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(54) Benævnelse: **APPARAT TIL FRASORTERING AF DÅRLIGE PRODUKTER FRA EN PRODUKTSTRØM**

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Description

The invention relates to a device for eliminating non-conforming articles from a product stream made up of conforming articles and non-conforming articles which is moving in a transport direction according to the preamble of claim 1.

From the US Patent No. 9,452,450 B2, a device for eliminating non-conforming articles from a product stream made up of conforming articles and non-conforming articles which is moving in a transport direction is known, which comprises an optical detection unit, a computing unit, a first elimination unit formed by a compressed air unit and a second elimination unit formed by a controllable mechanical lever. The optical detection unit, the computing unit, the first and the second elimination units are interconnected for the exchange of data. The first and the second elimination units are arranged on the product stream in the transport direction downstream of the optical detection unit. The first elimination unit and the second elimination unit are arranged adjacent to each another on the same side of the product stream, with the first elimination unit being arranged in the transport direction upstream of the second elimination unit. The optical detection unit detects the product stream and continuously transmits the resultant optical data to the computing unit. The computing unit processes the optical data, identifies non-conforming articles in the product stream in real time and controls the compressed air unit and/or the mechanical lever to discharge the non-conforming articles from the product stream. Such a device is used, for example, for sorting out fruit or vegetables. The patent US 9,452,450 B2 was published also as EP 2 396 124 B1.

However, this known device has turned out to be associated with the disadvantage that, due to the arrangement of the first and the second elimination units directly next to each other on the same side of the product stream and the resulting narrow spatial conditions, the elimination units may only have a small size. However, the small feasible size of the elimination units leads to the disadvantage that, particularly in case of very small and very large heavy-weight products, the performance of the elimination units is too low for eliminating non-conforming articles from the product stream, both in terms of the mass that can be eliminated and in terms of speed. Actually, there would be the possibility of increasing the distance between the elimination units, but this would lead to an undesirable lengthening of the device, whereby the use of such a device in a higher-level system, for example, a washing, sorting and packaging facility, would not be possible due to limited installation requirements. In addition, the maintenance of the elimination units is hampered by the closely spaced elimination units, as they are difficult to access.

The document DE 195 16 569 A1 discloses a device for eliminating non-conforming articles from a product stream made up of conforming articles and non-conforming articles which is moving in a transport direction according to the preamble of claim 1.

Another problem with sorting devices is that the non-conforming articles can have a wide variety of shapes, dimensions and weights and, therefore, it is difficult, often even impossible, to design elimination units suitable for discharging all non-conforming articles which, in practice, occur in a product stream.

It is thus the object of the present invention to provide a device for discharging non-conforming articles from a product stream, which overcomes the disadvantages of the prior art and improves a discharge quality.

According to the invention, the above-mentioned object is achieved by a device having the features of claim 1. Preferred embodiments of the invention are a subject-matter of the dependent claims.

In the device according to the invention, a compressed air elimination unit and a deflecting element elimination unit are arranged on opposite sides of the product stream. This results in the advantage that more installation space will be available for the elimination units and, despite this, the device will not be lengthened. Consequently, the elimination units can be constructed so as to be more powerful, which means that also very small and very large heavy-weight products can reliably be eliminated from the product stream. In addition, the arrangement of the elimination units on opposite sides of the product stream improves the accessibility of the elimination units, whereby they can be maintained better and more easily. A particularly important advantage of the invention is that a higher precision of discharge is achieved. That is to say, the closer to the line of sight of the detection unit the elimination units can be installed, the better will be the precision of discharge or elimination, since the accuracy regarding non-conforming articles in the material flow will be increased and oversorting, which is the undesirable discharge of conforming articles conforming articles together with non-conforming articles, will be reduced. Only by arranging the elimination units on opposite sides of the material flow, it is possible to arrange the elimination units closely enough to the line of sight, thus achieving the increased precision of discharge.

By combining the compressed air elimination unit and the deflecting element elimination unit, the system-related disadvantages of the respective type of discharge can be overcome and the respective system-related advantages can be utilized synergetically in an optimum way. In this context, the compressed air elimination unit is used advantageously for small-sized non-conforming articles, which can be deflected precisely by an air flow. Such non-conforming articles are characterized in particular by a low mass with a comparatively small surface area or a small surface area with a comparatively small mass.

