⑫ EUROPEAN PATENT SPECIFICATION

�54 A process for sorting bulbous and tuberous produce according to size, in particular suitable for potatoes.

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Description

This invention relates to a process for sorting bulbous and tuberous produce according to successive size classes, in particular suitable for sorting potatoes, wherein a sorting operation is carried out in which procedure is sorted according to sizes falling within at least two successive main classes.

Such a process is know from the US patent 4,763,794. According to this known process the produce travels over a series of opening or riddles ranging from small to large. The riddles are adjustable to handle various sizes of produce. The produce falls through the riddles and is collected beneath them. This completes the operation of sorting the produce in successive main classes.

In potato trade and processing industry potatoes are sorted into different size classes using internationally applied square size. The square size of a potato can be defined as the length of the side of the small square opening through which the potato can pass. The potatoes are sorted by means of the riddles into a number of classes, e.g., a first class of potatoes having a square size below 35 mm, a next class of potatoes having a square size ranging from 35 to 45 mm, etc. Although acceptable accuracy is obtainable with such a sorting method, yet the number of potatoes that will find their way to a wrong class cannot be disregarded. These are for the major part potatoes having a square size near the boundary value of a class. When, e.g., potatoes are sorted into three size classes of, e.g., 20-30 mm, 30-50 mm and 50-70 mm, there is a great chance that a relatively large number of the produce that wrongly found its way to the class of 50-70 mm will have a square size ranging from 46 to 50 mm. Similarly, a relatively large number of produce having a square size ranging from 26 to 30 mm will generally be present in the class of 30-50 mm.

Since in potato trade and processing industry a more and more accurate sorting into a relatively large number of classes each comprising a relatively small size range is required, there is a need for an improved sorting method. The object of this invention is to meet the above need. For this purpose a process of the above type is characterized according to the invention in that in a transitional range between the at least two successive main classes at least one intermediate class is defined; that a first sorting operation is carried out, in which produce is sorted according to sizes falling within the remaining range of the at least two main classes and the at least one intermediate class; that the produce selected as falling within the remaining range of the main classes are passed to collections of produce belonging to those main classes; that the produce falling within the at least one intermediate class (is subjected to a second sorting operation, the produce falling into an intermediate class being separated into a first group belonging to the one main class pertaining to the relevant intermediate class and a second group belonging to the other main class pertaining to the relevant intermediate class; and that the two groups are added to the collections belonging to the main classes.

The French patent application 941031 describes a process wherein potatoes are firstly sorted in at least two successive subclasses.and wherein the potatoes of at least one subclass are sorted into two successive main classes falling within the at least one subclass.

In the following the invention will be further described with reference to the accompanying Figure, which schematically illustrates the principle of the process according to the invention.

The Figure schematically shows, by way of example, three size classes, according to which bulbous and tuberous produce such as potatoes, but also, e.g., onions wit the stems cut off, apples etc. can be sorted. In this example the size classes I, II and III correspond to, e.g., sizes determined according to the square size principle of respectively 20 through 29 mm, 30 through 49 mm and 50 through 69 mm. As stated before, the sizes of the major part of the produce classified during the sorting process into a wrong class are just below the sizes belonging to the next class of larger produce.

According to the invention intermediate classes are introduced for produce having sizes that are near the boundary with the next class. The intermediate class may be completely within one of the original classes, but may also overlap the boundary between two original classes.

Thus, in the example shown, two intermediate classes IV and V are defined for produce having sizes of from, e.g., 26 and 34 mm and 46 and 54 mm, respectively. By now sorting not only according to the original main classes, but also according to the intermediate classes, the major part of the produce wrongly sorted at the original sorting machine will find its way to one of the intermediate classes. The other produce is directly classified into the right collections, as schematically indicated by arrows 1, 2 and 3. According to the invention the produce that found its way to the intermediate classes is subjected to a second sorting operation, as schematically indicated by blocks 4, 5. The second sorting operation need not be carried out similarly to the first sorting operation. For the second sorting operation a more accurate sorting method can be used advantageously. Although accurate sorting methods are generally also relatively time-consuming, this need not be a drawback, be-

cause relatively little produce is present in the intermediate classes.

For the second sorting operation the so-called channel sorting method could be used as described in applicants' simultaneously filed Dutch patent application, according to which method produce like potatoes can be sorted based on the square size by measuring the height of the potato located in a V-shaped channel.

In the second sorting operation the produce present in the intermediate class is accurately sorted into two groups, the separation between the two groups being formed by the boundary between the orginal classes. Thus the sorting operation indicated at 4 separates the produce into produce below 30 mm and produce above 29 mm, respectively. The first group is passed to the collection 20/29 and the second to the collection 30/49, as schematically indicated by arrows 6, 7. Similarly, the produce is separated at 5 into a first group below 50 mm and a second group above 49 mm, as indicated by arrows 8, 9.

It has been found that when using a two-stage sorting method as described above a sorting accuracy of 97 to 98% is obtainable.

