May 27, 1969 A. BORN 3,446,351

METHOD AND APPARATUS FOR SORTING CODED SEED BAGS

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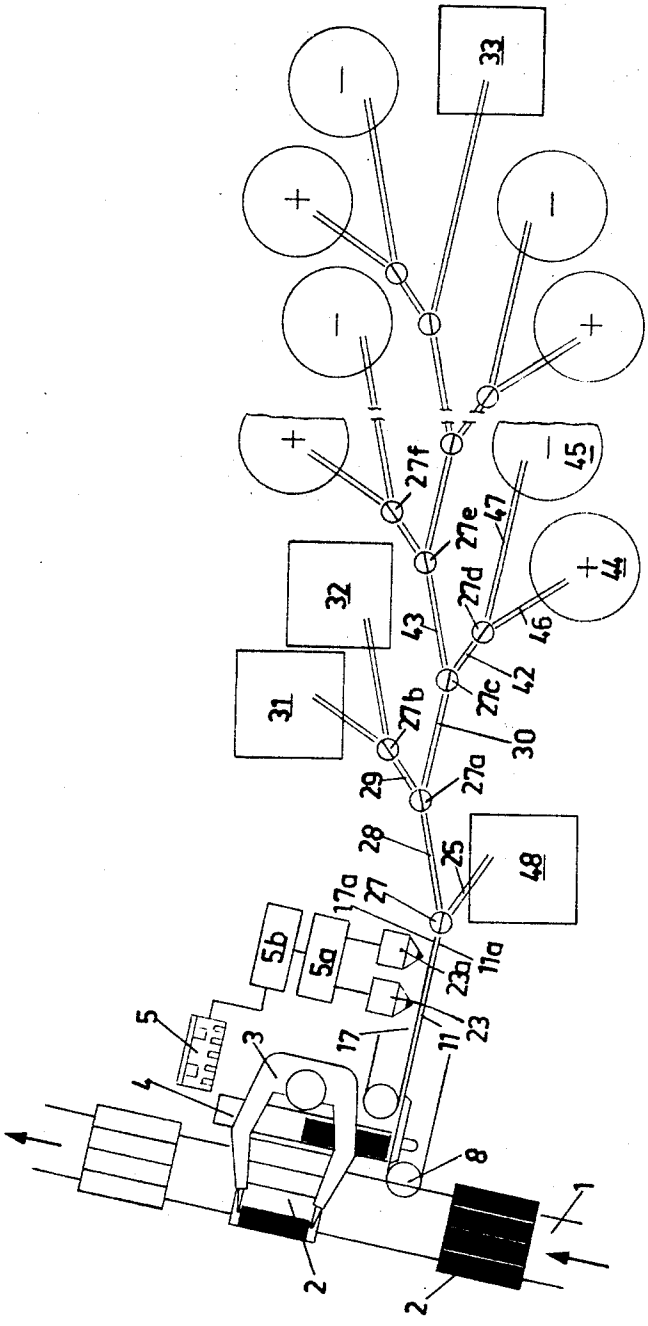


Fig. 1

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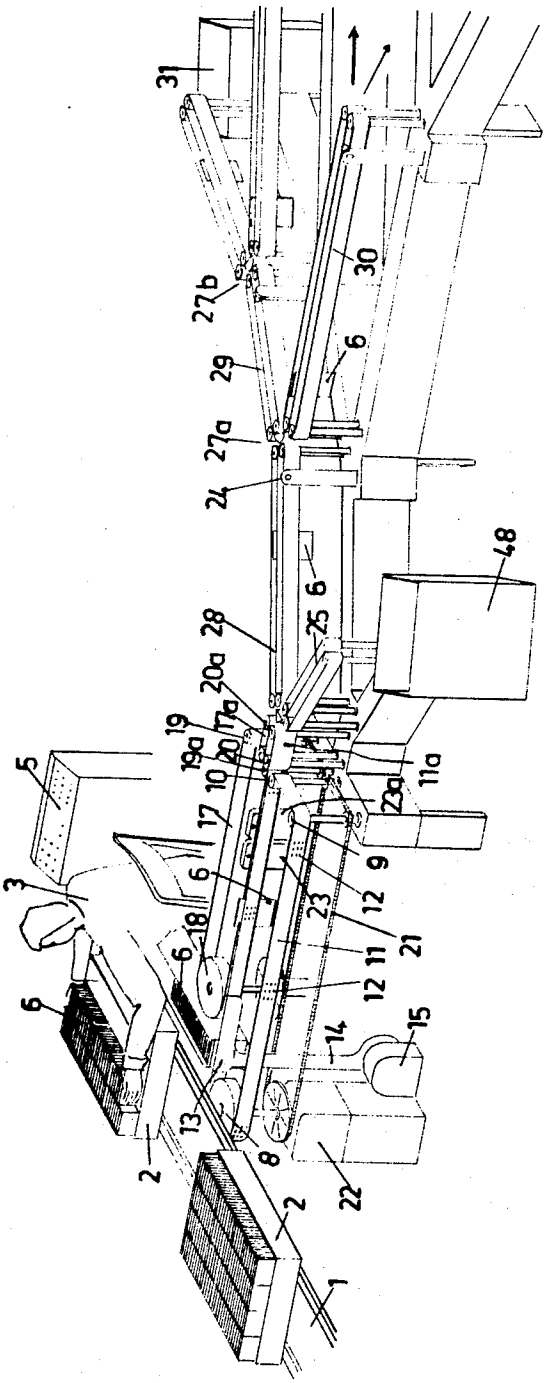


