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Apparatus for transferring substantially spherical or ellipsoidal products, such as for instance eggs, fruit or vegetables.

The invention relates to an apparatus for transferring substantially spherical or ellipsoid products, such as for instance eggs, fruit or vegetables, and comprises a supply conveyor (1) designed to supply products in parallel longitudinal rows (2) extending in a direction of supply, a discharge conveyor (3) with product carriers (4) each designed to receive a single product (P), and a transfer apparatus (5) designed to transfer the products supplied by the supply conveyor into the discharge conveyor product carriers. According to the invention, the apparatus is characterized in that the transfer apparatus comprises a plurality of transfer-conveying means (6) with transfer-product carriers (7), arranged in line with the longitudinal rows, the transfer apparatus further comprising a transfer element (8), designed to pass the transfer-product carriers in vertical direction and, upon vertical upward movement, to lift the products from the transfer-product carriers and to place these products into the discharge conveyor product carriers.

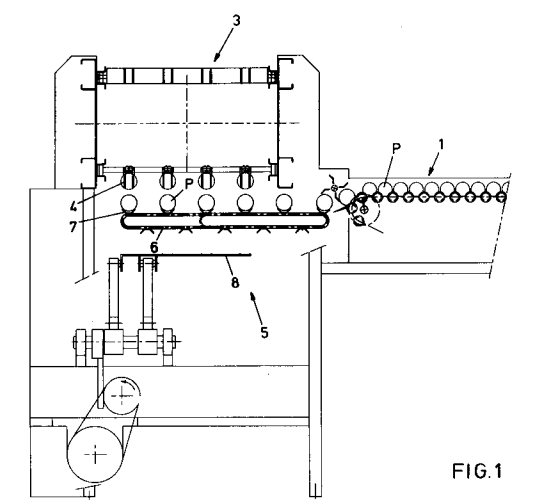


FIG. 1

The invention relates to an apparatus for transferring substantially spherical or ellipsoid products, such as for instance eggs, fruit or vegetables, which apparatus comprises a supply conveyor designed to supply products in parallel longitudinal rows extending in a direction of supply, a discharge conveyor with product carriers each designed to receive a single product, and a transfer apparatus designed to transfer the products supplied by the supply conveyor into the discharge conveyor product carriers.

Such an apparatus, particularly for transferring eggs, is disclosed in European patent 0 114 488. In the known apparatus, the supply conveyor is designed as a roller conveyor, supplying the eggs in parallel longitudinal rows extending in the direction of supply, whereupon a transfer apparatus transfers the eggs to a discharge conveyor with discharge conveyor product carriers, each being designed to engage a single egg.

The transfer apparatus in particular has a number of drawbacks.

Firstly, the number of times that an egg is transferred to a next part is very large, which increases the chance of the egg breaking. In fact, an egg is first deposited from the roller conveyor onto a guide rail (transfer 1), subsequently it is moved via a star-shaped wheel (transfer 2) to a carrying blade (transfer 3), then taken to a next carrying blade (transfer 5) via a push-up element (transfer 4) and finally received in the discharge conveyor product carriers (transfer 6). Such a route, in which each egg is transferred six times, is carried out in parallel for a plurality of eggs, delivered simultaneously per transverse row by the roller conveyor.

Secondly, it is hardly possible, if at all, to provide the discharge conveyor with more than two parallel longitudinal rows of product carriers extending in the direction of discharge because each additional row of product carriers in the discharge conveyor leads to an additional transfer of the eggs onto the second carrying blades. As the number of transfers per egg increases, so does the chance of the eggs breaking. As the discharge conveyor comprises a maximum of two parallel longitudinal rows of product carriers, the capacity of the discharge conveyor is limited.

Thirdly, in connection with the fact that the discharge conveyor is driven continuously, the carrying blades placing the eggs into the discharge conveyor product carriers must travel along a complex three-dimensional path, which increases the chance of the eggs breaking and renders the moving mechanism of the carrying blades complex and costly. Moreover, the second carrying blades describe a circular path in a vertical plane, which has as a consequence that the movements of the sec-

ond carrying blades and of the discharge conveyor must be adjusted to each other very accurately, because otherwise the chance of the eggs breaking will be considerable.

The object of the present invention is to provide an apparatus without the drawbacks described above.

To this end, according to the invention, the apparatus of the type described in the preamble is characterized in that the transfer apparatus comprises a plurality of transfer-conveying means, arranged in line with the parallel longitudinal rows and comprising transfer-product carriers, the transfer apparatus further comprising a transfer element movable at least in a vertical plane extending parallel to the longitudinal direction of the discharge conveyor and designed to pass the transfer-product carriers in vertical direction and, upon vertical upward movement, to lift the products from the transfer-product carriers and to place these products into the discharge conveyor product carriers.

An apparatus of such design has the advantage that the product, such as for instance an egg, is transferred only three times, viz., from the supply conveyor onto the transfer-product carriers (transfer 1), from the transfer-product carriers onto the transfer element (transfer 2) and from the transfer element into the discharge conveyor product carriers (transfer 3).

In principle, the length of the transfer-conveying means is unlimited, permitting the transfer element to bring a large number of products, supplied successively per transverse row by the supply conveyor, into the discharge conveyor product carriers in one operation. Hence, the number of parallel, adjacent product carriers in the discharge conveyor is not limited to two and the capacity of the discharge conveyor can be increased considerably.

