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(71) Applicant: **HALTON OY**
Teollisuustie 2
SF-47400 Kausala(FI)

(72) Inventor: **Tähkänen, Pekka**
Mäyränkatu 8
SF-18150 Heinola(FI)
Inventor: **Komonen, Petri**
Arrajoki
SF-16100 Uusikylä(FI)
Inventor: **Mäkinen, Samuli**
Tuokkostie 1 D 33
SF-18120 Heinola(FI)

(74) Representative: **Tiedtke, Harro, Dipl.-Ing. et al**
Patentanwaltsbüro Tiedtke-Bühling-Kinne-Grupe-Pellmann-Grams Bavariaring 4
Postfach 20 24 03
W-8000 München 2(DE)

(54) A method and a device for sorting returnable bottles, cans and other returnable packages.

(57) A returnable package is transferred by means of a transferring device (11) to an identification device (12) comprising a data processing unit (12a) and therein a storage unit (12b), in which data about different-type acceptable package forms and/or package colors are preregistered. An indentification index corresponding to the form/color concerned is given to the identified package and said index is transferred to a pushdown storage (M_1) of a first sorter (L_1) located after the identification device (12), to the first lowermost free storage location of the pushdown storage (M_1). The above-mentioned identification index is compared with the specific index (N_{1a}, N_{1b}, N_{1c}...) related to the sorter, and if said identification index corresponds to some specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), a sorting is performed with the sorter (L_1) and the returnable package is transferred away from the main conveyor (11), and if said index does not correspond to the specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), said identification index is transferred to the first lowermost free storage location (R_1, R_2, R_3...) of a pushdown storage (M_2) of a next sorter (L_2).

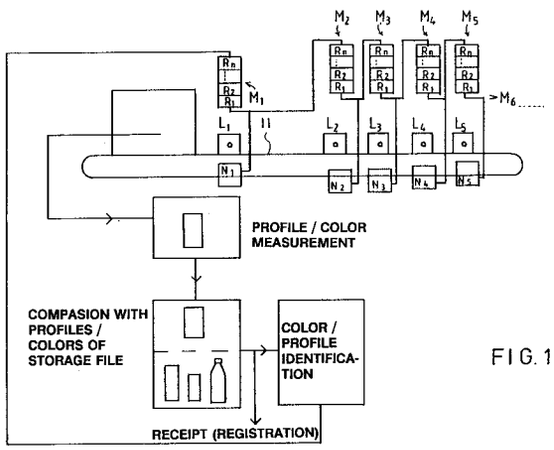

FIG. 1

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The invention relates to a method and a device for sorting returnable bottles, cans and other returnable packages.

Sorting solutions are known in prior art, in which a returnable bottle is led from a belt conveyor via different gates or other guides to a storage station determined by the sorting. In the solutions according to prior art, the one-sidedness of the sorting can be regarded as a disadvantage. In the known device solutions, it has not been possible to find a solution to how the sorting could occur flexibly after the identification of the packages in such a way that the sorter would automatically transfer the package which has entered at the station to its own storage station dependably on the identified profile data.

The invention tries to find an improvement on the above-mentioned problem. The applicants have discovered that it is useful to form such a post-identification package sorting system, in which the package is automatically transferred, on the basis of the profile data, to its own storage station, whereby an ejector located at the storage station receives the data about the identified profile by means of series-connected storage circuits.

The inventive package sorting system is mainly characterized in that when the package form and/or package color is identified in the method, an indentification index corresponding to the form/color concerned is given to the identified package and said index is transferred to a pushdown storage of a first sorter located after the identification device, to the first lowermost free storage location and that the above-mentioned identification index is compared with the specific index related to the sorter, and if said identification index corresponds to some specific index of the sorter, a sorting is performed with the sorter and the returnable package is transferred away from the main conveyor and if said index does not correspond to the specific index of the sorter, said identification index is transferred to the first lowermost free storage location of the pushdown storage of the sorter.

The inventive device for sorting returnable bottles, cans or other returnable packages is mainly characterized in that the equipment comprises a pushdown storage of a series bus connected with each sorter and storage register locations in each pushdown storage, whereby the identification data transfers to a first sorter in connection with the identification device, to the lowermost or first record of the storage register of the pushdown storage, and that the equipment comprises a conveyor that transfers the identified returnable package to the first sorter and that there is provided a sensor device, which senses the entry of the returnable package at the sorter, whereby the index data in the lowermost storage location of the pushdown storage of the sorter is compared with the specific index of the sorter, and if a correspondence is observed between the identification index of the pushdown storage and some specific index of the sorter, a sorting is accepted at said identified package and the sorter performs the sorting.