Fig. 2

METHOD AND APPARATUS FOR SORTING CODED SEED BAGS

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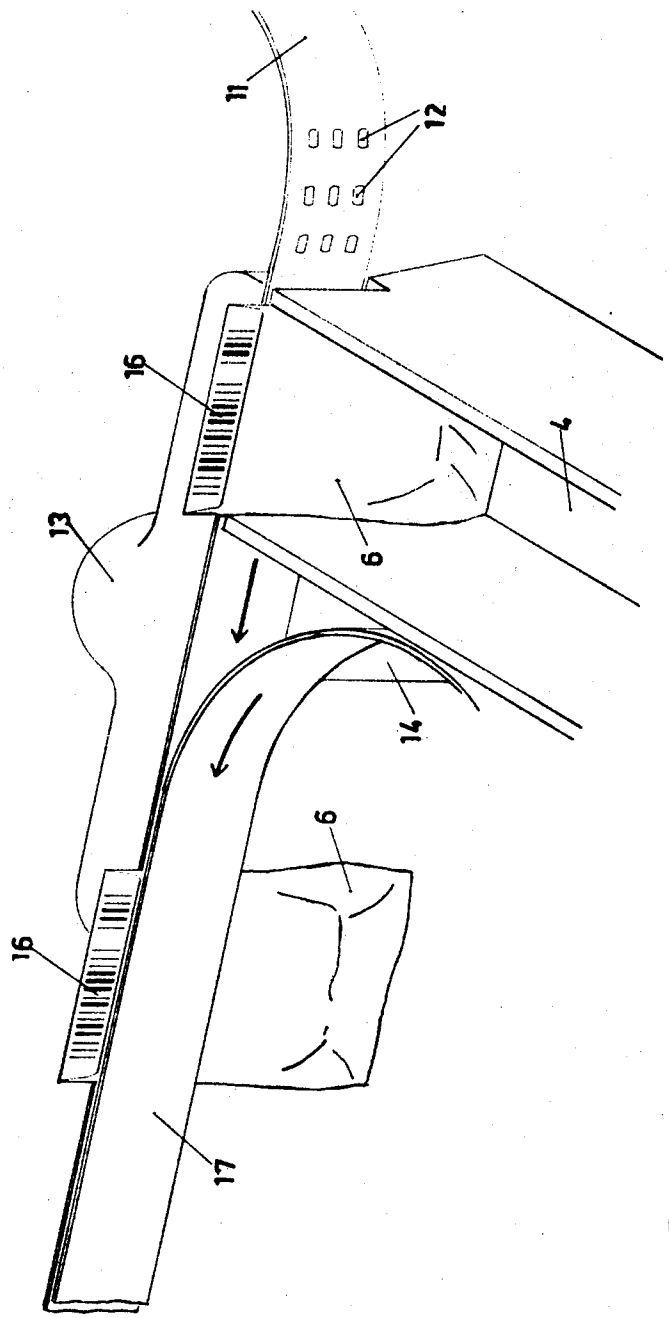


