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

(11) **EP 2 540 403 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.01.2013 Bulletin 2013/01

(51) Int Cl.:
B07B 13/00 *(2006.01)* ***B07B 13/04*** *(2006.01)*

(21) Application number: **12174156.5**

(22) Date of filing: **28.06.2012**

(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: **28.06.2011 NL 2007006**

(71) Applicant: **GEGE Machinebouw B.V.**
5464 RA Veghel (NL)

(72) Inventor: **Van Asseldonk, Johannes Maria**
5400 AG UDEN (NL)

(74) Representative: **Hylarides, Paul Jacques et al**
Arnold & Siedsma
Sweelinckplein 1
2517 GK The Hague (NL)

(54) **Device and method for sorting products to length**

(57) The invention relates to a device for sorting elongate products (P) to length, comprising:
- a feed conveyor (1) for transporting the products (P) in a direction of transport (T), wherein the conveyor (1) is adapted to hold the products (P) during transport with their longitudinal direction substantially parallel to the direction of transport (T);
- a sorting conveyor (2) for transporting the products (P), wherein the sorting conveyor (2) is adapted to separate the products (P) according to their length during transport;
wherein the sorting conveyor (2) comprises a number of successive sets (5, 6) (5', 6') of transport members, wherein each set comprises an upper (5, 5') and a lower transport member (6, 6') between which the products (P) can be clamped and moved forward;
wherein a sorting opening (b) is provided between two successive lower transport members (6, 6') for allowing products with a length smaller than a sorting length to drop via the sorting opening (b).

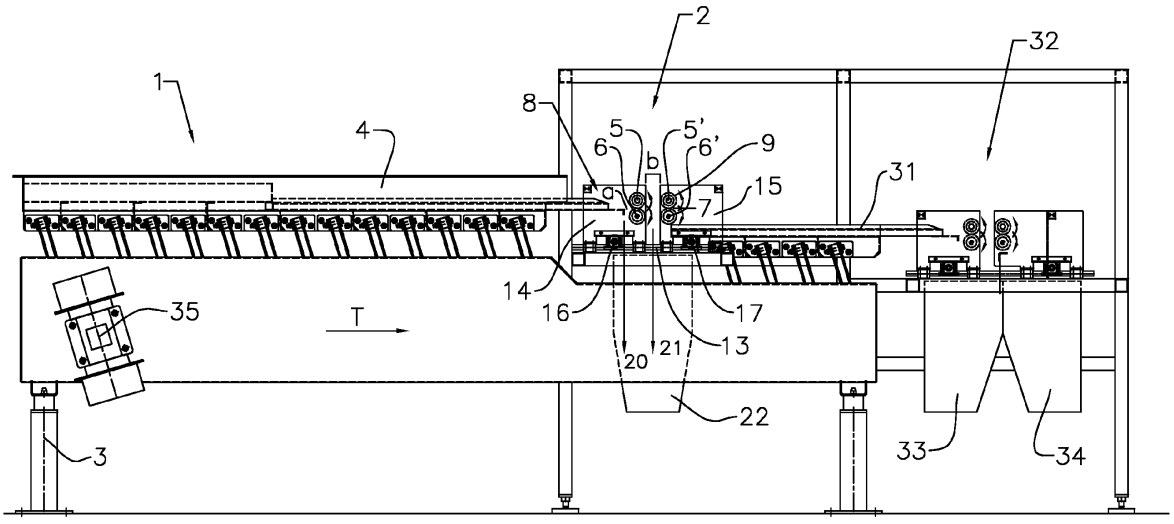


FIG. 2

EP 2 540 403 A1

Description

[0001] The present invention relates to a device and method for sorting elongate products to length, in particular natural products such as green beans.

[0002] Such a device is known from the Netherlands patent NL 1 033 048. The known device comprises transport means in the form of an endless conveyor belt on which the elongate products can be transported. The products are oriented during transport such that the longitudinal direction of the products extends parallel to the direction of transport. A sorting unit for sorting the transported products is provided as component of the transport means. The sorting unit is constructed from a number of parallel sorting rollers, the centre-to-centre distance and the diameter of which are chosen such that there is a sorting gap between the sorting rollers. This sorting gap has predetermined dimensions as seen in the conveyor belt direction for the purpose of allowing or not allowing passage of products. The sorting unit of the transport device further has an endless pressing belt which is provided above the sorting rollers and which is embodied to clamp the products between the pressing belt on one side and the sorting rollers on the other.

[0003] Products supplied via the conveyor belt are taken over by the sorting rollers and the pressing belt arranged thereabove, and all products with a length smaller than a determined sorting length (threshold value) will drop downward via the sorting gap between the sorting rollers and subsequently be collected.

[0004] Although the known device is an improvement compared to the sorting drums previously applied in the field, there are however still a number of drawbacks associated with the known device.

[0005] A first drawback is that in the known device too much good product nevertheless finds its way into the waste. The known device is for instance used in the separation of the supplied products into a first product flow with relatively long products suitable for further processing and a second product flow with relatively short products which are unsuitable for further processing and are discharged as waste. It has been found that a fairly large number of long products which are in fact suitable for further processing are still to be found in the second product flow (i.e. the waste flow).

[0006] A further drawback is that, if two or more products lie one on top of another in the supply, a proper sorting does not take place. As a result of the presence of the pressing belt the view and the accessibility are moreover limited in the known device.

[0007] Finally, the construction of the known device, and particularly the pressing belt and the suspension thereof relative to the sorting rollers, is quite complex, this making the device costly and requiring frequent maintenance.

[0008] The object of the present invention is to provide a device and/or method wherein at least one of the above stated drawbacks of the known device is obviated or at least reduced.

