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(54) **DISPENSING APPARATUS FOR DENESTING CARDBOARD SHEETS**

(57) The invention relates to dispensing apparatus for denesting cardboard sheets from a stack (1) of cardboard sheets. The apparatus may comprise at least one conveyor belt (3,4) arranged in immediate vicinity of an opening of a cardboard sheet magazine toward the at least one conveyor belt (3,4), and rear guide rail (6) with an angled outer end (8), and a front guide rail (7) with an angled outer end (9), the angle of the rear guide rail (6) being larger than the angle of the front guide rail (8). The apparatus may also comprise a rear conveyor belt (3) and a front conveyor belt (4) overlapping outside the opening of the cardboard sheet magazine towards the conveyor belts (3,4), a velocity of the rear conveyor belt (3) being lower than a velocity of the front conveyor belt (4).

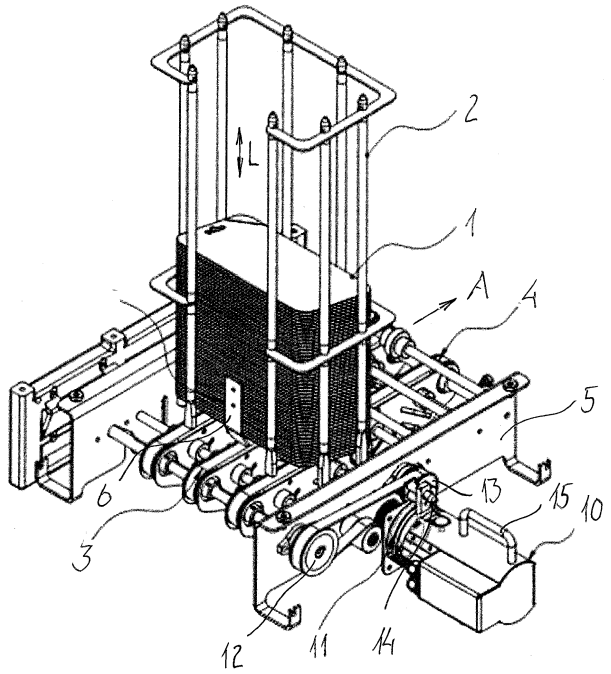

FIG. 1

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Description

Field of the Invention

[0001] The present invention relates to denesting of cardboard sheets, specifically denesting of cardboard sheets intended for accommodating foodstuff and where a dispensing apparatus for the cardboard sheets is part of a process line for packaging foodstuff.

Background of the Invention

[0002] Within the food industry packaging on cardboard sheets of sliced product such as salmon, bacon and cold cuts of meat is known. The retail business has an increasing demand for such packaging for other products as well.

[0003] In the retail business it is of the outmost importance that the packaging solutions are robust and easy to clean. In many situations it is furthermore important that production and packaging may be switched to other products.

[0004] US 4,452,031 discloses a cardboard sheet dispenser incorporated in a bacon slicing machine line that is operable to group slices in shingled fashion and into segregated batches of predetermined weight. The dispenser directs a cardboard sheet in synchronization with the movement of the batches so that individual batches are placed on a sheet and thereafter transferred to subsequent packaging stations. The dispenser includes a hopper for receiving vertically stacked cardboard sheets and includes a base having a plurality of strippers serving to support the stack of sheets while ensuring that only one sheet at a time is removed from the hopper. A pick-off assembly operates to remove the lowermost sheet from the hopper and transfer it to the nip of a roller assembly. The pick-off assembly includes a first piston-cylinder assembly that assumes a vertical position below the hopper so that suction cups at the free end of the piston of this assembly is adapted to engage and secure the lowermost sheet in the hopper upon extension of this piston and upon retraction thereof lower this sheet to a lowered position. The vacuum system for operating the suction cups constitutes a risk in relation to proper hygiene, and positioning of the piston increases operating time.

Object of the Invention

[0005] An object of the invention is to provide a dispenser for denesting cardboard sheets, and which dispenser has a high capacity, high operational reliability and easy switching between packaging one product or another product and/or switching between using one cardboard sheet or another cardboard sheet.

Description of the Invention

[0006] The object of the invention may be obtained by a dispensing apparatus comprising at least one conveyor belt arranged in immediate vicinity of the opening of the cardboard sheet magazine, the at least one conveyor belt intended for displacing a cardboard sheet to be denested from the stack away from the stack, and where a rear guide rail has an outer end constituting an angle α in relation to a longitudinal extension of the stack of cardboard sheets, and where a front guide rail has an outer end constituting an angle α in relation to a longitudinal extension of the stack of cardboard sheets, and where the angle α is larger than the angle β.

[0007] Different angles of the rear guide rail and the front guide rail result in the outermost cardboard sheet being displaced towards the first guide rail having the smallest angle.