The invention is next described with reference to certain preferred embodiments of the invention shown in the figures of the accompanying drawings, to which the invention is not intended solely to be limited.

Fig. 1 shows principally the construction and operation of the inventive package receiving device.

Fig. 2 shows as a block diagram of the inventive equipment.

Fig. 3 shows, seen from the side, the construction of the package identification device connected to the package receiving device.

Fig. 4 shows the equipment of Fig. 3 seen from the top.

Fig. 5 shows the forming of a line picture of a package to be monitored with the identification device of Fig. 3 and 4.

Fig. 6A and 6B show the color identification of a bottle.

Fig. 7 shows as an axonometric view the inventive equipment and a transferrable sorting station.

Fig. 1 illustrates as a block diagram representation the operation of the inventive device. In the device shown in the figure, the form and/or color of a returned package, such as a bottle, is identified and said form is compared with the known forms and/or colors stored in the central processor. When the form is identified, each returnable product is given an index corresponding to its form and/or color, and said index data is transferred to a storage register in the sequential communications bus in such a way that the data transfers to the first lowermost free storage location R_1, R_2... of a pushdown storage M_1.

When the returnable product enters, as shown in Fig. 1, at a first sorter L_1, the sorter receives the data about the entry of the bottle and compares the sorter's own index with the register data located first in the storage register of the pushdown storage, and if said index data are the same, the sorter performs a sorting operation and transfers the returnable can away from the conveyor track, e.g. to a parallel conveyor, or directly e.g. to a storage station V. If the pushdown storage space M of the the sorter L_1, the record located first in its storage register R_1, does not correspond to the storage station L_1's own index in the step when the data is read when a sensor device senses the entry of the returnable product at its location, the actuator of the sorter L_1 is not activated and the first record of the storage register of said storage location trans-

fers to the lowermost free storage location R_1, R_2, R_3... of the pushdown storage of the next sorter L_2. When the returnable bottle now enters at the sorter, a similar comparison occurs between the record contained in the first storage location R_1 of the storage register of the pushdown storage M_2 of said storage location and the index related to the sorting station concerned, and if the indexes correspond to each other, the sorter L_1 performs the sorting operation. Otherwise, said identification index of the storage register transfers to the lowermost free storage location R_1, R_2... in the storage register of the pushdown storage M_3 of a next sorter L_3. Similarly, if a correspondence is observed between some specific index of said sorter L_3 and the identified index of the pushdown storage M_3 related to the returnable package, a sorting is performed by the sorter L_3.

Fig 2-5 show a profile identification method known per se and applied to the device.

As shown in Fig. 2, an equipment arrangement 10 comprises a transfer equipment 11 for transferring a returnable package P, an identification device 12 with its data processing unit 12a for identifying and accepting packages having certain forms, as well as a registration device 12c for registering the accepted packages. The transfer equipment 11 can be comprised e.g. of one or more belt conveyors, of a rotating tray conveyor, or generally of any conveyor suitable for transferring packages. The conveyor 11 may be arranged to transfer the packages horizontally and/or possibly vertically, but a horizontal transfer is regarded as the most suitable one in connection with the inventive bottle receiving device.

The identification device 12 preferably comprises the data processing unit 12a with its storage unit 12b and its registration unit 12c. The data processing unit 12a is provided with package forms accepted by the record of its storage unit 12b, i.e. the data about the package forms to be accepted may be entered into the file for comparing the information to be obtained about the form of the package to be monitored with the corresponding information about the package forms to be accepted. The registration device 12 registers the number of the packages to be accepted, possibly the sizes and/or the amount of money to be remunerated or returned.

Fig. 3-4 show as a principal schematic view a certain indentification device 12, which mainly comprises a stationary illuminator 13 for illuminating a package P, a detector 14 for monitoring the package and a conveyor 11 for transferring the package past the detector 14. Said detector 14 is arranged to momentarily monitor the package, within time intervals, at line-like points, when the bottle transfers, conveyed by the conveyor 11, past the detector in such a way that the line-like monitoring points provide information, e.g. at the bottle, at least about the form of the neck and the upper part of the package, i.e. the detector is arranged to take a so-called line picture of the bottle.

When taking a line picture, the detector 14 thus takes line pictures of the package according to Fig. 5 at time intervals, when the conveyor transfers the package P past the detector 14. Line pictures can be taken at desired time intervals, i.e. the line density of the picture can be adjusted in the desired manner according to the accuracy of the desired information. The detector 14 changes the line picture information into electric impulses to be led to the data processing unit 12a in accordance with Fig. 2.