[0009] Provided for this purpose according to a first aspect of the present invention is a device for sorting elongate products to length, the device comprising:

- a feed conveyor for transporting the products in a direction of transport, wherein the conveyor is adapted to hold the products during transport with their longitudinal direction substantially parallel to the direction of transport;
- a sorting conveyor for transporting in the direction of transport the products supplied via the feed conveyor, wherein the sorting conveyor is adapted to separate the products according to their length during transport;

wherein the sorting conveyor comprises a number of successive sets of transport members, wherein each set comprises an upper and a lower transport member between which the products can be clamped and moved forward;
wherein a sorting opening is provided between two successive lower transport members for allowing products with a length smaller than a predetermined threshold value (also referred to as the sorting length) to drop via the sorting opening.

[0010] By applying two or more successive sets (pairs) of transport members the sorting result can be improved compared to the known device in which use is made of only a single upper pressing belt.

[0011] In the known device the pressing belt also extends above the sorting opening(s). The consequence hereof is that the products tend sometimes to be pressed to some extent round the lower conveyor roller or rollers. This can mean that products, which should in fact not be allowed to pass through a sorting opening because they are too long, may be allowed through this sorting opening. By making use of successive sets of transport members, wherein not only is a sorting opening provided between the lower rollers but a determined opening is also provided between the upper rollers, the above-mentioned tendency is reduced, which can improve the sorting result.

[0012] The transport members can comprise conveyor rollers, wherein the products are thus engaged in each case by a set of conveyor rollers placed one above another and displaced in the direction of transport. In other embodiments the transport members comprise one or more (endless) conveyor belts.

[0013] An advantage of using two or more sets of transport members placed one above another (particularly, but not limited to, embodiments in which the transport members are formed by conveyor rollers) is that the clamping force with which the products are clamped can be properly controlled, and certainly (though not limited hereto) in the embodiments to be described below in which both the lower and upper conveyor rollers are provided with a suitable covering.

[0014] It has further been found that in the known device products can adhere to the pressing belt. In that case the products can be carried along by the pressing belt to a position beyond the sorting rollers provided thereunder, so that the products cannot drop downward. This affects the sorting result in adverse manner. According to embodiments of the invention this effect does not occur, or does so to considerably lesser extent, so that the sorting result can be improved.

[0015] The use of a pair of conveyor rollers placed one above another further allows a good view of the device and the sorting process performed therein. The construction is relatively simple. The accessibility to the different components of the device is also good, so that maintenance can be carried out easily and quickly.

[0016] In embodiments of the invention the upper transport members are formed by free conveyor rollers, a first lower transport member is formed by a conveyor roller with an endless conveyor belt and the one or more other lower transport members are formed by free conveyor rollers. In this embodiment the products are given the opportunity to lie flat since they are not clamped fixedly directly from the vibrator. A green bean for instance may be a little curved but, because it is then not immediately clamped, it comes to lie flat in horizontal direction. The horizontal distance between the lower conveyor roller of the belt and the upper conveyor roller is moreover preferably adjustable. It is then possible for instance to allow the lower conveyor roller to protrude slightly, whereby the products are less likely to hang askew.

[0017] In order to improve the engagement of the transport members on the products they can be provided on their peripheral side with a material compressible by the products. When the transport members are formed by conveyor rollers, it is for instance possible to provide the running surface of the rollers with a compressible covering. The covering can be formed by flexible, in particular elastic material, for instance in the form of cellular rubber or similar material. The thickness of the covering depends on the application, but generally amounts to between 0.5 cm and 3 cm.

[0018] Provided in an embodiment are two sets of transport members between which a single sorting opening (sorting gap) is present. Provided in other embodiments are more than two successive sets of transport members, so that there are at least two sorting openings. These sorting openings can have an equal length in the direction of transport for the purpose of separating the products into a group of relatively long products and a group of relatively short products, although in determined other embodiments the centre-to-centre distance and/or the diameter of the rollers is selected such that the sorting openings have a differing length. In embodiments of the invention the length of the sorting openings of the successive sets of transport members increases as seen in the direction of transport. It is hereby possible to separate the products into more than the above stated two groups. The products can for instance be separated into three or more groups, in each case with products in a different length range.

[0019] Provided in a determined embodiment are a number of parallel groups of a number of successive sets of transport members with at least one sorting opening therebetween. Two or more product flows can in this way be sorted simultaneously.

[0020] The feed conveyor can for instance comprise a directional vibrator. A directional vibrator comprises a number of ridges or protrusions extending in the longitudinal direction (corresponding to the direction of transport) to form longitudinal channels in which the products can be supplied. Feed takes place by setting the directional vibrator into vibration, for instance using one or more unbalance motors or with other techniques lying within the reach of the skilled person.

[0021] The drive of the transport members is adapted to rotate the transport members in opposing rotation directions. The transport members arranged one above another preferably rotate at the same speed so that the friction forces between the products for sorting and the transport members are limited. These friction forces could otherwise result in the desired orientation of the products, i.e. substantially parallel to the direction of transport of the products, being lost during transport. This can have an adverse effect on the sorting to be performed.

[0022] The device further comprises a frame which is to be disposed on a ground surface and in which the transport members are rotatably arranged. An intermediate space (pinch) is provided between the transport members of a set of transport members for the purpose of clamping the products therebetween.

[0023] The transport members can be driven in different ways. In determined embodiments the device comprises a direct drive, for instance comprising an electric drive motor, for direct driving of only one of the transport members of a set of transport members, for instance the upper or lower transport member. The opposite transport member can be embodied here to co-rotate freely with the driven transport member, although in other embodiments of the invention the opposite transport member is also driven, either in direct manner or in indirect manner. The transport member can for instance be driven in indirect manner by a transmission mechanism which transmits the movement of the direct drive to the opposite transport member.