Because the transfer element needs to be movable in a vertical plane only, the moving mechanism of the transfer element may be of a simple construction and be manufactured economically.

According to a further elaboration of the invention, the discharge conveyor has a constant speed during operation, while the transfer element is also controllable so as to travel, as it carries the products into the discharge conveyor product carriers, along a horizontal path at a speed corresponding to the conveying speed of the discharge conveyor.

With an apparatus of such design, the movements of the transfer element and the discharge conveyor need not be adjusted to each other as accurately as is the case with the known apparatus, because they travel along a parallel path for a longer period.

Further elaborations of the invention will be further explained hereinafter on the basis of two

exemplary embodiments, with reference to the accompanying drawings.

Fig. 1 is a schematical side view of a portion of a first exemplary embodiment of the apparatus according to the invention;

Fig. 2 is a sectional view of a second exemplary embodiment, taken on line II-II in Fig. 6;

Fig. 3 is a detail from Fig. 2;

Fig. 4 is a schematical sectional view taken on line IV-IV in Fig. 2;

Fig. 5 is a similar view to Fig. 4, with the transfer element having lifted the products from the transfer-product carriers;

Fig. 6 is a side view taken on line VI-VI in Fig. 5, with the discharge conveyor leading the products to sorting and packing apparatuses; and

Fig. 7 is a side view of the mechanism by means of which the products in the discharge conveyor product carriers are tilted.

All apparatuses, shown in the drawings, for transferring substantially spherical or ellipsoid products P, such as for instance eggs, fruit or vegetables, are provided with a supply conveyor 1, designed to supply the products P in parallel longitudinal rows 2 extending in a direction of supply, a discharge conveyor 3 with product carriers 4, each being designed to receive a single product P, and a transfer apparatus 5, designed to transfer the products P, supplied by the supply conveyor 1, into the discharge conveyor product carriers 4. According to the invention, the apparatus is characterized in that the transfer apparatus 5 comprises a plurality of transfer-conveying means 6, arranged in line with the parallel rows 2 and comprising transfer-product carriers 7. The transfer apparatus 5 further comprises a transfer element 8, movable at least in a plane extending parallel to the longitudinal direction of the discharge conveyor 3 and designed to pass the transfer-product carriers 7 in vertical direction and, upon vertical upward movement, to lift the products P from the transfer-product carriers 7 and to place these products P into the discharge conveyor product carriers 4.

With such an apparatus, a large number of products P can be transferred in parallel into the discharge conveyor product carriers 4 with a minimum of transfers per product. Because of the small number of transfers during the transposition of the products P, the chance of the products P breaking is minimized.

According to a further elaboration of the invention, the discharge conveyor 3 has a constant speed during operation, while the transfer element 8 is also controllable so as to travel, as it carries the products P into the discharge conveyor product carriers 4, along a horizontal path at a speed corresponding to the conveying speed of the discharge conveyor 3. Such a discharge conveyor 3,

driven at constant speed, leads to a vibrationless, quiet machine behaviour.

In an alternative embodiment, the discharge conveyor 3 can be intermittently drivable, and the transfer element 8 and the discharge conveyor 3 can be controllable during operation in such a manner that the discharge conveyor 3 is stationary at the moment when the products P, located on the transfer element 8, are transferred to the discharge conveyor product carriers 4.

In an apparatus of such design, the path to be travelled along by the transfer element 8 is simplified to a substantially vertical reciprocal movement. Such a simple path can be realized through simple and hence inexpensive means.

In order to allow the transfer element 8 to lift the products P from the transfer-product carriers 7 in such a manner that the chance of the products P breaking is minimized, it is particularly favourable when the transfer-conveying means 6 are capable of being driven intermittently, the transfer element 8 and the transfer-conveying means 6 being controllable in such a manner that when the transfer element 8 lifts the products P from the transfer-product carriers 7, the transfer-conveying means 6 are stationary. An additional advantage of intermittently drivable transfer-conveying means 6 is that when the products P are being lifted, the transfer element 8 only has to travel along a vertically upward path.

To prevent the transfer element 8 from having to travel along a three-dimensional path, it is particularly favourable if the transfer-conveying means 6 and the transfer element 8 are controllable in such a manner that, at the moment when the products P are being lifted by the transfer element 8, the transfer-product carriers 7 are located in a vertical plane which also contains a row 4a of discharge conveyor product carriers 4, extending in the longitudinal direction of the discharge conveyor 3.

Such a two-dimensional path can be realized through simple and inexpensive means.

A practical embodiment of the apparatus as shown in the drawings is characterized in that the transfer-conveying means 6 extend parallel so as to form lateral interspaces 9, the transfer element 8 being constructed as a fork whose teeth 8a can be moved through the lateral interspaces 9 between the transfer-conveying means 6 and being designed such that when the fork 8 passes the transfer-conveying means 6 from the lower side, the products P are lifted from the transfer-product carriers 7 by the fork 8 and, upon continued upward movement of the fork 8, are carried into the discharge conveyor product carriers 4.

A transfer element 8 of such design is stable and of a simple construction.

According to the invention, a constructionally simple embodiment of the transfer-conveying means 6 can be formed by a plurality of endless conveyor chains or conveyor belts, each provided with a plurality of transfer-product carriers 7.