Non-conforming articles which do not meet those criteria and have a high mass with a comparatively small surface area or a large surface area with a comparatively small mass are eliminated with the deflecting element elimination unit, wherein, according to the invention, the deflecting element elimination unit has at least one actuator which moves the at least one deflecting element between a first position and a second position, with the deflecting element protruding into the product stream in the first position and being arranged outside of the product stream in the second position, with the conforming articles conforming articles being deflected in the first position. Such a device is referred to as a passive system as it deflects the good product from the product stream, whereas the bad product is not influenced in its path in the product stream by the deflecting elements. This passive system has the advantage that the elimination units and the associated control can be optimized for the conforming article, which usually is known in terms of shape and weight. By contrast, the non-conforming article may consist of very different products, which would render an optimization of the deflecting elements considerably more difficult, but is not necessary according to the invention, since the non-conforming article does not come into contact with the deflecting elements. As a result, non-conforming articles which cannot be eliminated with the compressed air elimination unit are eliminated passively with the deflecting element elimination unit. The quality of the discharge is thereby improved, since fewer non-conforming articles will remain in the product stream than in conventional sorting systems and oversorting will be minimized.

A sorting system is known from the document US 2010/236994 A1 which, unlike the passive discharge of external products from a product stream according to the invention, relies on the active discharge of external products from a product stream. As an active discharge, a system is defined in which the non-conforming article is deflected from its trajectory by the elimination units in such a way that it is removed from the product stream and conveyed into a separate path. The conforming article, however, is not influenced in its path by the elimination units. Until the present invention, the industry generally used an

active discharge of external products, since it was assumed among experts that oversorting would be largely avoided in this way. The inventors of the present application deserve credit for having realized, contrary to the generally prevalent opinion among experts, that by implementing a passive discharge, advantages can be obtained with regard to product safety, i.e., reliability in sorting out foreign materials and non-conforming articles, which far outweigh the disadvantages of a possible oversorting. For example, the risk that foreign materials cannot be removed from the product stream and therefore end up with the consumer, causing expensive recall campaigns, is minimized by the device according to the invention.

In a preferred embodiment of the invention, the deflecting element elimination unit - as seen in the transport direction - is arranged downstream of the detection unit on the product stream and is designed for discharging non-conforming articles by partially deflecting the product stream by means of at least one deflecting element. In an alternative embodiment, the order of the elimination units is reversed, i.e., the deflecting element elimination unit is arranged in the transport direction upstream of the compressed air elimination unit.

In the discharge of non-conforming articles, the deflecting element elimination unit provides a high degree of discharge safety due to the simple deflection of the non-conforming articles from the product stream also regardless of their size, material and shape, but has the disadvantage that, per discharge of non-conforming articles, also products which are not intended for discharge, i.e., conforming articles, are eliminated as well and, therefore, oversorting occurs.

The classification of the non-conforming articles is done by the computing unit, wherein the computing unit divides the non-conforming articles into first-order non-conforming articles, which can be eliminated readily by means of an air flow, and second-order non-conforming articles, which are the remaining bad products. The first-order non-conforming articles are eliminated by the compressed air elimination unit, while being controlled by the computing unit, and the second-order non-conforming articles are eliminated by the deflecting element elimination unit, while being controlled by the computing unit.

Advantageously, a distinction is made by the computing unit between conforming articles, first-order non-conforming articles and second-order non-conforming articles, based on at least one of the following features:

- the colour of the products contained in the product stream;

- contours and shapes, in particular the size and form, of the products contained in the product stream;
- differences in reflection or transmission spectra under irradiation with electromagnetic waves from the entire electromagnetic spectrum or parts thereof, preferably X-rays, infrared radiation, terahertz radiation;
- differences in the electrical conductivity or in the magnetizability of the product stream

Accordingly, at least one detection unit is preferably designed for detecting the above-mentioned features and for outputting corresponding feature data. To be more precise, in a preferred embodiment, the detection unit is designed for detecting at least a subrange of a reflection or transmission spectrum when the products are irradiated with electromagnetic waves. The subrange of the reflection or transmission spectrum can, on the one hand, be light in the visible wavelength range or outside of the visible wavelength range, but also other electromagnetic waves, such as, e.g., X-rays or terahertz radiation (microwave radiation).

If the computing unit is designed for determining both the contours or shapes of the products contained in the product stream and the spectral composition of the products contained in the product stream from the feature data of the product stream, the computing unit advantageously determines the material of the products from the spectral composition of the products contained in the product stream and the volume of the products from the contours or the shape of the products in order to estimate the mass of the products from their material and volume and to differentiate between conforming articles, first-order non-conforming articles and second-order non-conforming articles, based on the mass of the products.