[0024] The sorting conveyor can also comprise adjusting means for adjusting the length of at least one opening (i.e. at least one sorting opening) between the lower conveyor rollers. A high degree of flexibility can thus be obtained in respect of the threshold value for the length employed in processing the elongate products. The adjusting means can be adapted to modify the centre-to-centre distance between successive sets of transport members. Alternatively or additionally, the adjusting means can be adapted to adjust the distance between the outer end of the feed conveyor and the first set of

transport members.

[0025] In a further embodiment the adjusting means are adapted to adjust the length of at least one opening between the upper conveyor rollers. The opening between two successive upper conveyor rollers can correspond to the sorting opening of the associated lower conveyor rollers, but can also differ therefrom. The opening between upper conveyor rollers does after all have another function, i.e. that of preventing the situation where products are pressed to some extent round a lower roller.

[0026] In a further embodiment the throughfeed speed in the sorting conveyor is greater than the throughfeed speed in the feed conveyor. This results in the elongate products remaining as far as possible in the desired orientation (i.e. substantially parallel to the direction of transport) at the transition from the feed conveyor to the sorting conveyor.

[0027] In further embodiments of the invention two or more of the devices described herein are placed successively for further transport and separation of the separated products. According to a determined embodiment, the device comprises:

- a first feed conveyor and a first sorting conveyor;
- a second feed conveyor and a second sorting conveyor;

wherein the second feed conveyor is adapted to receive products from the first sorting conveyor. When for instance a number of products arrive one on top of another at the first sorting conveyor and optimum separation does not take place in a first sorting conveyor, the products are once again released from each other (for instance released by vibration) on the second feed conveyor, for instance a second vibrating feed, between the sorting conveyors. There is therefore little chance of these products coming to lie on each other again at the second sorting conveyor.

[0028] Provided according to another aspect of the invention is a method for sorting elongate products to length, in particular natural products such as green beans, wherein the method comprises of:

- feeding the products in a direction of transport such that during transport the products extend with their longitudinal direction substantially parallel to the direction of transport;
- further transporting the supplied products in the direction of transport and separating the products according to their length during the further transport;

wherein separation comprises of:

- guiding at least some of the products along a first set of transport members comprising an upper and lower transport member, wherein between the transport members is an intermediate space in which the products can be clamped;
- guiding at least some of the products along a second set of transport members comprising an upper and lower transport member, wherein between the transport members is an intermediate space in which the products can be clamped;

wherein a sorting opening is provided between two successive lower transport members for allowing products with a length smaller than a sorting length to drop via the sorting opening.

[0029] The invention will be elucidated hereinbelow on the basis of the description of several embodiments thereof. Reference is made in the description to the accompanying figures, in which:

- Figure 1 is a top view of a feed conveyor and sorting conveyor according to a first embodiment of the invention;
- Figure 2 shows a longitudinal section through the embodiment of figure 1;
- Figure 3 shows a cross-section through the embodiment of figure 1; and
- Figure 4 is a side view of a second embodiment according to the invention.

[0030] Figures 1-3 show a preferred embodiment of a device according to the present invention. The device comprises a feed conveyor 1 for feeding the products in a direction of transport (T) and a sorting conveyor 2 which is separate or combined with feed conveyor 1 for sorting to length the products (p) supplied by feed conveyor 1. The elongate products are supplied via a vibrating distributor or belt distributor and placed on feed conveyor 1. Feed conveyor 1 comprises a frame 3 on which a directional vibrating feed 4 is arranged. This directional vibrating feed 4 is provided with a number of ridges 29 in the longitudinal direction, whereby a number of parallel channels are formed extending in the direction of transport. The number of channels can vary, for instance from 1 to 20. Products (p) can be displaced in each of the channels by setting the channels into vibration. The elongate products are displaced along the channels while they are oriented with their longitudinal direction parallel to the direction of transport.

[0031] At outer end 8 of the directional vibrating feed 4 the elongate products (p) can be taken onto sorting conveyor 2. In the shown embodiment the sorting conveyor comprises a first set of conveyor rollers 5, 6 and a second set of conveyor rollers 5', 6' arranged adjacently thereof. In the shown embodiment the number of sets of conveyor rollers equals two, although this number can be greater in other embodiments.

[0032] Each set of conveyor rollers comprises a lower conveyor roller 6,6' and a conveyor roller 5,5' placed directly thereabove. Each set of conveyor rollers 5,6 forms a conveyor roller pair between which a receiving space (pinch) 7 is present for the purpose of clamping the supplied products therein and further transport thereof.

[0033] In order to increase the grip of the conveyor rollers on the products, the conveyor rollers 5, 5', 6, 6' are covered in the shown embodiment with an elastic covering, for instance cellular rubber. The covering ensures that the products can be properly pressed so that a change in the orientation (relative to the direction of transport) is prevented as far as possible and the products also extend in the sorting conveyor as far as possible parallel relative to the direction of transport. As alternative to the covering or in addition thereto, the conveyor rollers of a conveyor roller pair can also be spring-mounted relative to each other, wherein the rollers tend to be pressed against each other as a result of a determined bias.

[0034] The diameter of rollers 5,6 and the thickness of covering 9 depend on the dimensions of the product for sorting. In the case of for instance green beans the rollers can have an external diameter of 40 mm and covering 9 is formed by a 10 mm thick cellular rubber. In the case where carrots are being sorted, the conveyor roller preferably has an external diameter of 60 mm and a flexible covering about 20 mm thick is arranged on the conveyor roller.

