28-10-1999
		BR 9608415 A	17-08-1999
		CN 1190373 A	12-08-1998
		DE 03023248 T1	30-09-2004
		DE 69630373 T2	22-07-2004
		DE 69634708 T2	19-01-2006
		EP 0825952 A1	04-03-1998
		EP 1398273 A2	17-03-2004
		JP H11505495 A	21-05-1999
		PE 31197 A1	13-09-1997
		RU 2168448 C2	10-06-2001
		US 5486253 A	23-01-1996
		WO 9636537 A1	21-11-1996
WO 2019121152 A1	27-06-2019	NONE	
WO 2020025333 A1	06-02-2020	NONE	
WO 2018086712 A1	17-05-2018	EP 3538443 A1	18-09-2019
		WO 2018086712 A1	17-05-2018
WO 2011067148 A1	09-06-2011	BR 112012013335 A2	12-04-2016
		CA 2782706 A1	09-06-2011
		EP 2507135 A1	10-10-2012
		ES 2638890 T3	24-10-2017
		IT 1397196 B1	04-01-2013
		PL 2507135 T3	29-12-2017
		US 2012234495 A1	20-09-2012
		WO 2011067148 A1	09-06-2011
WO 0117858 A1	15-03-2001	AU 6356400 A	10-04-2001
		US 6347657 B1	19-02-2002
		WO 0117858 A1	15-03-2001

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82