Such an embodiment of the transfer-conveying means 6 has the advantage that the length thereof, and hence the number of transfer-product carriers 7 capable of cooperating with the transfer element 8, is in principle unlimited. As a result, the discharge conveyor 3 can be equipped with a correspondingly large number of parallel longitudinal rows 4a of discharge conveyor product carriers 4, which leads to a large capacity of the discharge conveyor 3.

Generally, if the products P have an ellipsoid shape, they will be supplied with their longitudinal axis oriented in a horizontal plane and in this position be carried into the discharge conveyor product carriers 4 via the transfer apparatus 5. Usually, the discharge conveyor 3 leads to a sorting and packing apparatus 10 (see Fig. 6) for sorting and packing the products P. Such an apparatus is for instance described in U.S. patent application 849712. This sorting and packing apparatus requires that the ellipsoid products P, in particular the eggs, be supplied in a position in which the longitudinal axis is vertically oriented. To effect the transfer of the products P from the horizontal to the vertical orientation, it is particularly favourable when the discharge conveyor product carriers 4 are constructed as depending grippers, designed to tilt the products P about a horizontal shaft 11 from a horizontal position into a vertical position (see Fig. 7).

In order to furnish the discharge conveyor 3 with a high capacity, according to a further elaboration of the invention, this discharge conveyor 3 comprises at least three parallel, longitudinal rows 4a of discharge conveyor product carriers 4, these rows extending in the conveying direction of the discharge conveyor. In the exemplary embodiments shown, the discharge conveyor 3 is provided with four longitudinal rows 4a of discharge conveyor product carriers 4.

In particular when the discharge conveyor 3 connects to a sorting and packing apparatus 10, it is particularly favourable when, in accordance with a further elaboration of the invention, an intermediate conveyor 12 is arranged between the supply conveyor 1 and the transfer apparatus 5, this intermediate conveyor 12 being designed to guide the products P over weighing cells 13 and to subsequently place the products P on the transfer-product carriers 7. After the products P have passed the intermediate conveyor 12, the weight of each product P is known. This information is passed on to the sorting and packing apparatus 10, which uses the information for sorting the products P by

weight. Such an embodiment of the invention is shown in Figs 3-5.

Fig. 4 shows the transfer element 8 in a lowermost position, products meanwhile being located in the transfer-product carriers 7. Fig. 5 shows a situation where the transfer element 8 has been moved vertically upward and has lifted the products P. The discharge conveyor product carriers 4 are about to take over the products.

Fig. 6 shows a side view taken on line VI-VI in Fig. 5, which clearly shows the moving mechanism 14 of the transfer element. The arrow 15 represents the movement pattern of the transfer element 8. It is clear that in these embodiments, the transfer element 8 travels along a horizontal path 15a at the moment when the products P are transferred from the transfer-product carriers 7 to the discharge conveyor product carriers 4.

It is clear that the invention is not limited to the exemplary embodiments described, but that various modifications are possible within the scope of the invention.

Claims

1. An apparatus for transferring substantially spherical or ellipsoid products, such as for instance eggs, fruit or vegetables, said apparatus comprising a supply conveyor designed to supply products in parallel longitudinal rows extending in a direction of supply, a discharge conveyor with product carriers each designed to receive a single product, and a transfer apparatus designed to transfer the products supplied by the supply conveyor into the discharge conveyor product carriers, characterized in that the transfer apparatus (5) comprises a plurality of transfer-conveying means (6) arranged in line with the parallel longitudinal rows (2) and comprising transfer-product carriers (7), said transfer apparatus (5) further comprising a transfer element (8) movable at least in a vertical plane extending parallel to the longitudinal direction of the discharge conveyor (3) and designed to pass the transfer-product carriers (7) in vertical direction and, upon vertical upward movement, to lift the products (P) from the transfer-product carriers (7) and to place said products (P) into the discharge conveyor product carriers (4).
2. An apparatus according to claim 1, characterized in that the discharge conveyor (3) has a constant speed during operation, while the transfer element (8) is also capable of being controlled so as to travel, as it carries the products (P) into the discharge conveyor product carriers (4), along a horizontal path (15a) at

a speed corresponding to the conveying speed of the discharge conveyor (3).

3. An apparatus according to claim 1, characterized in that the discharge conveyor (3) is capable of being driven intermittently, while the transfer element (8) and the discharge conveyor (3) are capable of being controlled during operation in such a manner that the discharge conveyor (3) is stationary at the moment when the products (P), located on the transfer element (8), are transferred to the discharge conveyor product carriers (4). 5
4. An apparatus according to any one of claims 1-3, characterized in that the transfer-conveying means (6) are capable of being driven intermittently, the transfer element (8) and the transfer-conveying means (6) being controllable in such a manner that when the transfer element (8) lifts the products (P) from the transfer-product carriers (7), the transfer-conveying means (6) are stationary. 10
5. An apparatus according to any one of claims 1-4, characterized in that the transfer-conveying means (6) and the transfer element (8) are controllable in such a manner that, at the moment when the products (P) are being lifted by the transfer element (8), the transfer-product carriers (7) are located in a vertical plane which also contains a row (4a) of discharge conveyor product carriers (4), extending in the longitudinal direction of the discharge conveyor (3). 15
6. An apparatus according to any one of claims 1-5, characterized in that the transfer-conveying means (6) extend parallel so as to form lateral interspaces (9), the transfer element (8) being constructed as a fork whose teeth (8a) can be moved through the lateral interspaces (9) between the transfer-conveying means (6) and being designed such that when the fork (8) passes the transfer-conveying means (6) from the lower side, the products (P) are lifted from the transfer-product carriers (7) by the fork (8) and, upon continued upward movement of the fork (8), are carried into the discharge conveyor product carriers (4). 20
7. An apparatus according to any one of claims 1-6, characterized in that the transfer-conveying means (6) are constructed as a plurality of endless conveyor chains or conveyor belts, each provided with a plurality of transfer-product carriers (7). 25