[0008] In a preferred embodiment the angle α is between 1 degree and 45 degrees in relation to the longitudinal extension of the stack of cardboard sheets, and the angle β is between 1 degree and 30 degrees in relation to the longitudinal extension of the stack of cardboard sheets. The angle α and the angle β depend on the size, the shape and the weight of the cardboard sheets to be denested and dispensed from the apparatus.

[0009] Preferably, the angled outer end of the rear guide rail starts at a rearward position in relation to a longitudinal extension of the stack in comparison with the angled outermost end of the front guide rail starting at a forward position in relation to a longitudinal extension of the stack. Thereby, at least the outermost cardboard sheet will obtain an inclination resulting in the front edge of the cardboard sheet being urged towards and contacting the at least one conveyor belt before a rear edge of cardboard sheet gets into contact with the at least one conveyor belt, and the cardboard sheet is denested.

[0010] The object of the invention is preferably obtained by at least two conveyor belts arranged in immediate vicinity of the opening of the cardboard sheet magazine, the at least two conveyor belts intended for displacing a cardboard sheet to be denested from the stack away from the stack, and where an extension of the at least one rear conveyor belt starts at a position to a rear in relation to opening of the cardboard sheet magazine, continues past a rear of the opening of the cardboard sheet magazine and ends at a position partly past the opening of the cardboard sheet magazine, and that an extension of the at least one front conveyor belt starts at a position outside the opening of the cardboard sheet magazine, continues towards a front of the opening of the cardboard sheet magazine and ends at a position past the front of the opening of the cardboard sheet magazine, and that the position where the rear conveyor belt ends is in a forward position in relation to the position where the at least one front conveyor belt starts so that an overlap is established between the at least one rear conveyor belt and the at least one front conveyor belt,

as seen in a direction of conveying.

[0011] Establishing an overlap between the at least one rear conveyor belt and the at least one front conveyor belt, as seen in a direction of conveying, results in a possibility of the cardboard sheet to be denested firstly being grabbed by the rear conveyor belt for initial denesting of the cardboard sheet from the stack of cardboard sheets, and secondly being grabbed by the front conveyor belt for subsequent dispensing of the cardboard sheet from the apparatus, towards further handling of the cardboard sheet.

[0012] In a preferred embodiment, a displacement and a velocity of the at least one rear conveyor belt is provided by at least one motor, and where a displacement and a velocity of the et least one front conveyor belt is provided by at least one motor, and where a velocity of the at least one rear conveyor belt is capable of being adjusted individually in relation to a velocity of the at least one front conveyor belt, and vice versa, and where the velocity of the at least one front conveyor belt, during use of the apparatus, when denesting cardboard sheets from the stack, is capable of being adjusted to a velocity being higher than a velocity of the at least one rear conveyor belt.

[0013] Adjusting a velocity of the at least one front conveyor belt to a higher velocity than a velocity of the at least one rear conveyor belt results in denesting of the cardboard sheet from the stack being performed safely at a relatively low velocity and dispensing of the cardboard sheet from the apparatus being performed quickly at a relatively higher velocity.

[0014] In still a preferred embodiment, displacement and velocity of the at least one rear conveyor belt conveyor and displacement and velocity of the at least one front conveyor belt conveyor is provided by one and the same motor, and where a first transmission is provided between a driving axle of the motor and a drive pulley of the at least one rear conveyor belt, and where a second transmission is provided between a driving axle of the motor and a drive pulley of the at least one front conveyor belt, and where the first transmission has a first ratio between the rational speed of the motor axle and of the drive pulley of the at least one rear conveyor belt, and where the second transmission has a second ratio between the rational speed of the motor axle and of the drive pulley of the at least one front conveyor belt, and where the first ratio is lower than the second ratio.

[0015] Displacement and velocity of the at least one rear conveyor belt conveyor and displacement and velocity of the at least one front conveyor belt conveyor being provided by one and the same motor, and having transmission adjusting the displacement and the velocity of the conveyor belts has the advantage that there is no need for electronic or electric adjustment of individual motors of each of the conveyor belts. The transmission provides a mechanical and fixed, when adjusted, relationship between displacement and velocity of each of the at least two first and front conveyor belts.

[0016] According to an aspect of the invention, the motor is capable of being detached from the remainder of the apparatus, and where detachment of the motor is provided by a hand-operated latch which latch in a first position holds the motor to the remainder of the apparatus and which latch in a second position allows the motor to be detached from the remainder of the apparatus, leaving the transmission, the drive pulleys and the conveyor belts in place on the remainder of the apparatus, for possible re-attachment of the motor or for possible attachment of another motor, without also re-attaching or detaching the transmission, the drive pulleys and the conveyor belts to or from the remainder of the apparatus.

[0017] Detachment and possible re-attachment of the motor from or to the remainder of the apparatus by a hand-operated latch has the advantage that only the motor needs to be handled when there is need or a wish for exchanging the motor. All other parts of the apparatus, including transmissions between the motor and the conveyor belts, need not be dismantled or in any other way handled when only the motor needs to be handled.