Fig. 3

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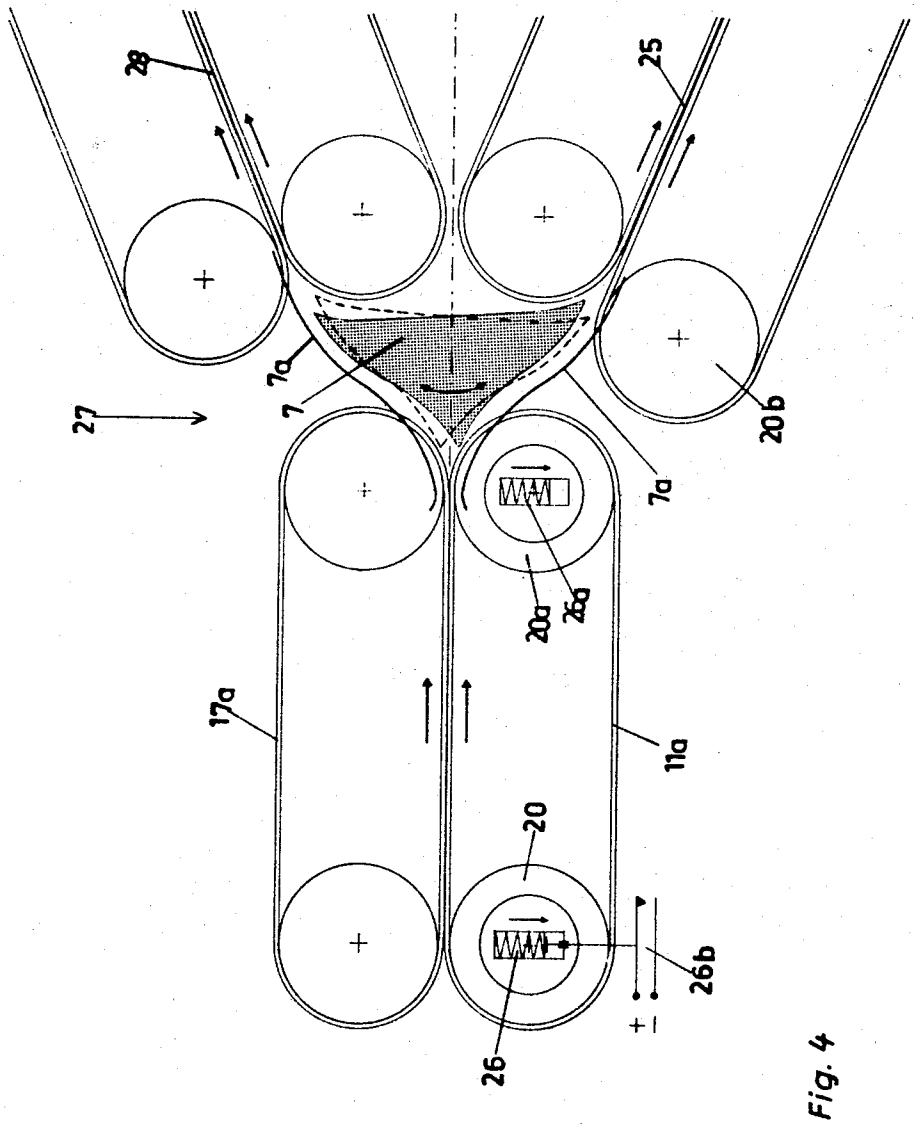