For example at the identification point of the bottles P, it is not necessary to take a line picture of the whole bottle, but it is generally sufficient to take a picture of an upper part 10' of the bottle in accordance with Fig. 5, since the specific features of the bottle types or models generally appear best at the upper part of the bottle. A lower part 10'' of the bottle then suitably remains unphotographed.

In Fig. 3-4, a conventional line camera has been used as the detector 14, which is arranged to photograph a bottle moving past the camera laterally perpendicularly against the direction of the camera's objective at the area of the bottle neck by means of vertical line pictures at intervals of 1 mm. The identification device is programmed to measure the height of the bottle. The detector 14 may, when so desired, be arranged to take horizontal pictures of the bottle, whereby the conveyour is suitably arranged to transfer the bottle vertically for photographing the bottle at the desired height.

When the profile identification information has been received, it is compared with the preknown profiles of different bottle types of the storage unit 12b of the data processing unit 12a, and if the identified profile form corresponds to some form prestored in the storage 12b, the returnable bottle is accepted and it is immediately given an index related to the profile form. Said index data is transferred to the pushdown storage M_1 of the first sorter L_1 located in the conveying direction of the bottle, to its first lowermost free storage location R_1 or R_2...

Fig. 2-5 show a certain profile identification equipment. However, it is not the intention to limit the invention solely to the embodiment of the identification device known per se and shown in Fig. 1-5, but the profile can be identified also by means of identification means of another type.

Fig. 6A shows a package color identification equipment. According to the figure, a light beam is produced from a light source 15, and said light beam produced from the light source is caused to

advance agaist the package, e.g. a bottle P, to be identified. Part of the light beam is reflected back to a receiver 16, whereby the color of the bottle may be identified by means of the reflected light beam. The received light beam is compared with preprogrammed identification signals corresponding to different shades and located in the storage circuit of the storage unit 12b, and if a correspondence between the identified and reflected identification signal and the identification signal prestored in the storage register is observed, an identification index corresponding to the identification data is given to the bottle. Thus, in the inventive returnable-package handling, an identification index can be given to the returnable package, which index is based either on the package form and/or the package color.

Fig. 6B shows the color identification equipment, a light beam produced from the light source 15 from behind the received bottle p with the receiver 16, and the data about the transmitted and received signal is processed in the color identification block of the central unit.

Fig. 7 shows as a principal view as well as an axonometric representation the inventive equipment. In accordance with the invention, the sorters L_1, L_2 and L_3... are located, as shown in the figure, after the profile/color identification equipment itself in connection with the conveyor passage 11. Each sorter L_1 comprises a frame 17, which rests freely on a base E. The frame 17 is a U-profile comprising leg portions 17a and 17b of the frame and a top frame section 17c connecting them with each other. Between said frame sections remains a gate 18, through which the conveyor belt is led. Each sorter L_1, L_2 further comprises an actuator 19 performing the sorting, e.g. a solenoid or an actuating cylinder, preferably a pneumatic or hydraulic cylinder, by means of which a returnable package that has come to the actuator 19 is transferred to a second station, if the sorter performs the sorting, i.e. if the command from the sorting has been given to the actuator 19. Each sorter L_1, L_2, L_3 - (three sorters are shown in the figure) may be freely transferred to the desired station on the conveyor passage, and the sorting point can thus be freely selected, and e.g. the point on the conveyor belt 11, from which the package is transferred e.g. to a second conveyor or directly to a storage station V. Each sorter L_1, L_2, L_3... further comprises a pushdown storage M_1, M_2, M_3... related to the sorter and an identification index N_{1a}, N_{1b}, N_{1c}...;N_{2a}, N_{2n}, N_{2c}; N_{3a}, N_{3b}, N_{3c}... Thus, there may be several specific indexes related to each sorter L_1, L_2, L_3... This means that the same sorter is capable of sorting packages of several types. The number of package types to be sorted with the same sorter corresponds to the specific indexes given to the sorter L_1, L_2, L_3...

The arbitrary transfer of said sorter L_1, L_2... to a station is made possible by an inventive usage of a series-connected bus of character strings, in which the microprocessor produces in the first storage register of the series-connected bus data about the identified returnable package, e.g. a bottle, which receives an identification index related to a certain identified profile and/or color. Said data is thus stored in the pushdown storage of the storage register. The register storage locations are arranged in a pushdown list in such a way that the index of the first returned bottle is placed first (lowermost) in the storage register location. This means that when a new identification index corresponding to a new idenfied bottle enters, it always transfers to the lowermost position in the storage register and to the first position in said storage register, in which connection the register does not comprise in that step other indexes. The first storage register corresponds to the first sorting automaton and said sorting automaton has also one or more indexes, which index or which indexes is/are related only to said sorting automaton. If it is desirable to sort the identified returnable package with the first sorter, said package is given an index, which corresponds to the index of the first sorting automaton. Since each sorting automaton may comprise several indexes, each sorter is capable of sorting several different package types.