[0018] According to another aspect, or an additional aspect, of the invention, the cardboard sheet magazine is capable of being detached from the remainder of the apparatus where detachment of the cardboard sheet magazine is provided by a hand-operated latch which latch in a first position holds the cardboard sheet magazine to the remainder of the apparatus, and which latch in a second position allows the cardboard sheet magazine to be detached from the remainder of the apparatus, leaving the transmission, the drive pulleys and the conveyor belts in place on the remainder of the apparatus, for possible re-attachment of the cardboard sheet magazine or for possible attachment of another cardboard sheet magazine, without also re-attaching or detaching the transmission, the drive pulleys and the conveyor belts to or from the remainder of the apparatus.

[0019] Detachment and possible re-attachment of the cardboard sheet magazine from or to the remainder of the apparatus has the advantage that it is easy and expedite to exchange the cardboard sheet magazine, when other sizes or shapes of cardboard sheets are to be denested. Only the cardboard sheet magazine needs to be handled, when there is a need or a wish for exchanging the cardboard sheet magazine. All other parts of the apparatus, including the motor, transmissions between the motor and the conveyor belts, and the conveyor belts themselves need not be dismantled or in any other way handled, when only the cardboard sheet magazine needs to be exchanged.

[0020] A method for operating the dispensing apparatus is characterized in

- providing a stack of cardboard sheets in a magazine of the dispensing apparatus,
- advancing the stack of cardboard sheets towards and opening of the magazine
- providing at least the outermost cardboard sheet with

an inclination in relation to a surface of a rear conveyor belt and a front conveyor belt,

- the outermost cardboard sheet being inclined so that a front edge of the cardboard sheet is closer to the conveyor belt than a rear edge of the cardboard sheet,
- displacing the front edge of the outermost cardboard sheet towards and into abutment with the rear conveyor belt,
- displacing forwards the outermost cardboard sheet, by means of the rear conveyor belt, at a first relative velocity,
- displacing the front edge of outermost cardboard sheet towards and into abutment with the front conveyor belt,
- displacing forwards the outermost cardboard sheet, by means of the front conveyor belt, at a second velocity, the second velocity being greater than the first velocity.

Description of the Drawing

[0021]

Fig. 1 is a drawing of a perspective view of an embodiment of a denesting apparatus according to the invention,

Fig. 2 is a drawing of a plane side view of an embodiment of a denesting apparatus according to the invention, and

Fig. 3 is a drawing of a close-up view of guide rails of the denesting apparatus according to the invention.

Detailed Description of the Invention

[0022] Fig. 1 shows a dispensing apparatus for denesting cardboard sheets from a stack 1 of cardboard sheets. The denesting apparatus has a cardboard sheet magazine 2. The apparatus also has a set of rear conveyor belts 3 and a set of front conveyor belts 4. Rear means upstream in relation to a dispensing direction A of the cardboard sheets, after being denested from the stack 1, and front means downstream in relation to the dispensing direction A.

[0023] In the embodiment shown a longitudinal extension of the stack of cardboard sheets is vertical. The cardboard sheets, during denesting of outermost cardboard sheets (see Fig. 3) displace by means of gravity, within the cardboard sheet magazine. In other embodiments a longitudinal extension of the stack of cardboard sheets is non-vertical. The cardboard sheets, during denesting of the outermost, and in the embodiment also the lowermost, cardboard sheets (see Fig. 3) may then displace within the cardboard sheet magazine by means of another force than gravity, or by means of a force additional to gravity. The other force or the additional force may be a piston pushing on an innermost or uppermost cardboard sheet, displacing the cardboard sheets within the cardboard sheet magazine.

[0024] The cardboard sheet magazine 2 is preferably attached to a frame 5 of the apparatus so that the magazine 2 can be detached from the frame and another magazine attached instead, for possibly allowing dispensing and denesting of cardboard sheets having another size, another dimension or another purpose than a previously dispensed cardboard sheet, while using the same conveyor belts 3, 4 of the apparatus.

[0025] A bottom (see Fig. 3) of the cardboard sheet magazine 2 constitutes an opening of the magazine for dispensing of a lowermost cardboard sheet. A rear guide rail 6 and a front guide rail 7 is positioned at the bottom and opening of the magazine 2. The rear guide rail 6 and the front guide rail 7 guide at least the lowermost cardboard sheet towards the rear conveyor belts 3 and the front conveyor belts 4 (see Fig. 1 and Fig. 2).

[0026] The rear guide rail 6 has an outer end 8 constituting an angle α in relation to the longitudinal extension L of the stack of cardboard sheets. The angle α is approximately 30 degrees, but may be between 1 degree and 45 degrees depending on the size, the shape and the weight of each of the cardboard sheets.