[0035] Each set of rollers 5,6 placed one above the other is driven so that the rollers rotate in an opposite direction relative to each other (see arrows), whereby as noted above the product can be carried along by the set of rollers. In the shown embodiment one of the rollers of a set of rollers is driven directly, for instance by an electric motor 11 for set of rollers 5,6 and electric motor 10 for set of rollers 5',6'. The other roller of a set of rollers is then driven in indirect manner, for instance by means of a gear transmission 12. In other embodiments (not shown) all rollers are driven directly, for instance with different electric motors.

[0036] Conveyor rollers 5, 6 are mounted in a frame 14 and conveyor rollers 5',6' are mounted in a frame 15. Both frames 14,15 are displaceable in direction of transport (T) over a linear guide 13. Frame 14 with rollers 5,6 mounted thereon and frame 15 with rollers 5',6' mounted thereon can be displaced independently of each other.

[0037] Displacement of a frame 14,15 takes place by operating a respective handwheel with which a continuous shaft 16,17 is set into motion with a toothed wheel on the outer side thereof. Mounted on frames 14, 15 of sorting conveyor 2 are respective gear racks with which the frames 14, 15 can be linearly adjusted. This adjustment is realized in order to set as required the intermediate distance (a) between outer end 8 of feed conveyor 1 and the first conveyor roller set 5, 6 and/or the distance (b) between the first conveyor roller set 5, 6 and a second conveyor roller set 5', 6'. Because both conveyor roller sets are adjustable, the mutual distance of the conveyor rollers can be set as well as the space between the end of the feed conveyor and the first conveyor roller set. Said distances (a,b) form sorting openings 20,21 along which products can drop downward and can be discharged via a discharge, for instance in the form of a hopper 22. When the distance (a) between the first conveyor roller set and the outer end of feed conveyor 1 is increased, possibly curved products can in this way also be better sorted. Because the products are not yet clamped at the end of the feed conveyor, the curved products can rotate here (for instance with the curve hanging downward), whereby they can drop downward through the gap between vibrating feed 4 and the first set of conveyor rollers.

[0038] During operation the elongate products which are supplied via feed conveyor 1 and which are long enough will be taken from feed conveyor 1 into rollers 5, 6 of the first conveyor roller set of sorting conveyor 2. The throughput speed of the conveyor rollers is at least as great here as the transport speed of feed conveyor 1 so that the orientation of the products continues to be maintained as far as possible in sorting conveyor 2.

[0039] Depending on the set distances (a/b) between the rollers, products from a determined length will be too curved and/or too short to be taken from feed conveyor 1 by the first set of conveyor rollers 5, 6 or be too short to be taken from the first set of conveyor rollers 5, 6 by the second set of conveyor rollers 5', 6'. These products then drop downward and can be collected, for instance in hopper 22. The products in hopper 22 guided to one or more discharge conveyors (not shown) which provide for discharge of the products. The other products which are carried along by the second set of conveyor rollers are discharged for instance via a chute (not shown) or, as in the shown embodiment, via a second feed conveyor 31 and sorting conveyor 32. The construction and operation of second feed conveyor 31 and sorting conveyor 32 are essentially identical to that of the first feed conveyor 1 and sorting conveyor 2. A further separation of the products takes place. The relatively short products drop into discharge 33, while the longer products drop into discharge 34.

[0040] The length from which the products can or cannot drop downward through a sorting gap (also referred to as the sorting length) is generally not exactly equal to the length of sorting gaps or openings 20,21 in the direction of transport, but is of course related thereto. The larger the sorting opening, the greater the sorting length. Products shorter than this sorting length drop downward via the sorting opening, while products longer than this sorting length are engaged by the following transport members and transported further.

[0041] Both vibrating channels of feed conveyors 1,31 are driven in the shown embodiment by one set of unbalance motors 35. In other embodiments this could optionally also take place separately per vibrator. The device can further be closed using doors 36.

[0042] It is further possible to allow the dimensions of the sorting gaps to increase in the direction of transport (for instance by selecting increasingly larger successive sorting gaps within a single sorting conveyor and/or sorting gaps of different sorting conveyors). It is hereby possible to have the sorting process take place in more than two groups. When the sorting process must result in more than two groups of products, it is of course also possible

to envisage carrying an already sorted product once again through the same sorting conveyor, only this time with a different (smaller) sorting gap/opening.

[0043] Figure 4 shows a further embodiment of the invention. The construction and operation of the second embodiment largely correspond to those of the first embodiment, and a lengthy description thereof is therefore dispensed with as far as possible below. The embodiment comprises a feed conveyor 41 for feeding the products in a direction of transport (T) and a sorting conveyor 42 which is separate or combined with feed conveyor 41 for sorting to length the products (p) supplied by feed conveyor 41. The elongate products are supplied via a vibrating distributor or belt distributor and placed on feed conveyor 41. Feed conveyor 41 comprises a frame 43 on which a directional vibrating feed 44 is arranged. This directional vibrating feed 44 is provided in the above described manner with a number of ridges 29 extending in the longitudinal direction. These ridges form a number of parallel channels which lie adjacently of each other and along which a number of rows of elongate products are supplied when the channels are set into vibration by a vibrating motor 45. At the outer end of directional vibrating feed 44 the

[0044] elongate products (p) can be taken over by sorting conveyor 42. In the shown embodiment the sorting conveyor comprises a flat conveyor comprising an endless conveyor belt 46. The endless conveyor belt 46 comprises a driver roller 47 on the feed side and a (pressing) roller 48 on the discharge side. The conveyor belt can be driven via the drive roller using an electric motor (not shown).

[0045] An upper roller 49 is situated above the discharge outer end of the conveyor belt, in particular above roller 48. In the shown embodiment the upper roller is provided on the peripheral surface with a covering, manufactured for instance from cellular rubber or similar material. Supplied products can now be clamped between upper roller 49 on the one side and lower roller 48 on the other and further transported in the direction of transport (T).