The package transfers from the identification and measuring point by means of the conveyor 11 to the first sorting automaton L_1 and a sensor 20 of the sorter L_1 senses the entry of the package, whereby the sorter L_1 immediately compares the first identification index in the pushdown storage M, with its own index, and if they correspond to each other, the sorter performs the sorting and transfers the package away from the main conveyor. If the read index of the pushdown storage corresponds to no specific index of the sorter, the first data concerned transfers from the pushdown storage M_1 of the sorter to the pushdown storage M_2 of the the next sorter automaton L_2, to its first lowermost free storage location R_1, R_2.... The package thus transfers further on the main conveyor 11 to the second sorter concerned, and the sensor device 20 of said second sorter L_2 senses the entry of the returnable package at the sorter L_2 and compares the first identification index of the pushdown storage M_2 related to the sorter L_2, and if a correspondence is observed at least at one specific index, the sorter L_2 performs the sorting and transfers the product e.g. to the second conveyor or e.g. directly to a storage station. The identification index is then removed from the storage location M_2 of the sorter L_2, and it is also not transferred to the pushdown storages M_1, M_2, M_3 M_4... of other sorters. If the

indexes do not correspond to each other, the indentification index stored in the pushdown storage of the sorting automaton and in its first storage location transfers to the first lowermost free storage location R_1, R_2... of the pushdown storage M_3 of the next sorting automaton L_3, and a corresponding comparison is repeated, when the returnable product, e.g. a bottle, enters at the third sorter L_3. In this way, it is possible to sort an indefinite number of returnable products at a high speed without that it is necessary to know the the speed of the conveyor or the distances between the sorting stations, etc.

The invention relates to a method and a device for sorting returnable bottles, cans and other returnable packages. In the method, a returnable package is transferred by means of a transferring device (11) to an identification device (12) comprising a data processing unit (12a) and therein a storage unit (12b), in which data about about different-type acceptable package forms and/or package colors are preregistered. In the method is idenfied the package form and/or package color, an indentification index corresponding to the form/color concerned is given to the identified package and said index is transferred to a pushdown storage (M_1) of a first sorter (L_1) located after the identification device (12), to the first lowermost free storage location of the pushdown storage (M_1). In the method, the above-mentioned identification index is compared with the specific index (N_{1a}, N_{1b}, N_{1c}...) related to the sorter, and if said identification index corresponds to some specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), a sorting is performed with the sorter (L_1) and the returnable package is transferred away from the main conveyor (11), and if said index does not correspond to the specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), said identification index is transferred to the first lowermost free storage location (R_1, R_2, R_3...) of a pushdown storage (M_2) of a sorter (L_2).

Claims

1. A method for sorting returnable bottles, cans and other returnable packages, in which method a returnable package is transferred by means of a transferring device (11) to an identification device (12) comprising a data processing unit (12a) and therein a storage unit (12b), in which data about about different-type acceptable package forms and/or package colors are preregistered, **characterized** in that when the package form and/or package color is identified in the method, an indentification index corresponding to the form/color concerned is given to the identified package and said index is transferred to a pushdown storage (M_1) of a first sorter (L_1) located after the identification device (12) to the first lowermost free storage location and that in the method the above-mentioned identification index is compared with the specific index (N_{1a}, N_{1b}, N_{1c}...) related to the sorter, and if said identification index corresponds to some specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), a sorting is performed with the sorter (L_1) and the returnable package is transferred away from the main conveyor (11) and if said index does not correspond to the specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter (L_1), said identification index is transferred to the first lowermost free storage location (R_1, R_2, R_3...) of a pushdown storage (M_2) of a sorter (L_2).

2. A method according to Claim 1, **characterized** in that if the idenditication index of the returnable package corresponds to the specific index of the sorter, a sorting is performed by said sorter and said identification index is removed from the storage location of the pushdown storage (M_1, M_2)..

3. A method according to Claim 1 or 2, **characterized** in that the comparison between the identification index and the specific index of the sorter occurs in a step when a sensor device (20) connected with the sorter has sensed the entry of the returnable package at its own location.