[0027] The front guide rail 7 has an outer end 9 constituting an angle β in relation to the longitudinal extension L of the stack of cardboard sheets. The angle β is approximately 10 degrees, but may be between 1 degree and 30 degrees depending on the size, the shape and the weight of each of the cardboard sheets.

[0028] The angle α of the outer end 8 of the rear guide rail 6 is greater than the angle β of the outer end 9 of the front guide rail 7. The angle α compared to the angle β depends on the size, the shape and the weight of each of the cardboard sheets and may also depend on the velocity of the rear conveyor belts 3 and the front conveyor belts 4.

[0029] In the embodiment shown, the set of rear conveyor belts 3 comprises three conveyor belts and the set of front conveyor belts 4 also comprises three conveyor belts. In other embodiments the set of rear conveyor belt and the set of front conveyor belt may comprise another plurality than three conveyor belts. The dispensing apparatus may also comprise only one rear conveyor belt and only one front conveyor belt.

[0030] The set of rear conveyor belts 3 starts at a position S3 and ends at a position E3. The set of front conveyor belts 4 starts at a position S4 and ends at a position E4. The position E3 where the set of rear conveyor belts 3 ends is an advanced position in relation to the position S4, where the set of front conveyor belts ends. Accordingly, an overlap O exists between the set of rear conveyor belts 3 and the set of front conveyor belts 4, the overlap being between the position S4 and the position E3.

[0031] A motor 10 is attached to the frame 5 of the dispensing apparatus. The motor 10 has an axle 11 driving both the rear conveyor belts 3 and the front conveyor

belts 4. A first transmission is provided between the motor axle 11 and drive pulleys 12 of the rear conveyor belts 3, and a second transmission is provided between the motor axle 11 and drive pulleys 13 of the front conveyor belts 4. The ratio between the rotational speed of the motor axle 11 and the rotational speed of the drive pulley 12 of the rear conveyor belts 3 and the front conveyor belts 4, respectively, may be, and preferably is, different and may possibly be adjustable. The ratio of the first transmission is lower than the ratio of the second transmission, resulting in the rotational speed of the drive pulley 12 of the rear conveyor belts 3 being lower than the rotational speed of the drive pulley 13 of the front conveyor belts 4. Accordingly, the velocity of the rear conveyor belts 3 is lower than the velocity of the front conveyor belts 4.

[0032] The motor 10 is attached to the frame 5 of the dispensing apparatus by means of a latch 14. The latch 14 is preferably hand-operated and when operated the motor 11 may be detached from the frame 5 and from the remainder of the dispensing apparatus. The motor 11 has a handle 15 for easing detaching and possible re-attachment of the motor 11 to the frame 5 and to the remainder of the dispensing apparatus.

[0033] If and when the motor 11 is detached from the frame 5 and the remainder of the dispensing apparatus, the first transmission and the second transmission remains on the remainder of the dispensing apparatus. It is only the motor axle 11, common to the first transmission and the second transmission, which is removed from the transmission. All other parts remain on the apparatus and a new motor may easily be attached or the same motor, possibly after repair, may easily be re-attached without interfering with the first transmission and the second transmission and with the ratios of the transmissions.

[0034] The dispensing apparatus, when in use, functions as described in the following.

[0035] A stack 1 of cardboard sheets is placed in the magazine 2 so that the cardboard sheets have an inclination in relation to horizontal. Thereby a front edge of each of the cardboard sheets is positioned in a lower position, closer towards the conveyor belts 3, 4, compared to a position of a rear edge of the cardboard sheets. The inclination is established by the rear edge of the cardboard sheets being guided by the rear guide rail 6 and the front edge of the cardboard sheets being guided by the front guide rail 7 (see Fig. 3).

[0036] When the stack 1 of cardboard sheets displaces downwards in the magazine, during denesting of cardboard sheets, the rear edge of a lowermost cardboard sheet will at some point of time be guided by the angled outer end 8 of the rear guide rail 6. The cardboard sheets guided by the outer end 8 of the rear guide rail 6 will maintain the inclination, while at the same time being urged towards the angled outer end 9 of the front guide rail 7. Urging the lowermost sheet towards the front guide rail 7 also urges the lowermost sheet in a forward dispensing direction of the lowermost sheet.

[0037] Because the angled outer 9 end of the front guide rail 7 has a smaller angle α with the longitudinal direction L of the stack of sheets than the angle β of the angled outer end 8 of the rear guide rail 6, the inclination of the lowermost sheet increases compared to the other sheets in the stack, while at the same time being urged forward, being squeezed between the outer end 9 of the front guide rail 7 and the conveyor belts 3, 4.