Fig. 4

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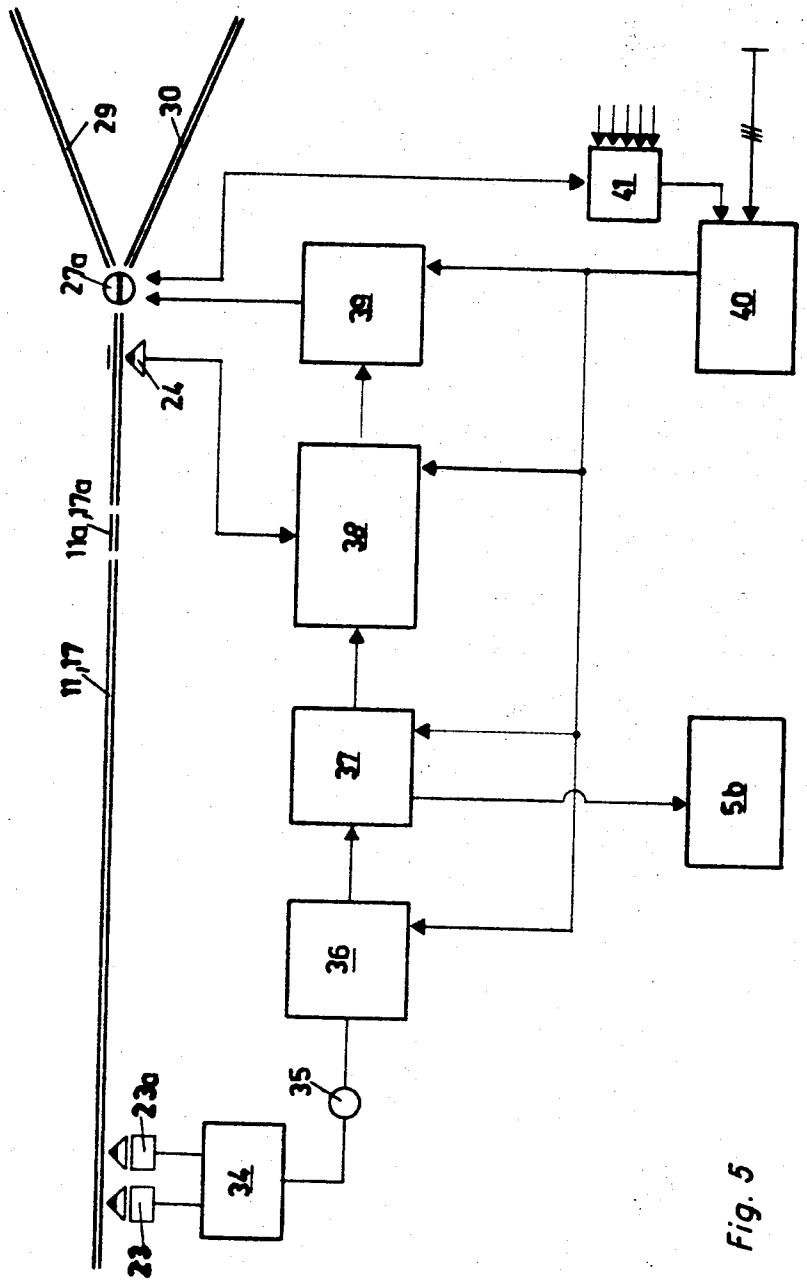