4. A method according to any of the preceding Claims, **characterized** in that in the method the color of the returnable package is sensed by producing a light beam from a light source (15) for the returnable package, e.g. a bottle, and that in the method the reflected light beam is compared with the identification signals of the acceptable colors stored in the storage unit (12b) of the data processing unit (12a), and if the light reflected in the comparison corresponds to some color identification signal stored in the storage, an index corresponding to said identification is given to the the returnable package.

5. A method according to any of the preceding Claims, **characterized** in that in the method are used such sorters (L_1, L_2), which may be freely transferred to different positions in connection with the conveyor (11) located after the identification device, whereby each sorter (L_1) comprises a frame section (17a, 17b, 17c) and a gate (18), between which the conceyor belt (11) is led, and whereby the sorter comprises an actuator (19), by means of which the sorting

is performed and whereby each sorter further comprises a sensor device (20), bu means of which the entry of the returnable package at the sensor device (20) is identified.

6. A device for sorting returnable bottles, cans or other returnable packages, which device comprises an identification device (12) for the returnable package and therein a data processing unit (12a) and a storage unit (12b), into which the data about accepted package forms and/or colors are preprogrammed, whereby an identification index corresponding to the identification is given to the returnable package by means of the identification device (12), **characterized** in that the equipment comprises a pushdown storage (M_1, M_2, M_3...) of a series bus connected with each sorter (L_1, L_2...) and storage register locations (R_1, R_2, R_3...) in each pushdown storage, whereby the identification data transfers to a first sorter (L_1) in connection with the idenfication device (12), to the lowermost or first record of the storage register of its pushdown storage (M_1), and that the equipment comprises a conveyor (11) that transfers the identified returnable package to the first sorter (L_1) and that there is provided a sensor device (20), which senses the entry of the returnable package at the sorter (L_1), whereby the index data in the lowermost storage location of the pushdown storage (M_1) of the sorter (L_1) is compared with the specific index (N_{1a}, N_{1b}, N_{1c}...) of the sorter, and is a correspondence is observed between the identification index of the pushdown storage (M_1) and some specific index of the sorter, a sorting is accepted at said identified package and the sorter (L_1) performs the sorting.

7. An equipment according to Claim 6, **characterized** in that each sorter (L_1, L_1...) comprises a pushdown storage (M_1, M_2, M_3...) related to the sorter in a series bus and at least one specific index (N_{1a}, N_{1b}, N_{1c}...;(N_{2a}, N_{2b}, N_{2c}...) related to each sorter, in which case, if the sorting is not performed with the first sorter (L_1), the lowermost index record in the storage register (M_2) of the sorter (L_1) transfers to the first lowermost free storage location of the storage register of the pushdown storage (M_2) of the next sorter (L_2), whereby a comparison is performed between the index data and the specific index of the sorter at said sorter at a step, when the package related to the indix has entered at said second sorter (L_2).

8. An equipment according to any of the preceding Claims, **characterized** in that the sorter (L_1) is such a sorting unit that comprises frame parts (17a, 17b) acting as a leg and a connecting part (18c) connecting them with each other, whereby between said sections remains a gate 18, through which a conveyor belt (11) may be led, and that the sorter (L) comprises a sensor device (20) and an actuator (19) performing the sorting, whereby the sequential sorters (L_1, L_2, L_3, L_4...) form a sorting system, wherein the location of the sorters (L_1, L_2, L_3...) in the vicinity of the conveyor belt (11) can be freely determined depending on point, in which the sorting with each sorter (L_1, L_2...) is desirable to perform.