If the detection unit is designed as an optical detection unit for detecting light in the visible wavelength range and/or outside of the visible wavelength range, it preferably comprises a hyperspectral camera and/or an RGB camera and/or a laser system. By using a combination of a hyperspectral camera, an RGB camera and a laser system as the optical detection system, a high accuracy of differentiation between conforming articles, first-order non-conforming articles and second-order non-conforming articles can be achieved, since a variety of properties of the products in the product stream can be detected with those optical systems. The use of a hyperspectral camera is preferred, since it disintegrates a spectrum into individual narrow frequency bands with high precision, thereby permitting

a very fine differentiation of materials. If a hyperspectral camera (also) operating in the near infrared range is used, a further improvement of the material differentiation is enabled, since many materials have characteristic frequency bands in the near infrared range. Through the optional combined use of a hyperspectral camera with an RGB camera and/or a laser system, the distinguishability of materials can be further improved.

The device according to the invention advantageously comprises at least one further detection unit, the further detection unit being arranged on the side of the product stream opposite to the first detection unit. This has the advantage that the product stream can be detected even better, whereby the computing unit can differentiate even better between conforming articles, first-order non-conforming articles and second-order non-conforming articles, and the quality of the discharge can thus be enhanced even further. The cameras can also be arranged three-dimensionally, i.e., looking at the material flow from different spatial directions.

Advantageous embodiments of the device according to the invention are explained in further detail hereinbelow by way of example with reference to the drawings.

Figures 1 to 3 show schematic views of embodiments of a device according to the invention for discharging non-conforming articles from a product stream moving in a transport direction.

Fig. 1 shows a schematic view of an embodiment of a device 1 according to the invention for discharging non-conforming articles 2a and 2b from a product stream 3 moving in a transport direction T, the product stream 3 being composed of conforming articles conforming articles 4 and non-conforming articles 2a and 2b. A subsection of the product stream 3 is depicted in Fig. 1, wherein the product stream 3 moves through the device 1 along a path 14 and is guided by baffles 9 and 10 in two sections.

The device 1 comprises a detection unit 5, a computing unit 6, a first elimination unit 7 and a second elimination unit 8, which are interconnected for the exchange of data. In the embodiment shown in Fig. 1, the second elimination unit 8 is arranged on the product stream 3 in the transport direction T downstream of the first elimination unit 7 and the first elimination unit 7 and the second elimination unit 8 are arranged opposite to each other on the product stream 3. However, there is also the possibility that the second elimination unit 8 is arranged on the product stream 3 in the transport direction T upstream of the first

elimination unit 7. The arrangement of the first elimination unit 7 and the second elimination unit 8 is advantageously adapted to the installation requirements of the device 1 in higher-level systems and/or of the transport direction T of the product stream 3 and the path 14 resulting therefrom.

The first elimination unit 7 is designed for discharging first-order non-conforming articles 2a. The first elimination unit 7 is formed by a compressed air unit which has a nozzle 11 with a valve that can be controlled electrically by the computing unit. The compressed air unit is connected to a compressed air supply via supply lines, which are not illustrated. The first elimination unit 7 thus constitutes a compressed air elimination unit. In the embodiment variant of the device 1 according to the invention as shown in Fig. 1, only a first elimination unit 7 is illustrated, but the device 1 can also have a plurality of first elimination units 7, which may be arranged either consecutively, side by side or offset from each other. There is also the possibility that the compressed air unit comprises a control valve designed for adjusting an intensity of a burst of compressed air emitted from the nozzle 11. The adjustment of the intensity can be effected either manually or via the computing unit 6. If the intensity is adjusted via the computing unit 6, the intensity is advantageously adapted to the first-order non-conforming articles 2a to be eliminated. For example, the intensity can thus be higher in a first-order bad product 2a with a high mass and a small dimension than in a first-order bad product 2a with a low mass and a small dimension.

The second elimination unit 8 is designed for discharging second-order non-conforming articles 2b. The second elimination unit 8 is formed by an actuator, e.g., in the form of an electrically controllable pneumatic cylinder 12, and a deflecting element 13, with the pneumatic cylinder 12 acting on the deflecting element 13, moving it between a first position and a second position. The second elimination unit 8 thus constitutes a deflecting element elimination unit. The pneumatic cylinder 12 is connected to a compressed air supply via supply lines, which are not illustrated. In the first position, the deflecting element 13 prjects into the product stream 3 and deflects it, and in the second position, the deflecting element 13 is arranged outside of the product stream 3. In the embodiment variant shown in Fig. 1, the pneumatic cylinder 12 is controlled by the computing unit 6 in such a way that the conforming articles conforming articles 4 are deflected in the first position and the second-order non-conforming articles 2b are eliminated in the second position. Such a discharge, which discharges the second-order non-conforming articles 2b without touching them, is also referred to as a passive discharge.