[0046] A second roller pair is situated some distance downstream of the first conveyor roller pair (consisting of the upper free conveyor roller 49 and the lower conveyor roller 48 which forms part of the flat conveyor). This roller pair comprises a lower conveyor roller 50 and an upper conveyor roller 51. In determined embodiments the upper conveyor roller 51 is provided with a flexible covering and the lower conveyor roller 50 takes a smooth (and substantially hard and essentially non-compressible) form. The covering is arranged to increase the grip of the conveyor rollers on the products. The covering ensures that the products can be properly pressed down so that a change in the orientation (relative to the direction of transport) is prevented as far as possible and the products also extend as parallel as possible relative to the direction of transport in the sorting conveyor. As alternative to the covering, or in addition thereto, the conveyor rollers of a conveyor roller pair can also be spring-mounted relative to each other.

[0047] In other embodiments the smooth and flexible conveyor rollers are however interchanged or both conveyor rollers take a smooth or flexible form. In all these embodiments both the conveyor rollers are however arranged such that they can clamp and further transport supplied products.

[0048] In the embodiment shown in figure 4 the number of sets (pairs) of conveyor rollers equals two, although in other embodiments this number can be greater so that the products can be sorted into more groups.

[0049] During use the products are supplied in one or more rows by feed conveyor 44. A product then comes to lie on the flat endless belt 46, whereby it has the opportunity to lie flat. Green beans for instance may be a little curved but, because they are not then immediately clamped, they generally come to lie flat in horizontal direction. At the end above flat belt 46 the product is clamped between upper conveyor roller 49 and (conveyor roller 48 of) conveyor belt 46. The product is then further sorted to length in the same way in that the product can be taken up in a set of double rollers 50,51. The gap between the outer end of belt 46 and the set of conveyor rollers 50,51 in principle takes an adjustable form here in order to thereby determine the sorting length.

[0050] After the longer products leave the set of rollers 50,51, they are collected via discharge conveyor belt 57 and discharged (A_2) for further processing. The short products drop downward into sorting opening 51 and are discharged (A_1) via a hopper-like receptacle 52.

[0051] In determined embodiments the conveyor roller 49 takes a form which is adjustable in height and lengthwise direction. The throughput speed of the product can be increased quite considerably. In order to prevent shorter products nevertheless being taken up by roller set 50,51 at this speed, in the embodiment of figure 4 an (adjustable) brush strip 55 is arranged on the upper side in the sorting opening. This brush strip 55 can ensure that the speed of these short products is slowed, and the sorting result can be enhanced. In another embodiment (not shown) it could also be possible to place air blowing means, for instance a so-called air knife, at the location of the brush strip. Such air blowing means ensure that the shorter products are blown downward out of the product flow so that the chance of blockages is reduced and a good throughflow can be realized.

[0052] The present invention is not limited to the embodiments thereof described herein. The rights sought are rather determined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Device for sorting elongate products to length, in particular natural products such as green beans, the device comprising:

- a feed conveyor for transporting the products in a direction of transport, wherein the conveyor is adapted to hold the products during transport with their longitudinal direction substantially parallel to the direction of transport;
- a sorting conveyor for transporting in the direction of transport the products supplied via the feed conveyor, wherein the sorting conveyor is adapted to separate the products according to their length during transport;

wherein a sorting opening is provided between two successive lower transport members for allowing products with a length smaller than a sorting length to drop via the sorting opening; **characterized in that** the sorting conveyor comprises a number of successive sets of transport members, wherein each set comprises an upper and a lower transport member between which the products can be clamped and moved forward.

2. Device as claimed in claim 1, wherein the transport members comprise one or more conveyor rollers.

3. Device as claimed in claim 1, wherein the transport members comprise one or more conveyor belts.

4. Device as claimed in any of the claims 1-3, wherein the upper transport members are formed by free conveyor rollers, a first lower transport member is formed by a conveyor roller with an endless conveyor belt and the one or more other lower transport members are formed by free conveyor rollers.

5. Device as claimed in claim 2, 3 or 4, wherein some of the transport members or all transport members are provided on their peripheral side with a material compressible by the products, wherein the material preferably comprises a covering, preferably a covering of cellular rubber and/or a covering with a thickness of between 5 mm and 30 mm, more preferably between 10 mm and 20 mm.

6. Device as claimed in any of the foregoing claims, wherein more than two successive sets of transport members with at least two sorting openings therebetween are provided, wherein the length of the sorting openings preferably increases as seen in the direction of transport and/or wherein a number of parallel groups of a number of successive sets of transport members with at least one sorting opening therebetween are provided and/or wherein the feed conveyor comprises a directional vibrator.

7. Device as claimed in any of the foregoing claims, comprising a drive for rotating the transport members in opposing rotation directions.

8. Device as claimed in any of the foregoing claims, comprising a frame in which the transport members are rotatably arranged, wherein an intermediate space (pinch) is provided between transport members of a set of transport members for the purpose of clamping the products therebetween.

9. Device as claimed in any of the foregoing claims, wherein the sorting conveyor comprises adjusting means for adjusting the length of at least one of the openings between the upper conveyor rollers and/or lower conveyor rollers.

10. Device as claimed in any of the foregoing claims, comprising means for reducing the product transport speed between two successive sets of transport members, particularly comprising one or more brush strips.

11. Device as claimed in any of the foregoing claims, comprising blowing means for blowing products through the sorting opening.

12. Device as claimed in any of the foregoing claims, wherein the throughfeed speed in the sorting conveyor is at least equal to or greater than the throughfeed speed in the feed conveyor and/or wherein the device comprises receiving means for receiving the separated products, preferably in two or more hopper receptacles.