Fig. 5

Fig. 6

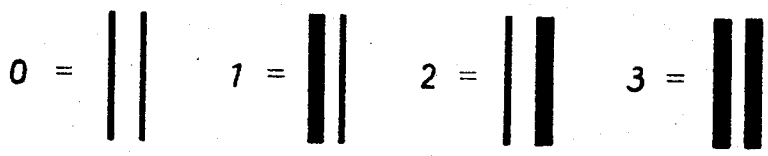


Fig. 7

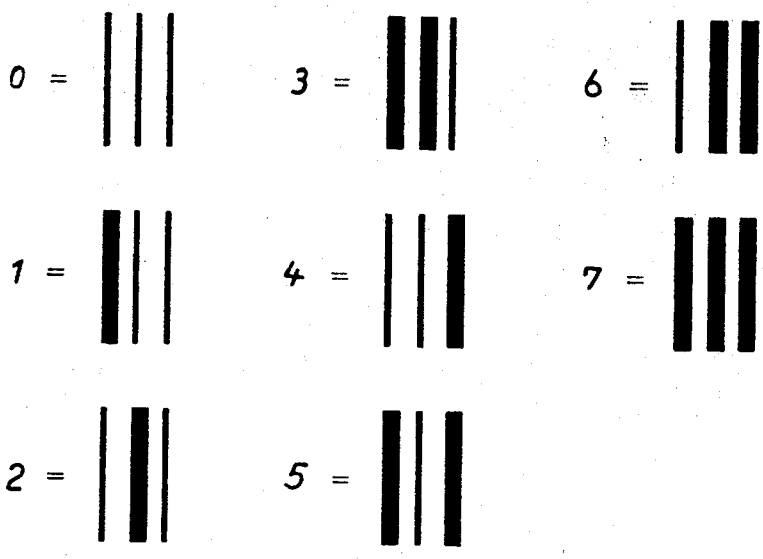


Fig. 8



Fig. 9

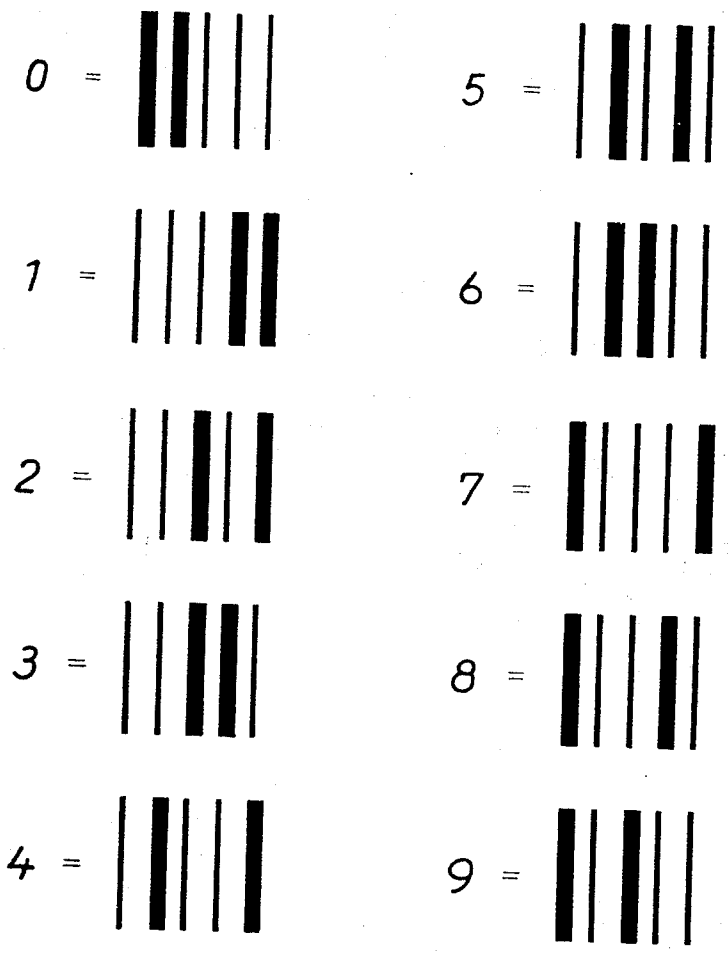
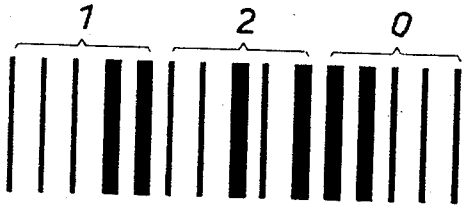


Fig. 10



United States Patent Office 3,446,351
Patented May 27, 1969

3,446,351

METHOD AND APPARATUS FOR SORTING CODED SEED BAGS

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Filed Jan. 12, 1968, Ser. No. 697,415
Claims priority, application Germany, Jan. 19, 1967, D 52,062
Int. Cl. B07c 5/34; G01n 21/30; H01j 39/12
U.S. Cl. 209—111.7 12 Claims

ABSTRACT OF THE DISCLOSURE

Method and apparatus for sorting bags, such as seed bags, in which code lines are placed on the bags at one end on one side and the bags are suspended between the belts of a belt conveyor with the coded portions projecting above the belts. Photoelectric scanning means are located along the belts to scan the coded regions of the bags. Diverting gates in the belt conveyor divert the bags to various receiving stations and are under the control of the scanning means.

The present invention relates to a method of and apparatus for sorting seed bags according to types or classes and sub-classes while eliminating seed bags the contents of which, due to spot-checks or due to age no longer have a sufficient germination ability. By seed bags are means letter-envelope shaped bags which, however, in contrast to ordinary letters have a content that does not assure uniform thickness over the entire inner surface but have varying thickness in view of the trickle ability of the seeds. Therefore, none of the heretofore known letter-sorting installations can be used for sorting seed bags. Moreover, the sorting of seed bags has to meet requirements that are fundamentally different from those to be met by letter-sorting installations. While with letter-sorting installations it is an object to ascertain the place of destination of a letter and to deposit the letter according to the destination, the sorting of seed bags additionally requires a sorting of the seed bags according to number of types per sender.

This problem presents itself particularly when mailing seed bags and shipping the same on a common basis to dealers as customers of seed mailing houses. In such an instance, seed bags with different types of seeds in a certain number are mailed to retailers for sale, and the unsold seed bags are at the end of the season returned by the retailer to the seed mailing house. In these circumstances there exists the necessity on one hand to re-sort the returned seed bags according to types and subclasses, and on the other hand to sort those sub-classes of types of seeds which are of different origin and the contents of which will, during the next season, no longer be able to germinate so that they cannot be sold anymore. Furthermore, it is desirable to ascertain which seed bags were sold according to types and which seed bags were returned so that on the basis of the thus obtained information, the seed mailing house will be able in the coming season to reduce those types which sold poorly and to increase those types which had a successful market.