As an active discharge, a system is defined in which the bad product is deflected from its trajectory by the elimination units in such a way that it is removed from the product stream and conveyed into a separate path. The good product, however, is not influenced in its trajectory by the elimination units. Such an active discharge takes place only in the first elimination unit 7 by means of compressed air.

During the passive discharge implemented in the second elimination unit 8, the good product is deflected, whereas the bad product is not influenced in its trajectory. This passive system has the advantage that the elimination units and the associated control can be optimized for the good product, which usually is known in terms of shape and weight. The bad product may consist of very different products, which would render an optimization considerably more difficult. Since the trajectory of the bad product is not affected, foreign materials, such as, e.g., rubber balls, are also removed more safely, because, during the deflection in an active system, uncontrolled movements of elastic products, e.g., uncontrolled bouncing of the rubber ball, may easily occur in the plant, whereby the ball can ultimately end up back in the good product. The same applies also to extremely light-weight or, respectively, floating non-conforming articles, such as, for example, film or paper. The system provides further advantages, for example, also for glass, as it can be eliminated without splinters.

Instead of electrically controllable pneumatic cylinders, other actuators may also be used. Such actuators are known to the person skilled in the art, and he or she knows how to select them according to the intended application. The demands made on the actuators are such they can be used in the system quickly enough, with sufficient accuracy and with great reliability. Examples of such alternative actuators are hydraulic cylinders, solenoids, electric drives, in particular rotary or linear drives.

For certain applications, in particular if the shapes, dimensions and weights of non-conforming articles are within narrow tolerances, there is also the possibility that the second elimination unit 8, depending on the nature of the products, is designed as a switch point which actively deflects the conforming articles conforming articles 4 toward a first elimination path and actively deflects the second-order non-conforming articles 2b toward a second elimination path, thus discharging them. Furthermore, there is the possibility that the second elimination unit has more than two positions and, hence, a multiway sorting can be performed with this elimination unit alone. (For example: subdivision of conforming

articles into several classes by deflection into different elimination paths and passive discharge of non conforming articles).

In this embodiment, the detection unit 5 is designed as an optical detection unit and comprises a hyperspectral camera and, optionally, an RGB camera or a laser system. However, instead of optical detection units, the above-mentioned alternative detection units are also usable.

When the device 1 according to the invention is used, the product stream 3 is guided through the device 1 in the transport direction T along the path 14. In doing so, the product stream 3 is detected with the optical detection unit 5, wherein the optical feature data resulting therefrom are continuously transmitted to the computing unit 6.

The optical properties include the spectral composition, the size, the shape and the colour of the products contained in the product stream 3, the computing unit 6 being designed for classifying the products according to their different chemical compositions, based on the spectral composition of the products. Based on the detected size, shape and colour, the computing unit is able to refine the classification and, for example, to differentiate wood residues from skin residues. On the basis of this classification, the computing unit 6 identifies conforming articles 4 as well as non-conforming articles 2a and 2b in the product stream 3 in real time, wherein the computing unit 6 divides the non-conforming articles 2a and 2b into first-order non-conforming articles 2a and second-order non-conforming articles 2b, in accordance with the better discharge method.

Based on the ascertained conforming articles 4, first-order non-conforming articles 2a and second-order non-conforming articles 2b, the computing unit 6 controls the first elimination unit 7 in a further step so that it will actively discharge the first-order non-conforming articles 2a, and controls the second elimination unit 8 so that it will passively discharge the second-order non-conforming articles 2b, whereby only the conforming articles 4 will remain at the end of the path 14.

Fig. 2 shows a schematic view of a further embodiment of a device 15 according to the invention for discharging non-conforming articles 2a and 2b from a product stream 3 moving in a transport direction T. In contrast to the device 1 according to Fig. 1, in the device 15, the detection unit 5 is split into two housings, with, for example, a hyperspectral camera and an RGB camera being accommodated in the housing 5a and a laser system