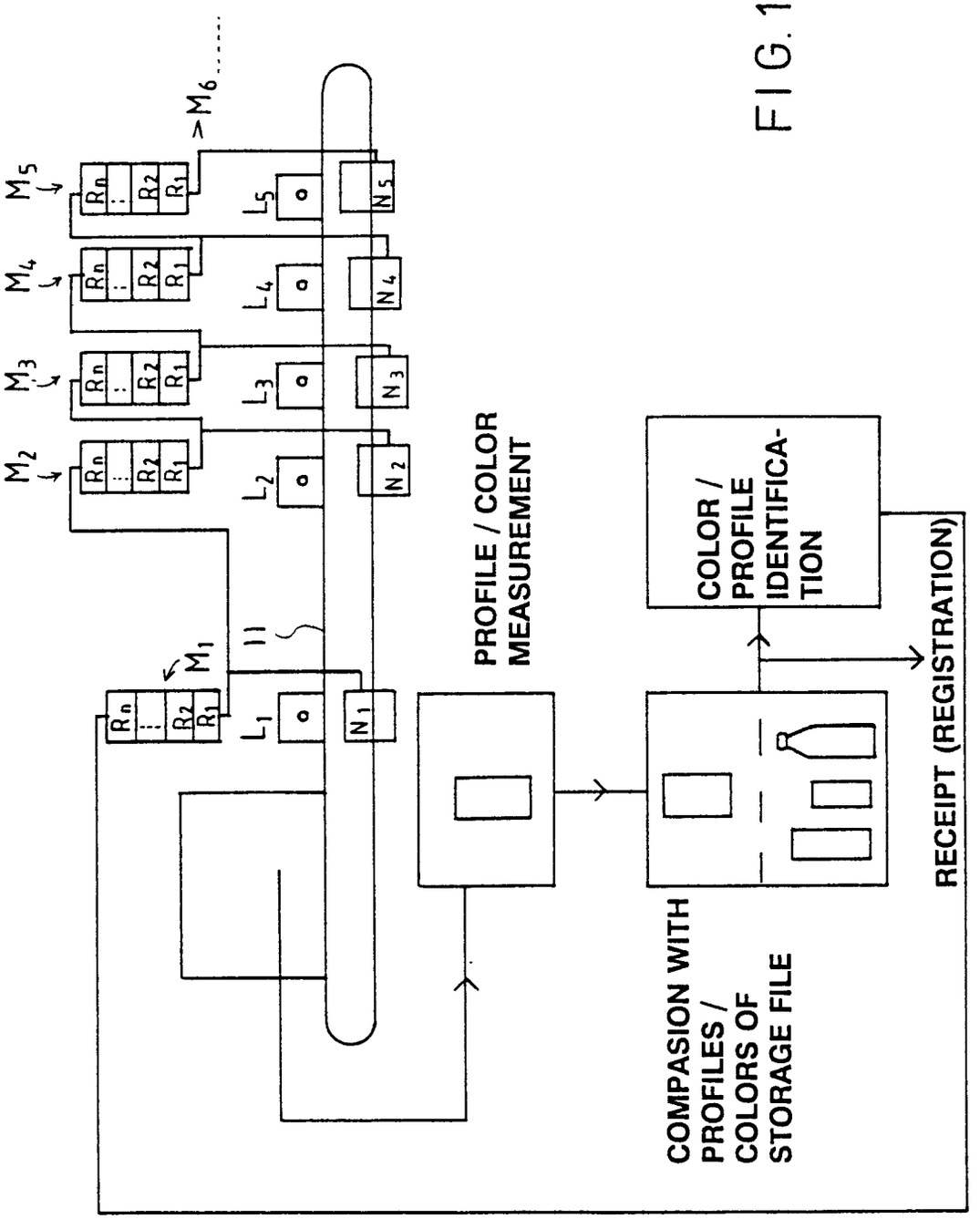
M1
M2
M3
M4
M5
M6
L1
L2
L3
L4
L5
N1
N2
N3
N4
N5
Rn
R2
R1
PROFILE / COLOR MEASUREMENT
COLOR / PROFILE IDENTIFICA-TION
COMPASION WITH PROFILES / COLORS OF STORAGE FILE
RECEIPT (REGISTRATION)