In view of the above problems inherent to the mailing and selling of seed bags, the heretofore known methods and devices for sorting letters cannot be employed for the sorting of seed bags particularly inasmuch as seed bags, in view of the non-uniform thickness of the bags, do not permit a reading and distribution as is possible with letters, while on the other hand, as outlined above, the sorting of seed bags has to be effected in conformity with other requirements.

It is an object of this invention to provide a method of and device for sorting seed bags which will permit a fast and proper sorting of the seed bags according to class and sub-class.

It is another object of this invention to provide a method of and apparatus for sorting seed bags which will also during the sorting process eliminate seed bags which no longer possess a germination ability.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIGURE 1 diagrammatically illustrates the top view a device according to the invention for sorting seed bags;

FIGURE 2 is a diagrammatic view of a portion of an apparatus according to FIGURE 1;

FIGURE 3 is a perspective view of an apparatus by means of which the seed bags are introduced into a transporting device;

FIGURE 4 is a diagrammatic illustration of a distributing switch and shows the arrangement of controllable deviating rollers of the conveyor belt pair ahead of the first distributing switch;

FIGURE 5 is a circuit for the electronic control units;

FIGURE 6 shows the coding scheme for the year's code;

FIGURE 7 shows the coding scheme for the sub-class code;

FIGURE 8 is an example of a code for a certain year and a certain type or class;

FIGURE 9 shows the coding scheme for the types of a certain type number;

FIGURE 10 illustrates an example for the codifying of a certain type number.

The method according to the present invention is characterized primarily in that seed bags are employed which at the marginal portion of the folding flap have a light and dark line codification arrangement in a row and comprising lines which are perpendicular to the marginal portion of the flap. The seed bags are by means of a transporting device vertically suspended on their folding flap margins moved past a reading device which is located at the level of the line codification and is adapted photoelectrically to respond. This reading device, by means of sliding registers and light barriers controls disributing switches between successive transporting devices by means of which the seed bags are sorted and deposited.

Inasmuch as seed bags are employed which have their folding flap provided with a light and dark codification arranged in a row and comprising lines arranged vertically with regard to the folding flap edge, and since the seed bags are transported while being vertically suspended at their folding flap edges, the pre-conditions are created for having the bag contents located exclusively in the free-hanging lower bag section which is swelled by the contents. The bag is completely flat within the range of the folding flap edge so that when the flap edge is passed by the reading device according to the present invention, a proper reading operation will be made possible.

The line codification affords the possibility of covering by means of the reading device all data which are required by the succeeding sorting. Thus, the line codification may indicate the type or class, the sub-classes, and the year at which the bag contents lose their germination ability.

The codification scheme for the type or class may be a self-examining triple 2- or 5-code so that 999 types or classes can be covered with high reading precision. The sub-class codification may be effected by means of three lines of different thicknesses whereby eight sub-classes can be registered, whereas for the year code two lines of different thicknesses may be employed, so that four years will be covered.

When employing the method according to the present invention there exists the possibility, without additional expense, to ascertain the number of seed bags per type and per customer. To this end, according to the present invention, the method may be carried out in such a way that the seed bags are moved past the reading device in groups and by means of a data registering device which follows the reading device are, in conformity with the line codification group-wise decoded according to types, stopped and counted. The data registering device may be a device employing cards with punched holes.

The above operation is effected in particular in such a way that the type numbers read by the reading device are, in the sequence in which they arrive, registered by the data registering device on punched cards and the same type numbers which pertain to a group being delivered are counted by a counter mechanism.

To this end, the numbers of the delivered groups are fed to the punched-hole registering device so that the number of the bags of one type of a certain group will be ascertained. By means of the ascertained numbers it is thus possible with the next delivery to a customer to reduce or increase the number of the bags to be delivered to the customer in conformity with the number of sold bags in the preceding season.

The method according to the present invention may be carried out by an apparatus which is characterized primarily in that as transporting device there is provided a plurality of successive conveyor belt pairs circulating about a vertical axis. These pairs of conveyor belts move forward the seed between those belt sections thereof which engage each other, while said seed bags are clamped and are hanging free. Each conveyor belt pair is followed by a depositing station, or when a distributing switch is provided, each conveyor belt pair is at an acute angle with regard to the preceding conveyor belt pair followed by two conveyor belt pairs, while ahead of the second distributing switch there is provided a photo-electrically responding reading device. This reading device is adapted through the intervention of a slide register and light barriers to control the succeeding distributing switches for the sorting depositing of the seed bags.