being accommodated in the housing 5b. Furthermore, the device 15 has an additional detection unit 16 in comparison to the device 1 according to Fig. 1, which is arranged on the side of the product stream 3 opposite to the detection unit 5 and which is also split into two housings, with, for example, a hyperspectral camera and an RGB camera being accommodated in the housing 16a and a laser system being accommodated in the housing 5b. It should be mentioned that, instead of or in addition to optical sensors, the detection units 5, 16 may also have other sensors, in particular sensors for detecting electromagnetic waves outside of the wavelength range of light, e.g., for the detection of X-rays or terahertz radiation. Due to the additional detection unit 16, the advantage is obtained that the product stream 3 can be detected even more precisely, as a result of which the computing unit 6 is able to differentiate even better between the good product 4, the first-order bad product 2a and the second-order bad product 2b, and thus the quality of the discharge is enhanced even further. Elements which are the same as in the device 1 according to Fig. 1 are provided with the same reference symbols. Furthermore, it should be pointed out that, in other embodiments of the invention, the above-described arrangement of the detection units 5, 16 can be varied in different housings on different sides of the product stream. For example, adjacent arrangements or an arrangement surrounding the product stream may also be chosen, or, respectively, more than two bad product streams may also be chosen in an unlimited manner.

It should be mentioned that, in the device 15, the discharge of the second-order non-conforming articles 2b by means of the second elimination unit 8 is a passive discharge. This means that the conforming articles 4 are deflected in the first position of the deflecting element 13, whereas, in the second position of the deflecting element 13, the second-order non-conforming articles 2b are eliminated from the product stream 3.

Fig. 3 shows a schematic view of a further embodiment of a device 17 according to the invention for discharging non-conforming articles 2a and 2b from a product stream 3 moving in the transport direction T. In contrast to the device 15 according to Fig. 2, the position of the elimination units 7 and 8 relative to the product stream 3 is reversed in the device 17.

Elements of the device 17 which are the same as in the device 15 according to Fig. 2 are provided with the same reference symbols.

Patentkrav

1. Apparat (1, 15, 17) til frasortering af dårlige produkter (2a, 2b) fra en produktstrøm (3) af gode produkter (4) og dårlige produkter (2a, 2b), der bevæger sig i transportretningen (T), omfattende

en genkendelsesenhed (5, 5a, 5b), der er udformet til registrering af produktstrømmen (3), en computerenhed (6), der er forbundet med genkendelsesenheden (5, 5a, 5b) og udformet til fra genkendelsesenheden (5, 5a, 5b) at modtage egenskabsdata for produktstrømmen (3) og ud fra egenskabsdataene i realtid at afsløre dårlige produkter (2a, 2b) i den af genkendelsesenheden (5, 5a, 5b) registrerede produktstrøm (3), og

en af computerenheden (6) styret frasorteringsenhed (7), der - set i transportretningen (T) - er anbragt ved produktstrømmen (3) efter genkendelsesenheden (5, 5a, 5b) og er udformet til frasortering af dårlige produkter (2a, 2b) fra produktstrømmen (3) ved hjælp af mindst et trykluftstød, idet

apparatet (1, 15, 17) har mindst en yderligere af computerenheden (6) styret frasorteringsenhed (8), der - set i transportretningen - er anbragt ved produktstrømmen (3) efter genkendelsesenheden (5, 5a, 5b) på den over for trykluft-frasorteringsenheden (7) liggende side af produktstrømmen (3) og er udformet til at frasortere af dårlige produkter (2a, 2b) ved partiel afledning af produktstrømmen (3) ved hjælp af mindst et afledningselement (13), og at computerenheden (6) er udformet til at opdele de afslørede dårlige produkter (2a, 2b) i dårlige produkter (2a) af første orden og dårlige produkter (2b) af anden orden, idet trykluft-frasorteringsenheden (7) er udformet til styret af computerenheden (6) at frasortere de dårlige produkter (2a) af første orden, og afledningselement-frasorteringsenheden (8) er udformet til styret af computerenheden (6) at frasortere de dårlige produkter (2b) af anden orden, idet afledningselement-frasorteringsenheden (7) har mindst et betjeningselement (12), der omstiller det mindst ene afledningselement (13) mellem en første stilling og en anden stilling, og afledningselementet (13) i den første stilling rager ind i produktstrømmen (3) og i den anden stilling er anbragt uden for produktstrømmen (3), idet de gode produkter (4) afledes i den første stilling, **kendetegnet ved, at** computerenheden

(6) er udformet til ud fra egenskabsdataene for produktstrømmen (3) at bestemme de i produktstrømmen (3) indeholdte produkters konturer eller former og den spektrale sammensætning af de i produktstrømmen (3) indeholdte produkter samt at drage slutninger ud fra den spektrale sammensætning af de i produktstrømmen (3) indeholdte produkter med hensyn til produkternes materiale, ud fra produkternes konturer eller form med hensyn til produkternes volumen, ud fra produkternes materiale og rumfang at skønne over deres masse og at skelne mellem gode produkter (4), dårlige produkter (2a) af første orden og dårlige produkter (2b) af anden orden ud fra produkternes masse.