8. An apparatus according to any one of the preceding claims, characterized in that the discharge conveyor product carriers (4) are constructed as depending grippers, designed to tilt the products (P) about a horizontal shaft (11) from a horizontal position into a vertical position. 30
9. An apparatus according to any one of the preceding claims, characterized in that the discharge conveyor (3) comprises at least three parallel, longitudinal rows (4a) of discharge conveyor product carriers (4), said rows (4a) extending in the conveying direction of the discharge conveyor (3). 35
10. An apparatus according to any one of the preceding claims, characterized in that an intermediate conveyor (12) is arranged between the supply conveyor (1) and the transfer apparatus (5), said intermediate conveyor (12) being designed to guide the products (P) over weighing cells (13) and to subsequently place the products (P) on the transfer-product carriers (7). 40

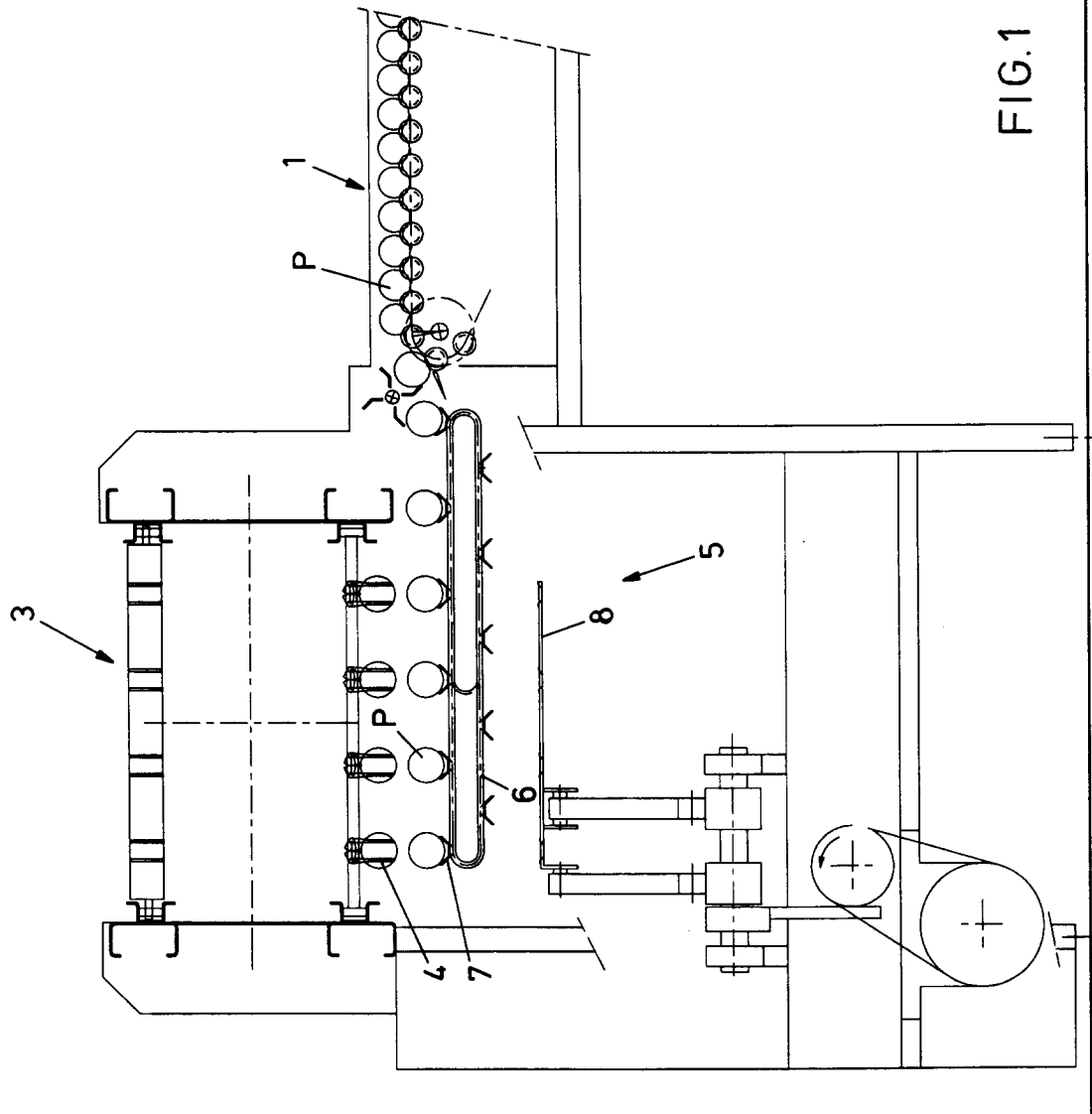


FIG. 1

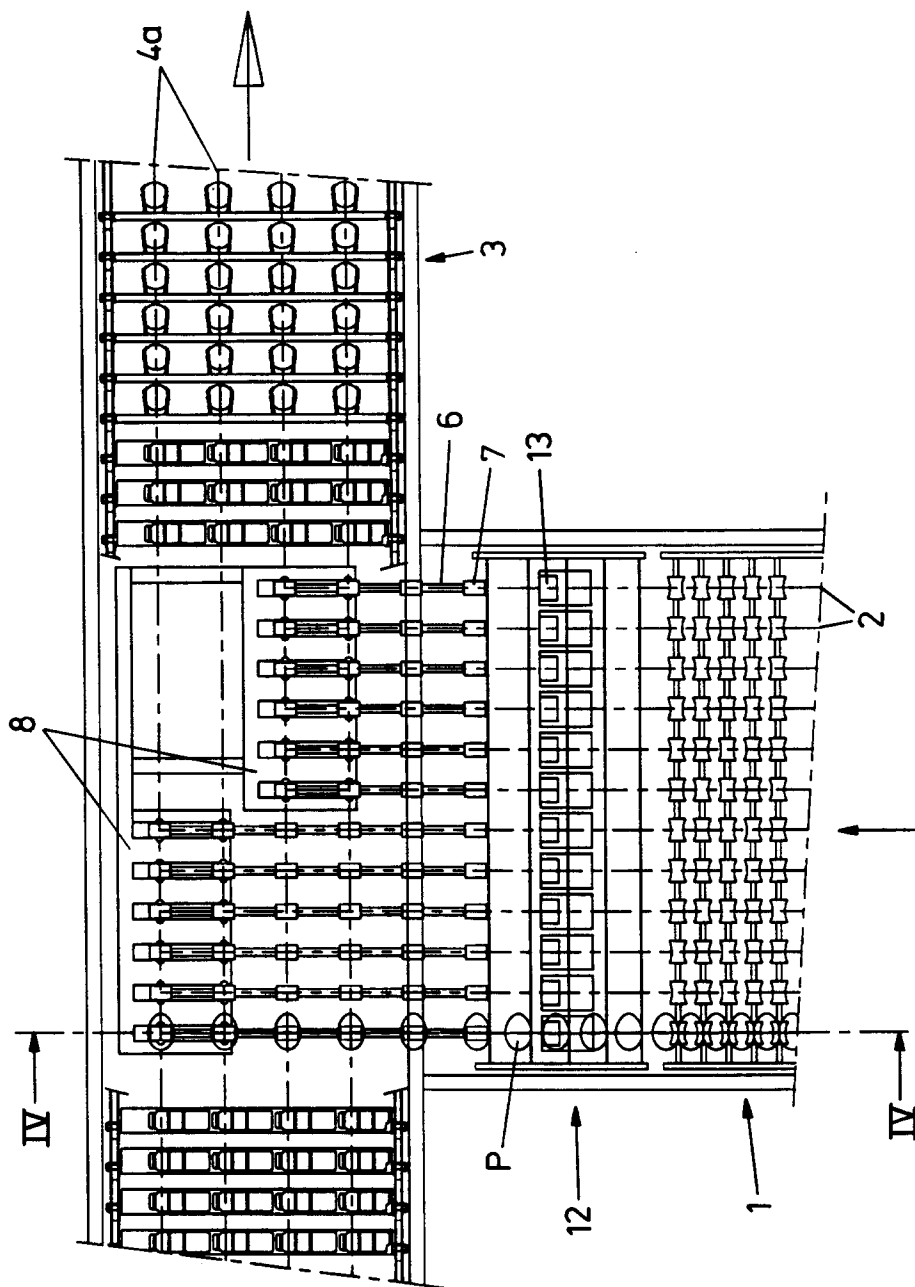
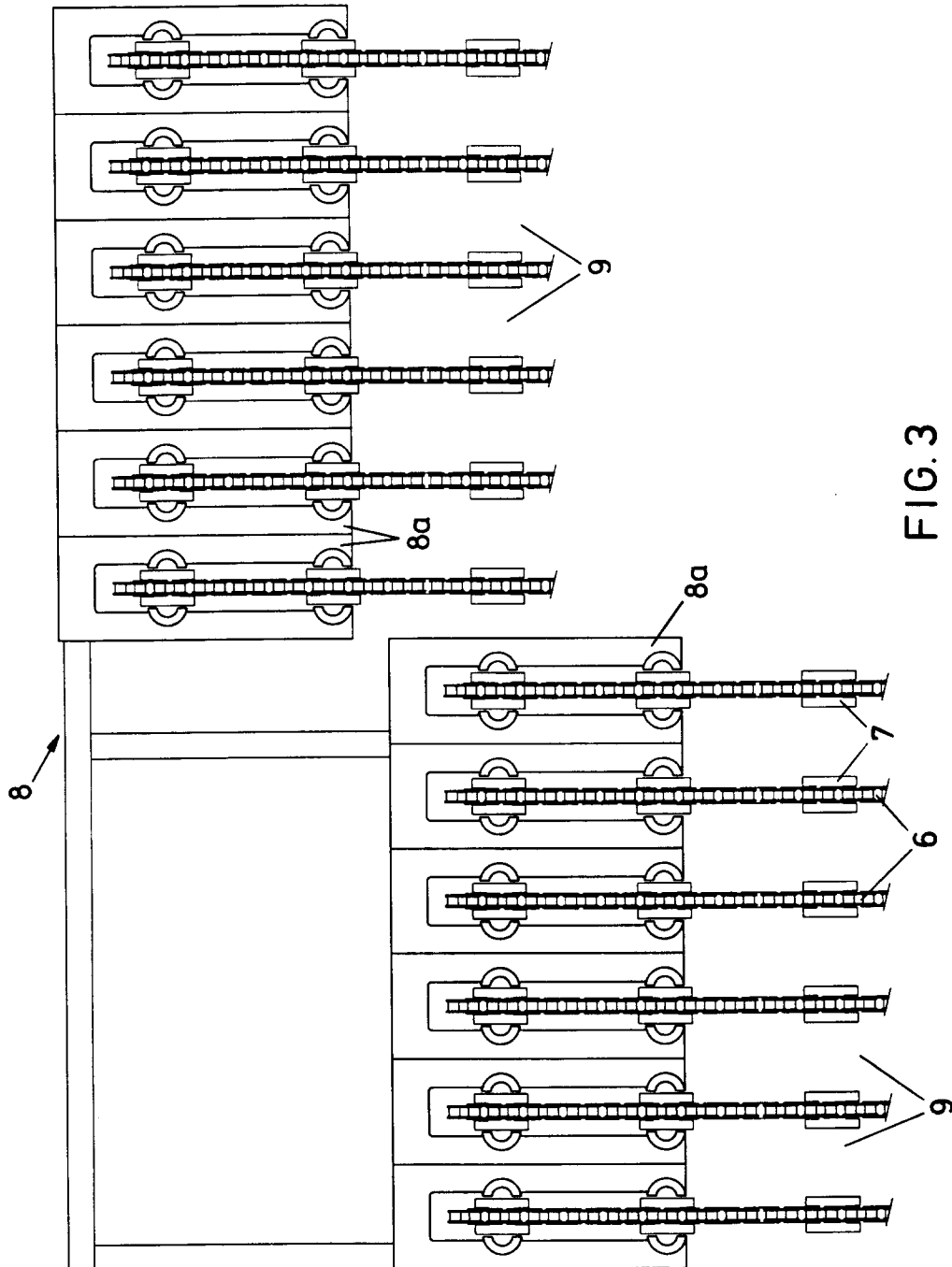