Inasmuch as the conveyor belt pairs move the seed bags forwardly in clamped-free suspended position directly below the line codification, the bag contents is exclusively within the lower range of the bag so that neither between the conveyor belt pairs nor within the range of the line codification will there be located any seeds by means of which the further transport or the reading could be impeded. In conformity with the control signals brought about by the line codification, the seed bags moved through the apparatus are sorted and pass from one conveyor belt pair to the next conveyor belt pair while one of the two conveyor belt pairs branches off a certain type of seeds from the preceding branched-off conveyor belt pair and again usable seed bags are separated from the no longer usable seed bags and deposited inasmuch as the above-mentioned conveyor belt pair is followed by two conveyor belt pairs which end at the depositing containers.

According to a further development of the present invention, it may be provided that the first conveyor belt pair is preceded by a locally perforated endless circulating belt to which the seed bags below the line codification are in a free-hanging manner connected by suction air and conveyed to the next following conveyor belt pair. This brings about that the the seed bags can in the required position automatically be brought into the first conveyor belt pair, viz, in the form in which the line codification is located above the conveyor belt pairs so as to permit a proper reading by the reading device. Furthermore, the bag contents will be only in the lower part of the seed bag which is swelled only in said lower part.

According to a still further development of the present invention, the reading device may have two reading heads adjacent to each other which are slightly offset as to height

and the readings of which are electronically compared and corrected. By means of the thus obtained checking of the reading, it will be assured that possibly locally limited inaccuracies will be automatically taken care of in the line codification and that reading errors will be corrected. With heretofore known distributing conveying installations for letters, the device as a rule consists of a straight main conveying path along which switches are provided. Such design of the device according to the invention, however, does not meet all of the requirements in connection with the sorting of seed bags as outlined above, and does not assure a proper deviation of the seed bags at said switches because the seed bags must be grasped only at their upper portions at the narrow side thereof and must be transported so that they freely hang downwardly.

In view of the above, the present invention provides that the two conveyor belt pairs following a conveyor belt pair are arranged at an angle of up to 30° with regard to the direction of the preceding conveyor belt pair, whereby a uniform distribution of the conveyor belt pairs on both sides of the main conveying direction will be assured and the deviation of the seed bags in said switches will be only minor, but nevertheless will make it possible that the two conveyor belt pairs which follow a conveyor belt pair can with their switch directly follow said one conveyor belt pair without in any way interfering with each other and with the deviation of the seed bags.

To this end, according to the present invention, it may be provided that the switch member of the switches which deviates the seed bags in one or the other direction, has the shape of the pointed portion of a heart whereby a proper deviation of the seed bags will be assured. The deviation may, according to the invention, be further improved by providing arched guiding strips which extend at slightly spaced relationship from the side edges of said switch member.

Inasmuch as it may occur that in spite of the displacement of the bag contents into the lower portion of the bag individual seed grains become stuck within the area of the folding flap edge whereby the transport, especially in the switches, could be interfered with, it is provided according to a further development of the invention that at least one deviating roller of a conveyor belt pair which precedes the first distributing switch is adapted, against the thrust of a spring, to be moved away from the other conveyor belt and thereby controls the next distributing switch in such a way that the seed bag which brought about the moving-away from the other conveyor belt will be directed to a waste container. In this way, it will be assured that seed bags of this type will from the very start be eliminated from the sorting operation but will nevertheless be numerically registered by the above-mentioned punch-hole registering device.

Referring now to the drawings in detail, the apparatus proper for sorting the seed bags is preceded by a transport path **1** on which cartons **2** are transported which contain the seed bags returned by the customer in such a presorted manner that the seed content is located in the lower portion of the bag and that the folding flap of the bag has the codification located at the top and always pointing toward one side. The box contents forms a delivered group, which means a group not sold by the customer which contains seed bags with different contents.