2. Apparat (1, 15, 17) ifølge krav 1, **kendetegnet ved, at** afledningselement-frasorteringsenheden (8) er anbragt efter trykluft-frasorteringsenheden (7) i transportretningen (T).

3. Apparat ifølge krav 1, **kendetegnet ved, at** afledningselement-frasorteringsenheden er anbragt før trykluft-frasorteringsenheden i transportretningen.

4. Apparat (1, 15, 17) ifølge et af kravene 1 til 3, **kendetegnet ved, at** genkendelsesenheden (5, 5a, 5b) er udformet til registrering af mindst et delområde af et refleksions- eller transmissionsspektrum ved bestråling af produkterne med elektromagnetiske bølger og til udlæsning af de korresponderende egenskabsdata.

5. Apparat (1, 15, 17) ifølge krav 4, **kendetegnet ved, at** genkendelsesenheden (5, 5a, 5b) er udformet som optisk genkendelsesenhed til registrering af lys i det synlige bølgelængdeområde og/eller uden for det synlige bølgelængdeområde.

6. Apparat (1, 15, 17) ifølge krav 5, **kendetegnet ved, at** den optiske genkendelsesenhed omfatter et hyperspektralkamera, idet hyperspektralkameraet fortrinsvis opløser frekvenser i det nær-infrarøde bølgelængdeområde, mere foretrukket frekvenser i den nær-infrarøde og i det synlige bølgelængdeområde.

7. Apparat (1, 15, 17) ifølge krav 5 eller 6, **kendetegnet ved, at** den optiske genkendelsesenhed omfatter et RGB-kamera eller et lasersystem.

8. Apparat (1, 15, 17) ifølge et af kravene 4 til 7, **kendetegnet ved, at** genkendelsesenheden (5, 5a, 5b) omfatter en genkendelsesenhed til registrering af elektromagnetiske bølger uden for lysets bølgelængdeområde, især til registrering af røntgenstråling eller terahertzstråling.

9. Apparat (1, 15, 17) ifølge et af kravene 1 til 8, **kendetegnet ved, at** trykluft-frasorteringsenheden (7) har en reguleringsventil, som er udformet til regulering af en intensitet af mindst et trykluftstød.

10. Apparat ifølge et af kravene 1 til 9, **kendetegnet ved, at** afledningselementet i den første stilling afleder produktstrømmen til en første frasorteringsbane og i den anden stilling afleder produktstrømmen til en anden frasorteringsbane.

11. Apparat ifølge krav 10, **kendetegnet ved, at** afledningselementet kan omstilles til andre stillinger til dannelse af yderligere frasorteringsbaner.

12. Apparat (1, 15, 17) ifølge et af kravene 1 til 11, **kendetegnet ved, at** computerenheden (6) er udformet til ud fra egenskabsdataene for produktstrømmen (3) at bestemme de i produktstrømmen (3) indeholdte produkters farver og at skelne mellem gode produkter (4), dårlige produkter (2a) af første orden og dårlige produkter (2b) af anden orden ud fra produkternes farver.

13. Apparat (15, 17) ifølge et af kravene 1 til 12, **kendetegnet ved, at** apparatet (15, 17) har mindst en yderligere registreringsenhed (16a, 16b).