13. Device as claimed in any of the foregoing claims, comprising:

- a first feed conveyor and a first sorting conveyor;
- a second feed conveyor and a second sorting conveyor;

wherein the second feed conveyor is adapted to receive products from the first sorting conveyor.

14. Method for sorting elongate products to length, in particular natural products such as green beans, the method comprising of:

- feeding the products in a direction of transport such that during transport the products extend with their longitudinal direction substantially parallel to the direction of transport;
- further transporting the supplied products in the direction of transport and separating the products according to their length during the further transport;

wherein separation comprises of:

- guiding at least some of the products along a

first set of transport members comprising an upper and lower transport member, wherein between the transport members is an intermediate space in which the products can be clamped;

characterized in that the separation further comprises of:

- guiding at least some of the products along a second set of transport members comprising an upper and lower transport member, wherein between the transport members is an intermediate space in which the products can be clamped;

wherein a sorting opening is provided between two successive lower transport members for allowing products with a length smaller than a sorting length to drop via the sorting opening.

15. Method as claimed in claim 14, comprising of receiving the separated products, carrying the received products further in the direction of transport such that during transport the products extend with their longitudinal direction substantially parallel to the direction of transport, and transporting the products further and separating these products according to their length during transport, and/or wherein a device according to any of the claims 1-13 is applied.