[0038] In relation to the position of where the rear conveyor belt 3 ends and the front conveyor belt 4 starts, the outer end 9 of the front guide rail 7 is positioned within the overlap between where the rear conveyor belts 3 end and where the front conveyor belts 4 start. Thereby, the lowermost sheet firstly gets into contact with the rear conveyor belts 3, having a relatively lower velocity compared to the velocity of the front conveyor belts 4. The rear conveyor belts 3 displace the lowermost sheet forwards so that the lowermost sheet is partly denested from the stack of sheets and so that the lowermost sheet gets into contact with the front conveyor belts 4. The front conveyor belts 4 have a relatively higher velocity compared to the rear conveyor belts 3. Therefore, the lowermost sheet is displaced forwards at a higher speed and is fully denested from the stack of sheets.

Claims

1. A dispensing apparatus for denesting cardboard sheets from a stack of cardboard sheets, the denesting apparatus comprising a cardboard sheet magazine for holding a stack of cardboards to be denested, the cardboard sheet magazine having an opening for allowing sheets to be dispensed from the stack, **characterized in that** the dispensing apparatus comprises at least one conveyor belt (3,4) arranged in immediate vicinity of the opening of the cardboard sheet magazine (2), the at least one conveyor belt (3,4) intended for displacing a cardboard sheet to be denested from the stack (1) away from the stack (1), and where a rear guide rail (6) has an outer end (8) constituting an angle α in relation to a longitudinal extension (L) of the stack (1) of cardboard sheets, and where a front guide rail (7) has an outer end (9) constituting an angle β in relation to the longitudinal extension (L) of the stack (1) of cardboard sheets, and where the angle α is greater than the angle β.

2. A dispensing apparatus according to claim 1, **characterized in that** the angle α is between 1 degree and 45 degrees in relation to the longitudinal extension (L) of the stack (1) of cardboard sheets, and the angle β is between 1 degree and 30 degrees in relation to the longitudinal extension (L) of the stack (1) of cardboard sheets.

3. A dispensing apparatus according to claim 1 or 2, **characterized in that** the angled outer end (8) of

the rear guide rail (6) starts at an innermost position in relation to an opening of the cardboard sheet magazine towards the at least one conveyor belt in comparison with the angled outermost end (9) of the front guide rail (7) starting at an outermost position in relation to the opening of the cardboard sheet magazine towards the at least one conveyor belt.

4. A dispensing apparatus according to any of the preceding claims, **characterized in** at least two conveyor belts (3,4) arranged in immediate vicinity of the opening of the cardboard sheet magazine towards the conveyor belts (3,4), the conveyor belts (3,4) intended for displacing a cardboard sheet to be denested from the stack (1) away from the stack (1), and an extension of the at least one rear conveyor belt (3) starting at a position (S3) to a rear in relation to opening of the cardboard sheet magazine, continues past a rear of the opening of the cardboard sheet magazine and ends at a position (E3) partly past the opening of the cardboard sheet magazine, and that an extension of the at least one front conveyor belt starts at a position (S4) outside the opening of the cardboard sheet magazine, continues towards a front of the opening of the cardboard sheet magazine and ends at a position (E4) past the front of the opening of the cardboard sheet magazine, and that the position (E3) where the rear conveyor belt ends is in a forward position in relation to the position (S4), where the at least one front conveyor belt starts so that an overlap (O) is established between the at least one rear conveyor belt (3) and the at least one front conveyor belt (4), as seen in a direction (A) of conveying.

5. A dispensing apparatus according to claim 4, **characterized in that** a displacement and a velocity of the at least one rear conveyor belt (3) is provided by at least one motor (10), and where a displacement and a velocity of the at least one front conveyor belt (4) is provided by at least one motor (10), and where a velocity of the at least one rear conveyor belt (3) is capable of being adjusted individually in relation to a velocity of the at least one front conveyor belt (4), and vice versa, and where the velocity of the at least one front conveyor belt (4), during use of the apparatus when denesting cardboard sheets from the stack, is capable of being adjusted to a velocity being higher than a velocity of the at least one rear conveyor belt (3).

6. A dispensing apparatus according to claim 4 or 5, **characterized in that** a guide rail (7) is arranged between the opening of the cardboard sheet magazine and the conveyor belts (3,4), and that the guide rail (7) has an angled outer end (9) arranged in a position, where an overlap (O) is established between the at least one rear conveyor belt (3) and the at least one front conveyor belt (4), and in a position where both the at least one rear conveyor belt (3) and the at least one front conveyor belt (4) pass the opening of the cardboard sheet magazine towards the conveyor belts (3,4).

7. A dispensing apparatus according to any of the preceding claims, **characterized in that** displacement and velocity of the at least one rear conveyor belt (3) and displacement and velocity of the at least one front conveyor belt (4) is provided by one and the same motor (10), and where a first transmission is provided between a driving axle (11) of the motor (10) and a drive pulley (12) of the at least one rear conveyor belt (3), and where a second transmission is provided between the driving axle (11) of the motor (10) and a drive pulley (13) of the at least one front conveyor belt (4), and where the first transmission has a first ratio between the rational speed of the motor axle (11) and of the drive pulley (12) of the at least one rear conveyor belt (3), and where the second transmission has a second ratio between the rational speed of the motor axle (11) and of the drive pulley (13) of the at least one front conveyor belt (4), and where the first ratio is lower than the second ratio.