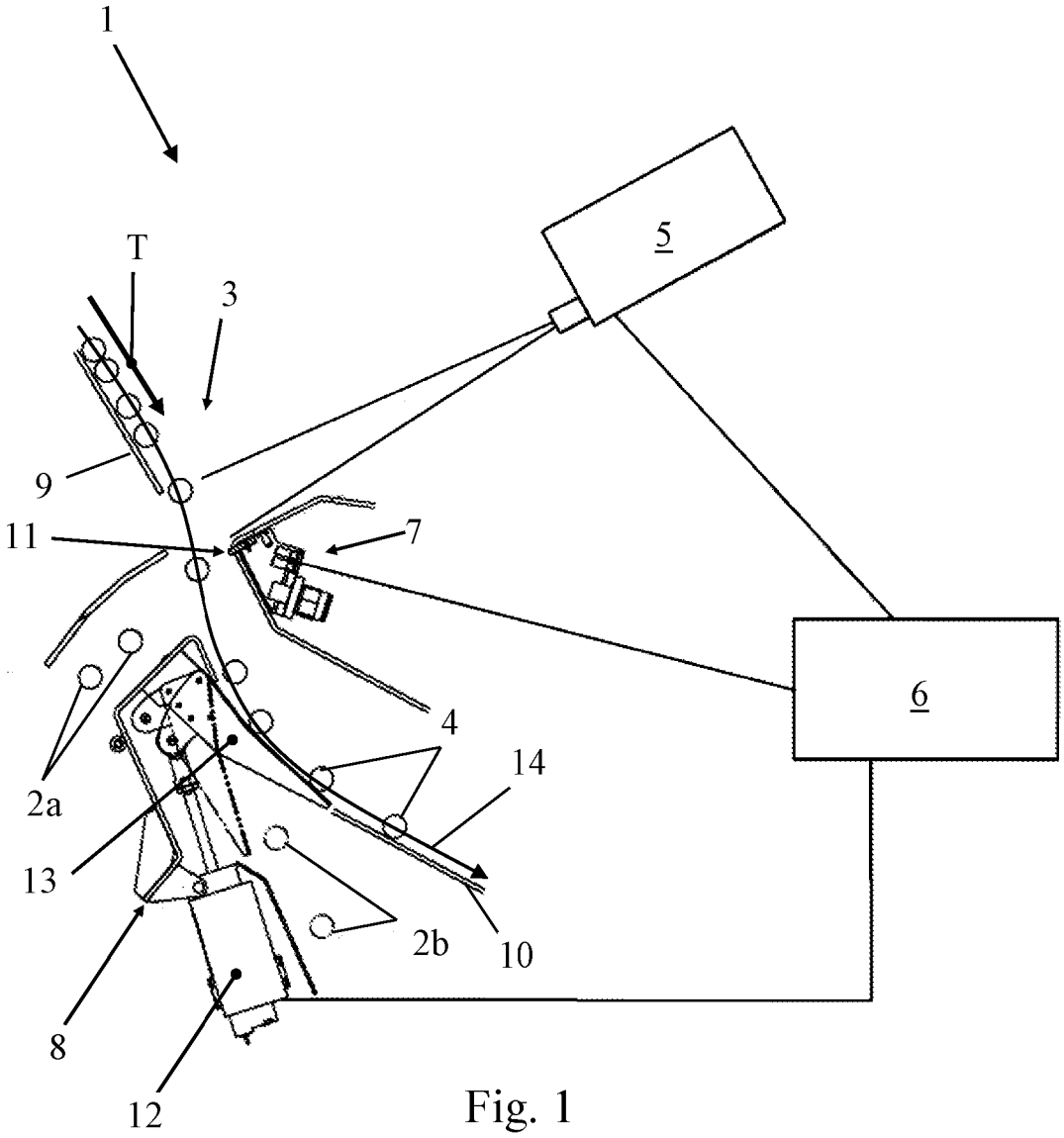
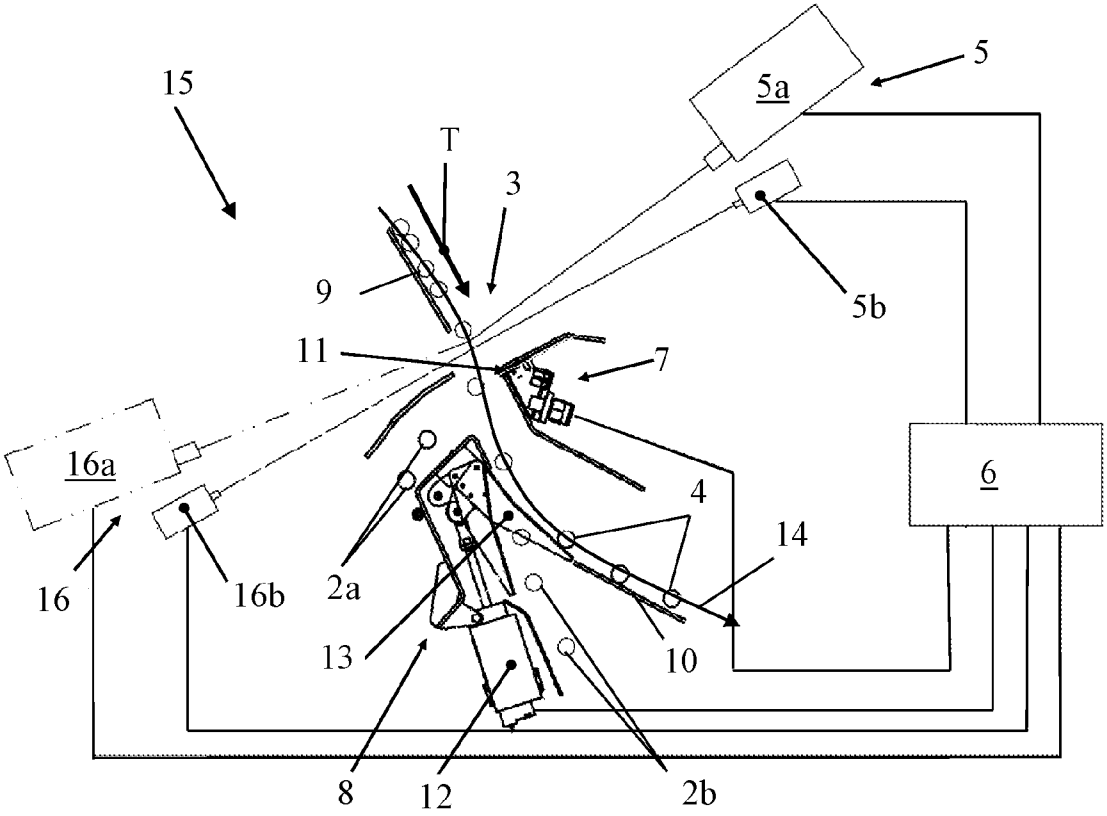