FIG. 2



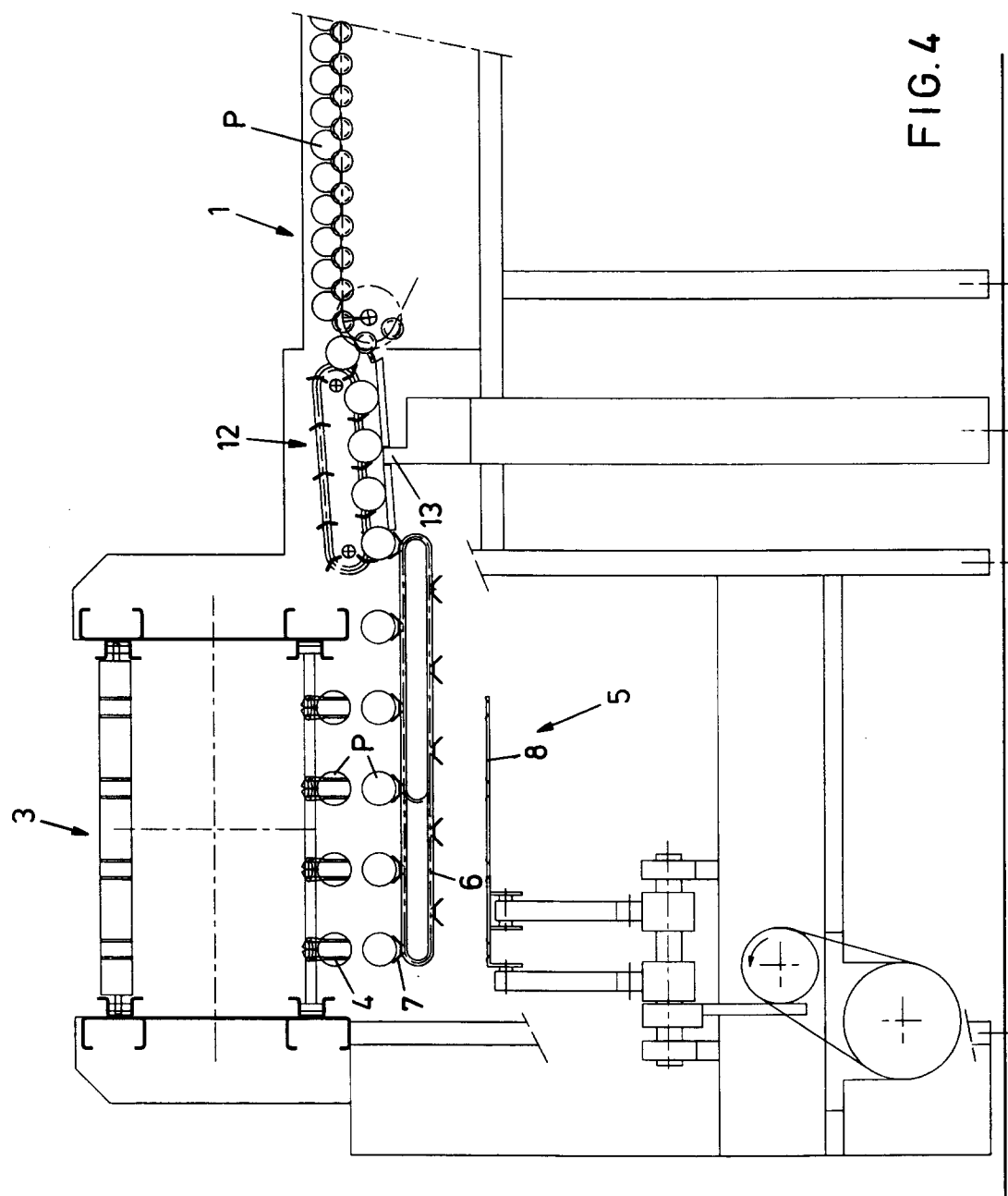