8. A dispensing apparatus according to any of the preceding claims, **characterized in that** the motor (10) is capable of being detached from the remainder of the apparatus, and where detachment of the motor is provided by a hand-operated latch (14), which latch (14) in a first position holds the motor to the remainder of the apparatus, and which latch (14) in a second position allows the motor to be detached from the remainder of the apparatus, leaving the transmission, the drive pulleys (12,139 and the conveyor belts (3,4) in place on the remainder of the apparatus, for possible re-attachment of the motor or for possible attachment of another motor, without also re-attaching or detaching the transmission, the drive pulleys (12,13) and the conveyor belts (3,4) to or from the remainder of the apparatus.

9. A dispensing apparatus according to any of the preceding claims, **characterized in that** the cardboard sheet magazine (2) is capable of being detached from the remainder of the apparatus, and where detachment of the cardboard sheet magazine (2) is provided by a hand-operated latch, which latch in a first position holds the cardboard sheet magazine (2) to the remainder of the apparatus, and which latch in a second position allows the cardboard sheet magazine (2) to be detached from the remainder of the apparatus, leaving the transmission, the drive pulleys (12,13) and the conveyor belts (3,4) in place on the remainder of the apparatus, for possible re-attachment of the cardboard sheet magazine (2) or for

possible attachment of another cardboard sheet magazine (2), without also re-attaching or detaching the transmission, the drive pulleys (12,13) and the conveyor belts (2,3) to or from the remainder of the apparatus.

10. Method of denesting cardboard sheets from a stack of cardboard sheets, the method comprising utilizing a dispensing apparatus according to any of claims 1-9, and

- providing a stack of cardboard sheets in a magazine of the dispensing apparatus,
- advancing the stack of cardboard sheets towards and opening of the magazine
- providing at least the outermost cardboard sheet with an inclination in relation to a surface of conveyor belt of a rear conveyor belt and a front conveyor belt,
- the outermost cardboard sheet being inclined so that a front edge of the cardboard sheet is closer to the conveyor belts than a rear edge of the cardboard sheet,
- displacing the front edge of outermost cardboard sheet towards and into abutment with the rear conveyor belt,
- displacing forwards the outermost cardboard sheet, by means of the rear conveyor belt, at a first relatively velocity,
- displacing the front edge of outermost cardboard sheet towards and into abutment with the front conveyor belt,
- displacing forwards the outermost cardboard sheet, by means of the front conveyor belt, at a second velocity, the second velocity being greater than the first velocity.