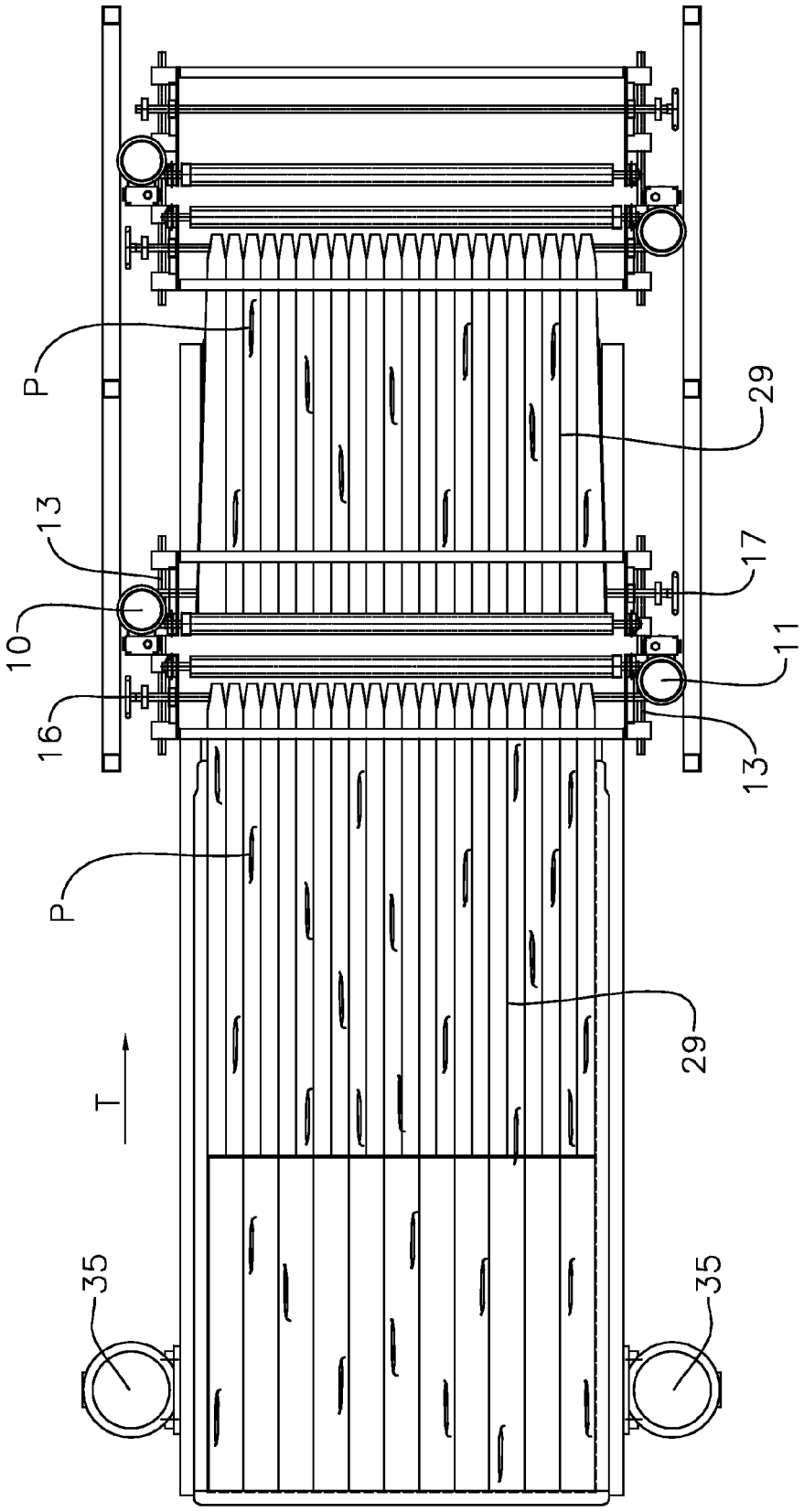


FIG. 1

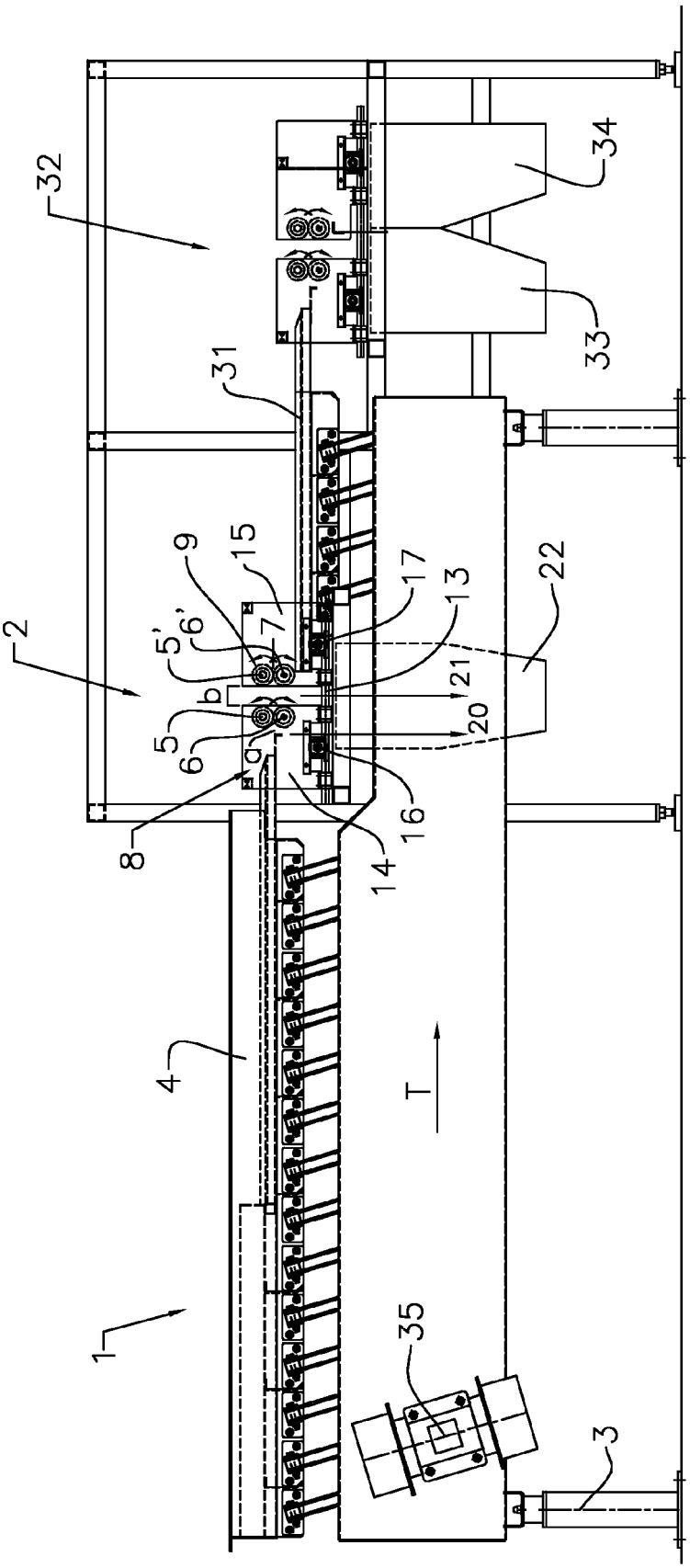


FIG. 2

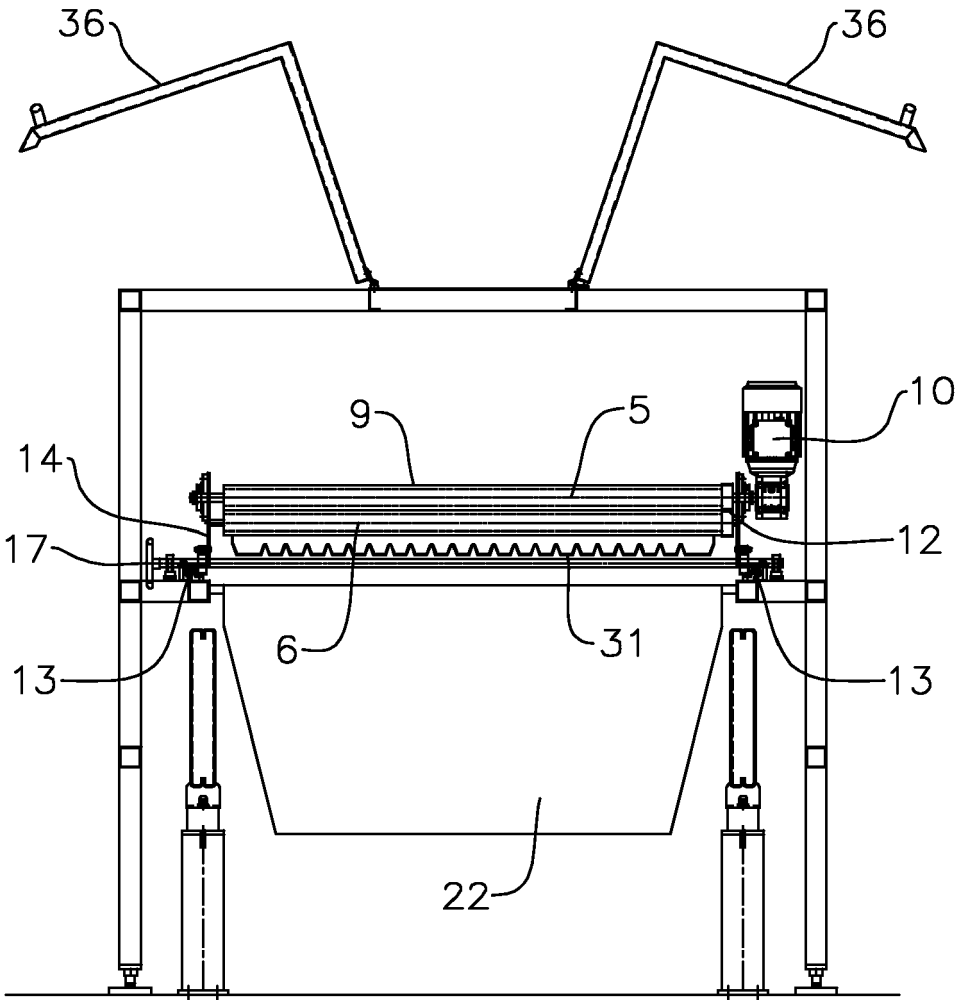


FIG. 3

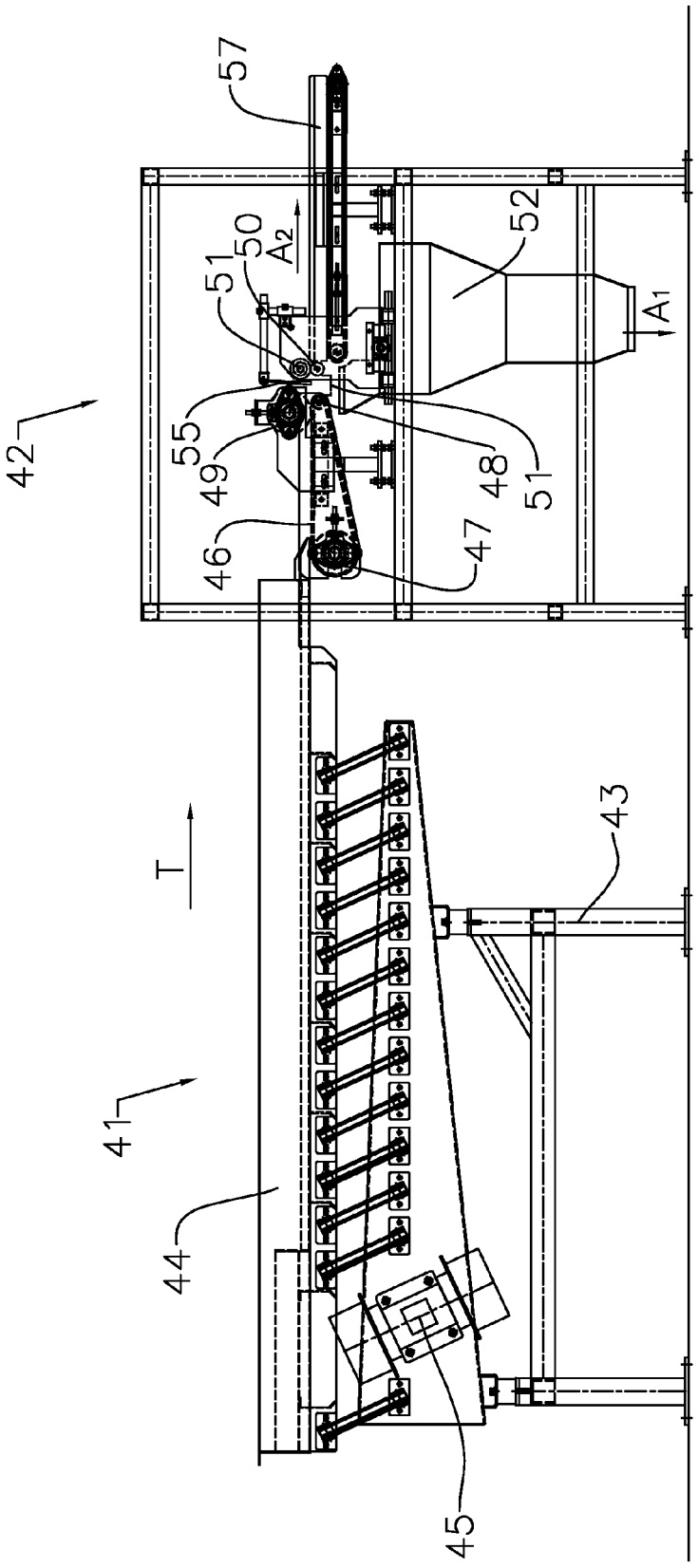


FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 17 4156

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,D	NL 1 033 048 C1 (GEGE MACHINEBOUW BV) 16 June 2008 (2008-06-16)	1-3, 5-10, 12-15	INV. B07B13/00 B07B13/04
Y	* abstract * * page 5, line 18 - page 6, line 24 * * page 7, line 26 - page 10, line 12 * * claims * * figures *	4,11	

Y	NL 8 403 813 A (L.S. MIEDEMA LANDBOUWWERKTUIGENFABRIEK BV) 1 July 1986 (1986-07-01)	4,11	
A	* page 1, line 1 - line 4 * * page 1, line 31 - page 3, line 12 * * claims * * figures *	1-3,7,8, 10,12, 14,15	

X	FR 2 847 493 A1 (CFF RECYCLING SA) 28 May 2004 (2004-05-28)	1,2, 5-10,12, 14,15	
	* abstract * * page 2, line 19 - page 3, line 2 * * page 4, line 6 - page 5, line 31 * * claims * * figures *		TECHNICAL FIELDS SEARCHED (IPC) B07B A23N

X	US 2011/056797 A1 (TSAI) 10 March 2011 (2011-03-10)	1,3,5, 7-10,12, 14,15	
	* abstract * * paragraph [0005] - paragraph [0007] * * paragraph [0036] - paragraph [0038] * * claims * * figures *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 September 2012	van der Zee, Willem

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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 17 4156

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.

28-09-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
NL 1033048 C1	16-06-2008	NONE	
NL 8403813 A	01-07-1986	NONE	
FR 2847493 A1	28-05-2004	NONE	
US 2011056797 A1	10-03-2011	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- NL 1033048 **[0002]**