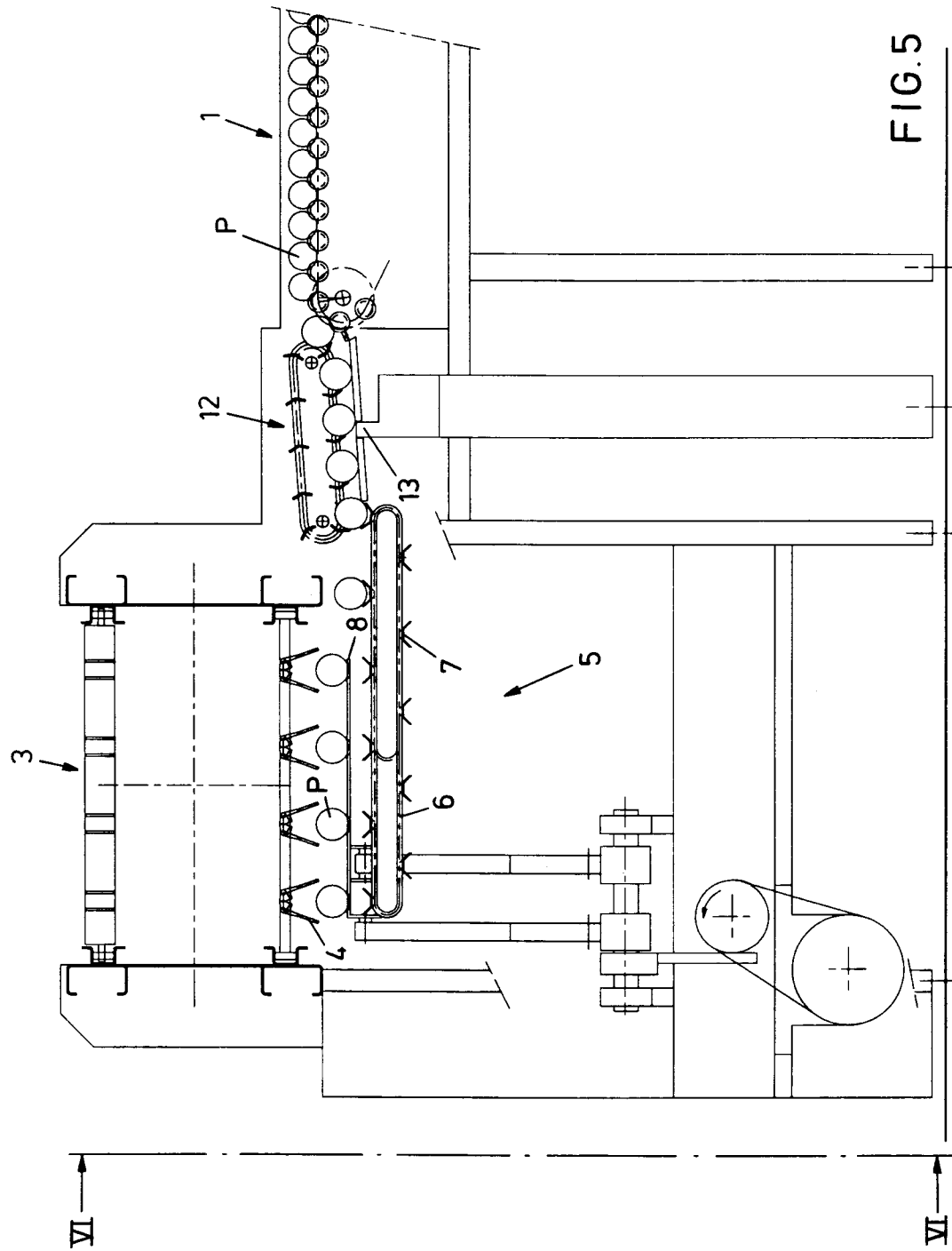