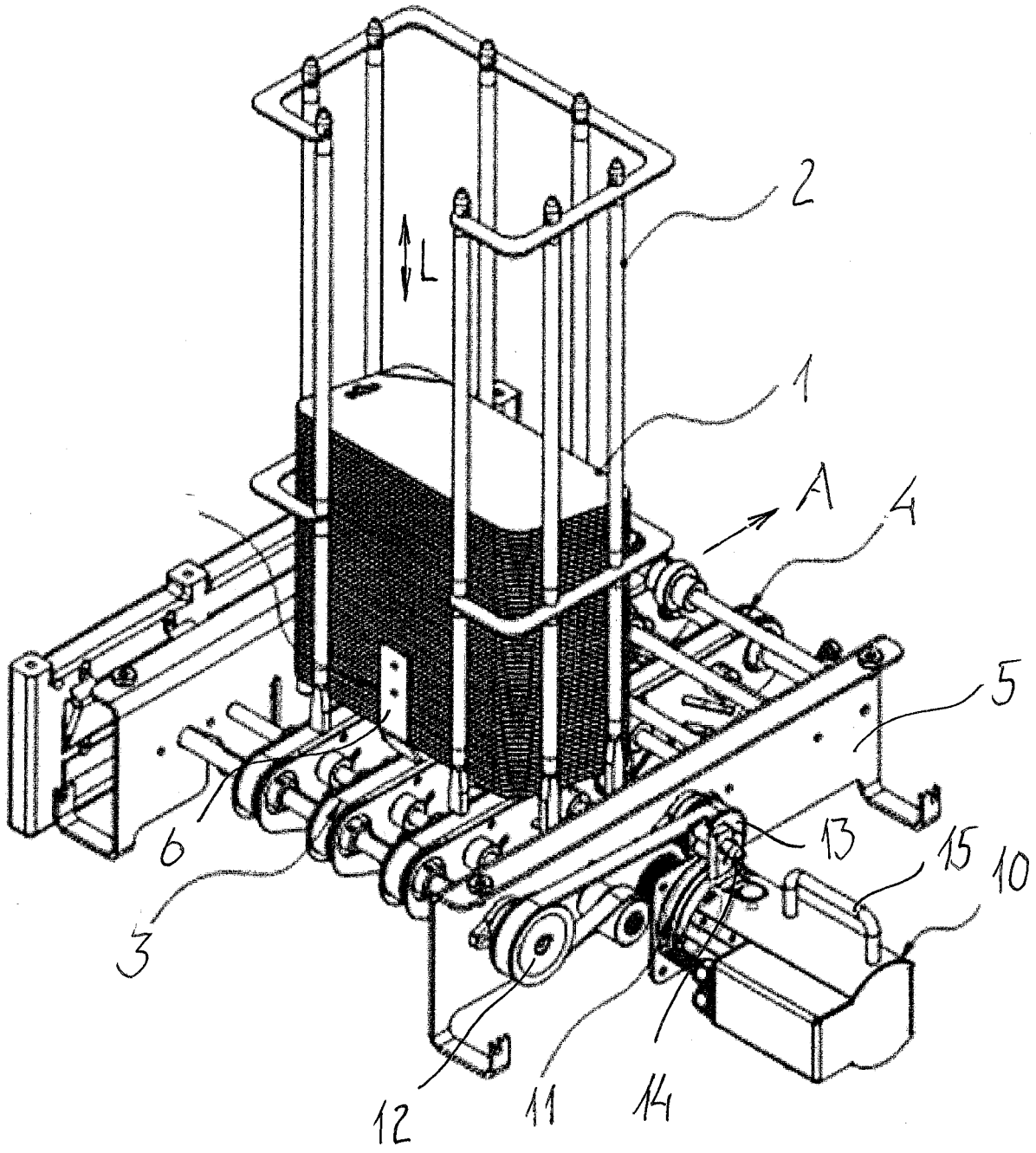

FIG. 1

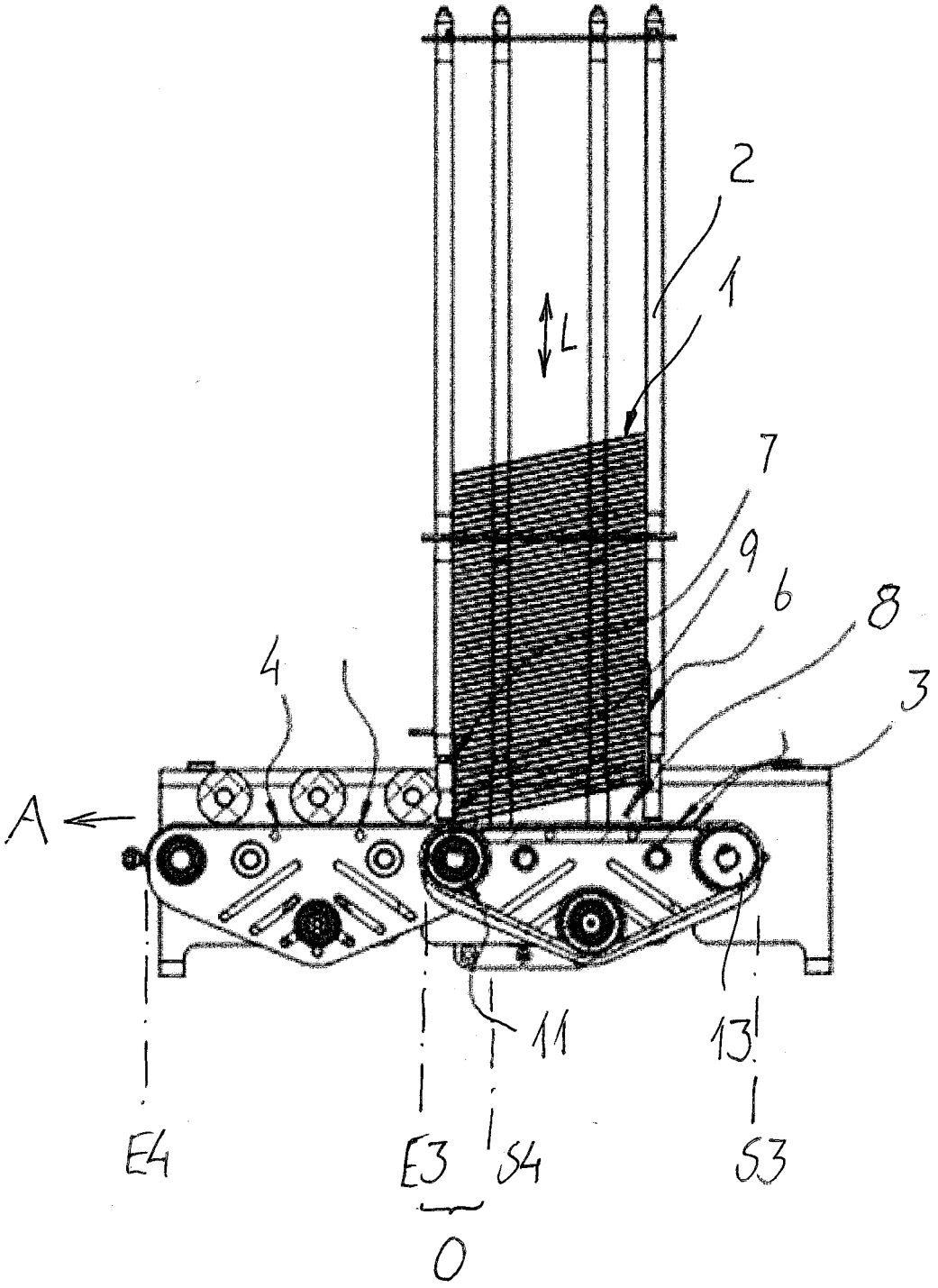

FIG. 2

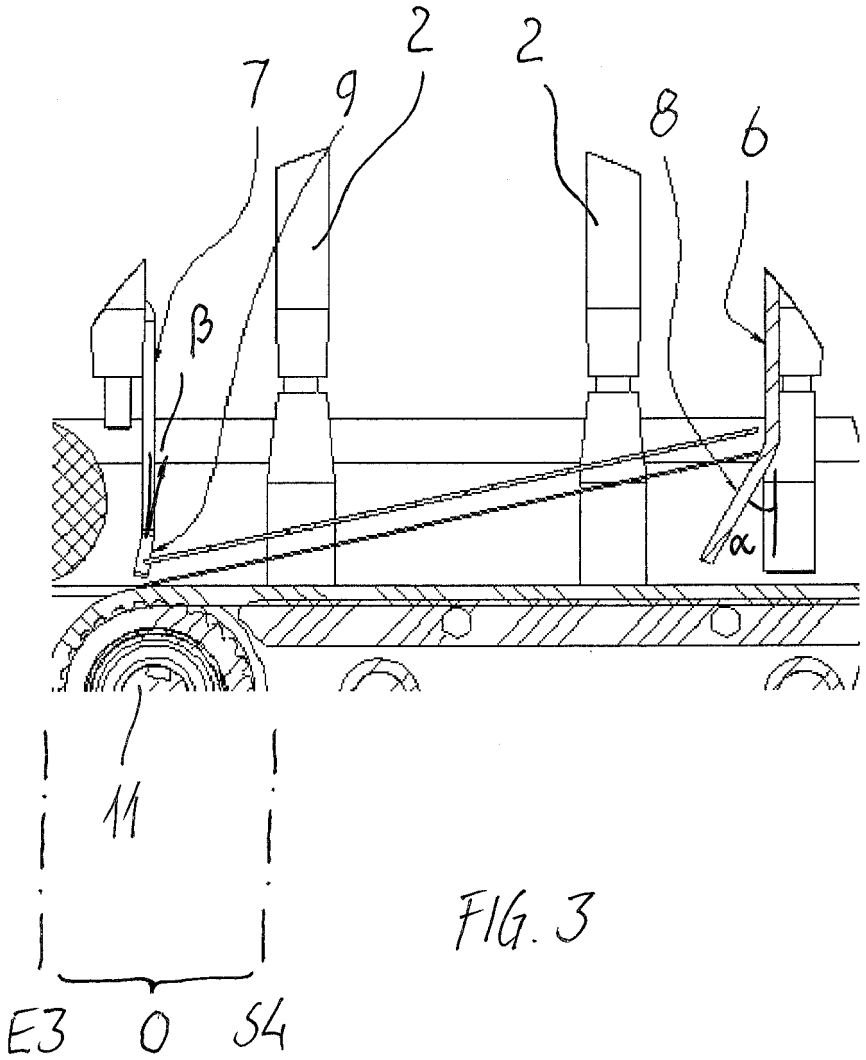

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 0193

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 3 664 660 A (RUNZI KURT) 23 May 1972 (1972-05-23) * column 2, line 15 - column 3, line 65; figures 1-4 *	1,10 2-9	INV. B65H1/26 B65H3/04 B65H3/56
X A	DE 10 2009 023109 A1 (PETRATTO GIORGIO [IT]) 17 December 2009 (2009-12-17) * paragraph [0020] - paragraph [0025]; figures 1-7 *	1,3 2,4-10	
A	US 2014/377048 A1 (HÖPNER BERND [DE] ET AL) 25 December 2014 (2014-12-25) * paragraph [0035] - paragraph [0055]; figures 1-6 *	1-10	
A	DE 94 03 531 U1 (STAHL GMBH & CO MASCHF [DE]) 11 May 1994 (1994-05-11) * page 6, paragraph 6 - page 7, paragraph 2; figures 1-3 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

B65H
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 October 2018	Henningsen, Ole

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 16 0193

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
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09-10-2018

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

REFERENCES CITED IN THE DESCRIPTION

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