Claims

1. A process for sorting bulbous and tuberous produce according to successive size classes, in particular suitable for sorting potatoes, wherein a sorting operation is carried out in which procedure is sorted according to sizes falling within at least two successive main classes, the sorting operation being character-ized in that in a transitional range between the at least two successive main classes (20/29, 30/49, 50/69) at least one intermediate class (IV, V) is defined; that a first sorting operation is carried out, in which produce is sorted according to sizes falling within the remaining range (I, II, III) of the at least two main classes (20/29, 30/49, 50/69) and the at least one inter-mediate class (IV, V); that the produce se-lected as falling within the remaining range (I, II, III) of the main classes are passed (1,2,3) to collections of produce belonging to those main classes (20/29, 30/49, 50/69); that the produce falling within the at least one intermediate class (I, II, III) is subjected to a second sorting op-eration (4,5), the produce falling into an inter-mediate class being separated into a first group (6,7,8,9) belonging to the one main class (20/29, 30/49, 50/69) pertaining to the relevant intermediate class (IV, V) and a second group (6,7,8,9) belonging to the other main class (20/29, 30/49, 50/69) pertaining to the relevant intermediate class (I, II, III); and that the two groups (6,7,8,9) are added to the collections belonging to the main classes.

2. A process as claimed in claim 1, characterized in that the second sorting operation (4,5) is carried out more accurately than the first sor-ting operation.

Patentansprüche

1. Verfahren zum Sortieren zwiebel- und knollen-artiger Produkte nach aufeinanderfolgenden Größenklassen, das besonders zum Sortieren von Kartoffeln geeignet ist, wobei ein Sortier-vorgang durchgeführt wird, in dem nach Grö-ßen sortiert wird, die in wenigstens zwei auf-einanderfolgende Hauptklassen fallen, wobei das Sortierverfahren dadurch gekennzeichnet ist, daß in einem Übergangsbereich zwischen den wenigstens zwei aufeinanderfolgenden Hauptklassen (20/29, 30/49, 50/69) wenigstens eine Zwischenklasse (IV, V) definiert ist; daß ein erster Sortiervorgang durchgeführt wird, bei dem das Produkt nach Größen sortiert wird, die in den verbleibenden Bereich (I, II, III) der wenigstens zwei Hauptklassen (20/29, 30/49, 50/69) und die wenigstens eine Zwischenklas-se (IV, V) fallen; daß die in den verbleibenden Bereich (I, II, III) der Hauptklassen fallenden Produkte in Sammelbehälter für zu diesen Hauptklassen (20/29, 30/49, 50/69) gehörende Produkte geleitet werden (1, 2, 3); daß die in die wenigstens eine Zwischenklasse (IV, V) fallenden Produkte einem zweiten Sortiervor-gang (4, 5) unterzogen werden, wobei die in eine Zwischenklasse fallenden Produkte in eine erste Gruppe (6, 7, 8, 9), die zu der einen der betreffenden Zwischenklasse (IV, V) be-nachbarten Hauptklasse (20/29, 30/49, 50/69) gehört, und in eine zweite Gruppe (6, 7, 8, 9) unterteilt werden, die zu der anderen der be-treffenden Zwischenklasse (IV, V) benachbar-ten Hauptklasse (20/29, 30/49, 50/69) gehört; und daß die beiden Gruppen (6, 7, 8, 9) den Sammelbehältern der jeweiligen Hauptklasse zugeschlagen werden.

2. Verfahren nach Anspruch 1, dadurch gekenn-zeichnet, daß der zweite Sortiervorgang (4, 5) genauer durchgeführt wird als der erste Sor-tiervorgang.

Revendications

1. Un procédé pour trier des produits bulbeux et tubéreux en fonction de classes de taille suc-cessives, en particulier approprié pour trier des pommes de terre, selon lequel une opération

de tri est effectuée au cours de laquelle le produit est trié en fonction de tailles comprises dans au moins deux classes principales successives, l'opération de tri étant <u>caractérisée</u> en ce que dans un intervalle transitionnel entre les au moins deux classes principales successives (20/29, 30/49, 50/69) est définie au moins une classe intermédiaire (IV, V) ; en ce qu'une première opération de tri est effectuée au cours de laquelle le produit est trié en fonction de tailles comprises dans l'intervalle restant (I, II, III) des au moins deux classes principales (20/29, 30/49, 50/69) et l'au moins une classe intermédiaire (IV, V) ; en ce que les produits sélectionnés comme compris dans l'intervalle restant (I, II, III) des classes principales sont passés (1, 2, 3) dans des collections de produit appartenant à ces classes principales (20/29, 30/49, 50/69) ; en ce que le produit compris dans l'au moins une classe intermédiaire (I, II, III) est soumis à une seconde opération de tri (4, 5), le produit compris dans une classe intermédiaire étant séparé dans un premier groupe (6, 7, 8, 9) appartenant à une classe principale (20/29, 30/49, 50/69) concernant la classe intermédiaire applicable (IV, V) et un second groupe (6, 7, 8, 9) appartenant à l'autre classe principale (20/29, 30/49, 50/69) concernant la classe intermédiaire applicable (I, II, III) ; et en ce que les deux groupes (6, 7, 8, 9) sont additionnés aux collections appartenant aux classes principales.

2. Un procédé comme revendiqué dans la revendication 1, <u>caractérisé</u> en ce que la seconde opération de tri (4, 5) est effectuée plus précisément que la première opération de tri.

IV   V

I		II		III
20/29		30/49		50/69

1   2   3

4   5

6   7   8   9

20/29	30/49	50/69