Fig. 1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5b
11
7
16a
6
4
14
16
16b
2a
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8
12
2b

Fig. 2

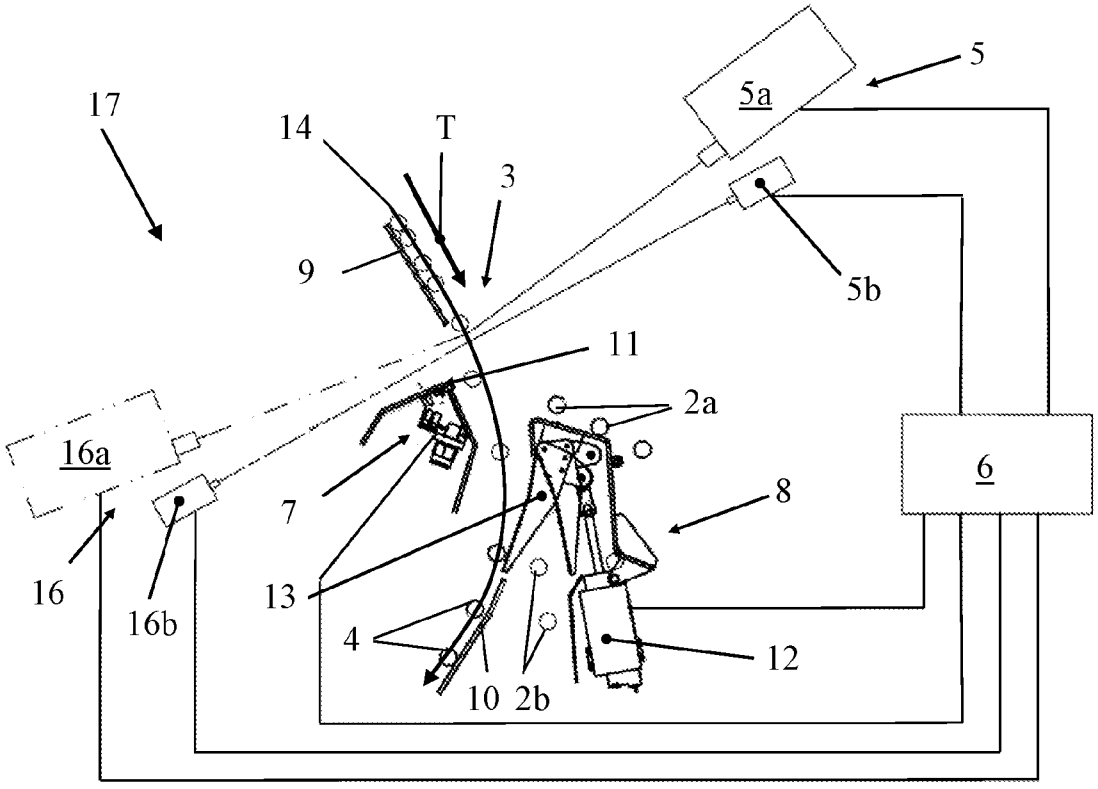
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Fig. 3