FIG. 1

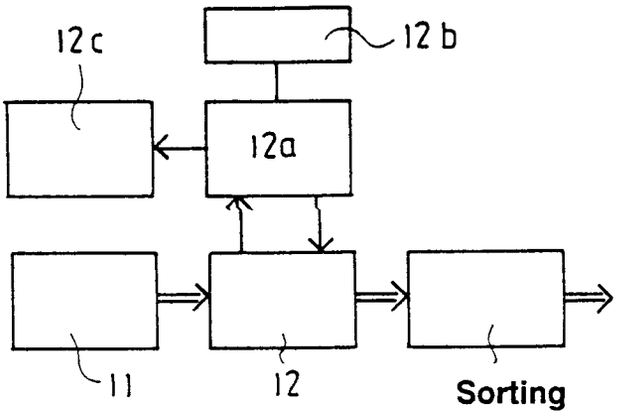

FIG. 2

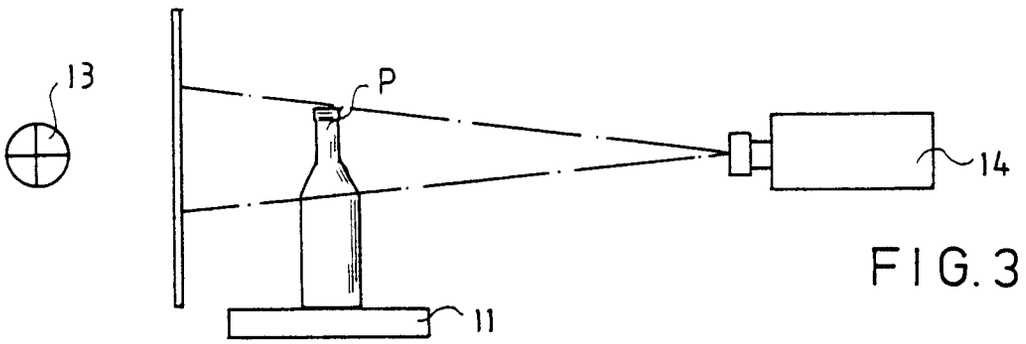

FIG. 3

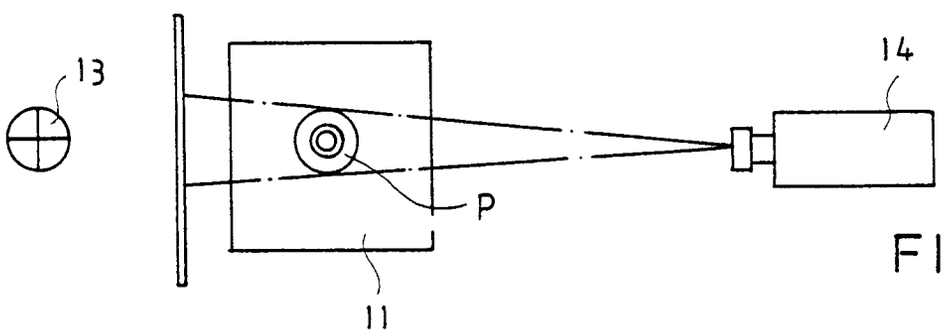

FIG. 4

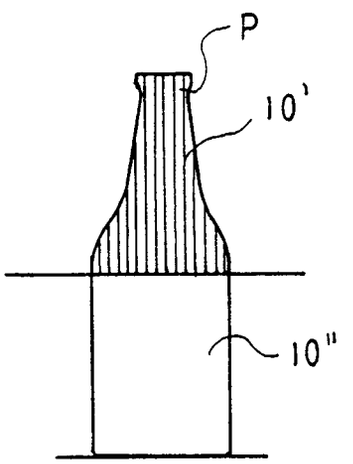

FIG. 5

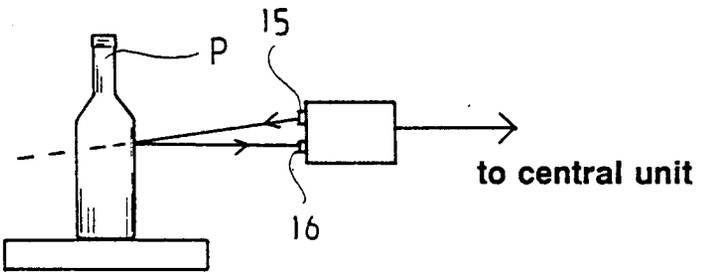

FIG. 6A

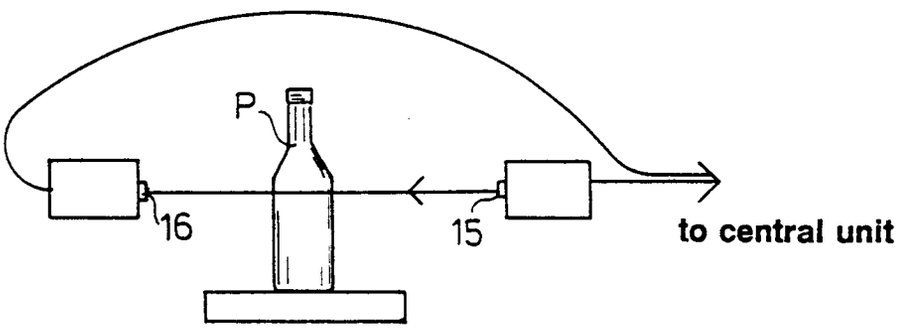

FIG. 6B

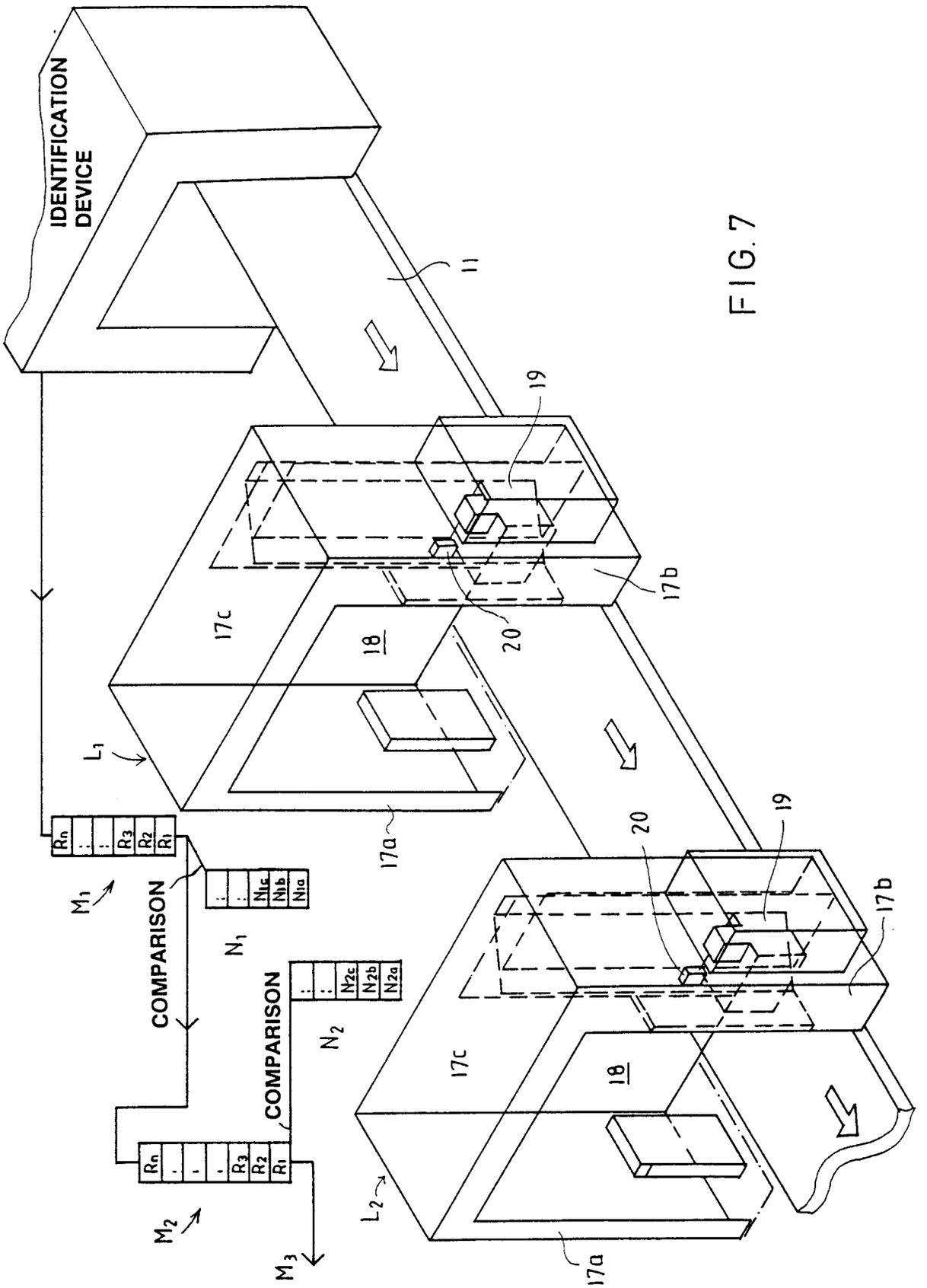
IDENTIFICATION DEVICE
11
19
17b
17c
18
20
17a
L1
L2
M1
M2
M3
COMPARISON
COMPARISON
N1
N2
Rn
R3
R2
R1
N1c
N1b
N1a
N2c
N2b
N2a

FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 9000

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)
X	AUTOMATION. vol. 8, no. 1, January 1961, CLEVELAND US pages 50 - 59; D.W. SHENTON ET AL.: 'Automated Material Control' * page 52 *	1-3,6,7 4 5	B07C5/342 B07C5/36 B07C5/34
X	RADIO AND ELECTRONIC ENGINEER. vol. 26, no. 4, October 1963, LONDON GB pages 347 - 356; G. CLARK: 'Electronic Queueing Control for Materials Handling' * page 353, paragraph 5 *	1-3,6,7	
X	DE-A-1 431 543 (SIEMENS AG) * page 3, line 5 - line 18 *	1-3,5-7	
Y	DE-A-2 728 473 (PLANKE) * page 5, line 5 - line 15 *	4	
A	US-A-3 352 417 (A. CUTAIA) * the whole document *	1,2,6,7	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B07C
A	US-A-3 867 283 (HORN ET AL.) * claim 1; figure 1 *	1,2	B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 MARCH 1992	GYSEN L.A.D.

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