FIG. 4



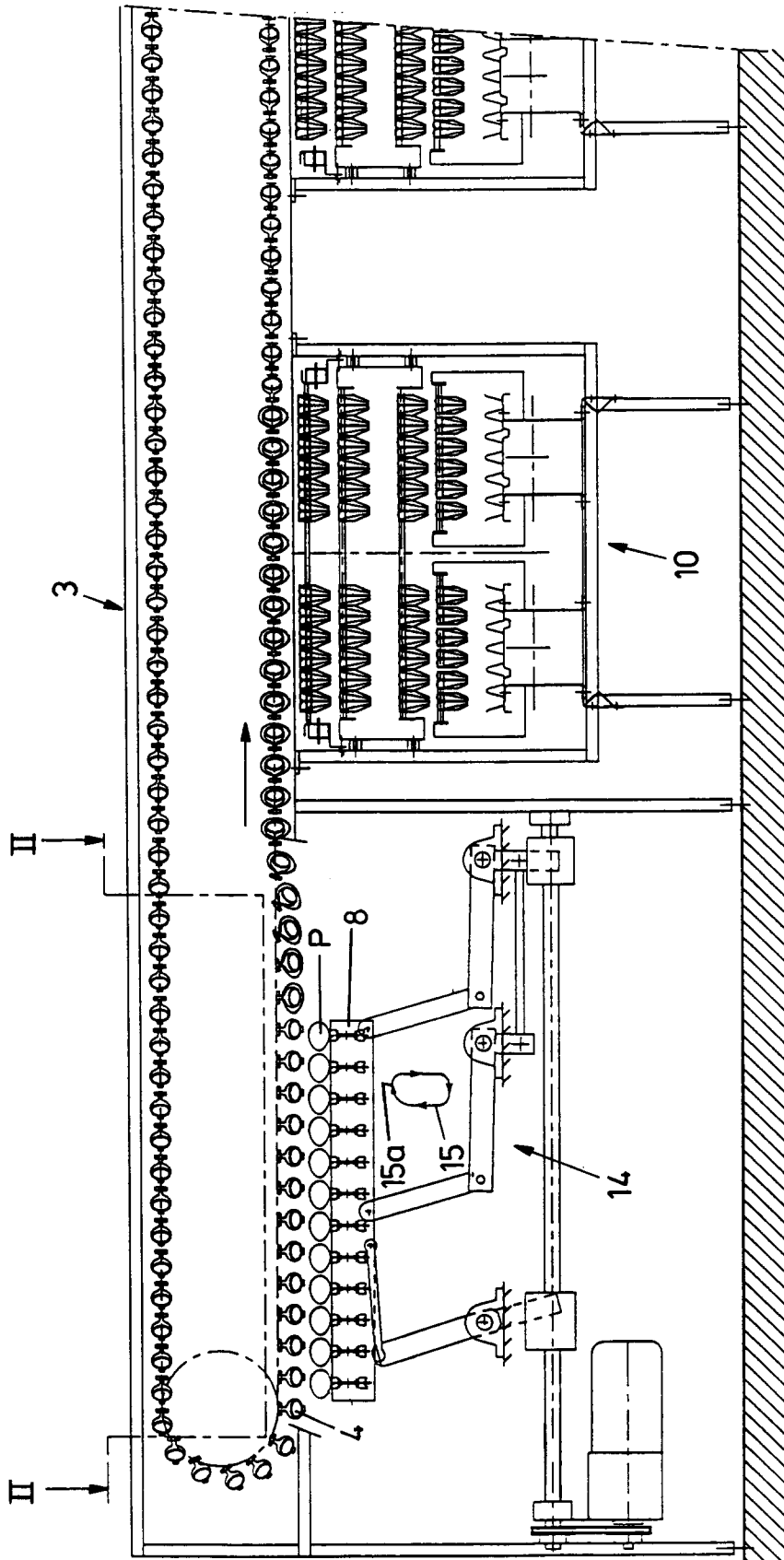


FIG. 6

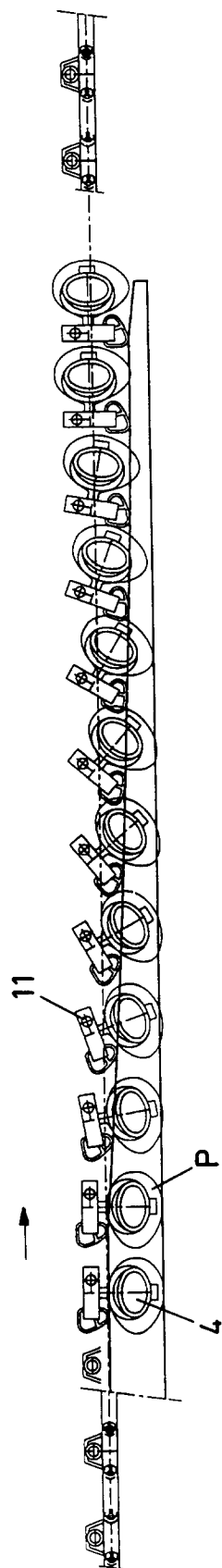


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2569

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
D,A	EP-A-0 114 488 (DIAMOND AUTOMATIONS INC.) * page 15, line 30 - page 17, line 33 * * figures 2-5,13,14 * ---	1,10	B65B23/06 B65G47/82
A	US-A-3 894 631 (B. ROSE ET AL.) * abstract; figure 1 * ---	1,2	
A	US-A-4 863 008 (E. DOI) * abstract; figure 4 * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B65B B65G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 December 1993	Examiner Smolders, R
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