An operator **3** feeds the seed bags in packs from the boxes **2** into the feeding trough **4** in such a way that the folding edges of the seed bag **6** are located in the proper location at the top while the bag contents is located in the lower portion of the bag and as uniformly distributed as possible. At the time the contents of a box **2** is withdrawn and prior to feeding the first seed bag into the sorting apparatus, the operator **3** feeds the number of the customer and the number of the respective box by actuation of keys **5** into the punch-card or punch-strip device **5***b* in order that the punch-strip or punch-card handling device will, in view of the line of the codification cover the types group-wise, and that the number of seed bags

returned by a customer and pertaining to the respective type is recorded for purposes of evaluating the same with later deliveries to the customer. The discharge of the seed bag **6** to the sorting apparatus is illustrated in detail in FIGS. 2 and 3. FIG. 3 shows the receiving trough **4** for the seed bag **6** of which the one shown in FIG. 3 will engage the perforated endless band **11** which rotates about the rollers **8, 9**. The perforation in the band **11** is locally provided in groups in such a way that only at certain distances will it be able to take along a seed bag **6**. The taking-along of a seed bag **6** is effected by the fact that from the back side of belt **11** suction air becomes effective. The suction connection is designated with the reference numeral **13** and is through a conduit **14** connected to a suction blower **15** (FIG. 2).

In the trough **4**, the seed bags **6** are so located that their lower edge rests on the trough bottom so that the bags **6** are slightly upset whereby the seeds still in the upper bag portion will be caused to slide downwardly. The bag **6** is thus swelled at the bottom portion only while being flat within the area of the band **11** and in particular within the area of the codification **16** which protrudes above the upper edge of the belt **11**.

Held fast on the belt **11** by suction air, the seed bag **6** is transported by said belt while being clamped between the conveyor belt **11** and the additional conveyor belt **17**. The conveyor belt **17** passes about the rollers **18, 19** and **19***a*. The driver of the rollers **8, 9, 10** and **18, 19, 19***a* is effected, for instance by a chain drive **21** and the diagrammatically indicated driving motor **22**, as shown in FIG. 2.

While a seed bag **6** is being transported between the bands or belts **11** and **17**, the upper flap edge of the seed bag with the line codification **16** passes by the two reading heads **23, 23***a* which are slightly offset as to height and the readings of which are electronically compared and corrected.

By means of the reading heads, there is also effected the feeding of the type numbers into the punch-strip device **5***b* by means of which the data are recorded for counting.

The distributor switch **27** which is arranged at the end of the waste testing conveyor belt pair **11***a*, **17***a* corresponds to that of FIG. 4. Such switch **27** may be an electromagnetically reversible switch the second end position of which is indicated by dash-lines. Said switch becomes effective by means of the switch member **7** with the guiding strips **7***a*. The switching member **7** has the shape of the tip portion of a heart. The deviating angle is less than 30°. The succeeding conveyor belt pairs are arranged and aligned accordingly.

According to FIG. 4, the deviating rollers **20, 20***a* are by means of springs **26, 26***a* journalled so as to be adapted to be deflected. Care is taken by means of the working contact **26***b* that when the deviating roller **20** is deflected, the switching member **7** of the distributing switch **27** is so controlled that the seed which brings about the deviation is passed into the waste container **48** according to FIGS. 1 and 2. The said deviation is brought about, for instance, when the flap edge is creased and therefore a further transport of the bag could cause a disturbance, or when the seed becomes stuck in the fold edge and, therefore, likewise could cause disorders. In order to facilitate the entry of seed bags which are too thick in their upper portion between the conveyor belt pair **25**, the deviating roller **20***b* is, according to FIG. 4 so arranged as to be pulled toward the deviating roller **20***a*.

Thus, by first distributing switch **27**, faulty seed bags **6** are conveyed to container **48** by means of the transport belt pair **25**. The corresponding control impulse is extinguished in the slide register **38**.

Proper seed bags **6** which should be transported further are received by the conveyor belt pair **28** in view of the distributing switch **27** and are transported to the next following distributor switch **27***a* by means of which, in conformity with the reading of the reading heads **23, 23***a*, a pre-sorting is effected. This pre-sorting is carried out in such a manner that bags without code or with illegible code or with codes reading on a non-existing number or such bags the sorting numbers of which can be sorted only during another passage through the device, are conveyed to the transporting belt **29** and are, through the distributing switch **27***b*, passed to the deposit containers **31, 32** respectively. Properly codified seed bags are by means of the distributing switch **27***a* conveyed to the feeding belt pair **30**. Each distributor switch is preceded by a light barrier **24** which in cooperation with the reading heads **23, 23***a* will in conformity with the circuit according to FIG. 5 bring about the adjustment of the distributor switch.

The operation of the electronic control is known per se, so that it will suffice in the control circuit merely to indicate the main units. According to FIG. 5 there is provided an electronic reading device **34** with the reading heads **23, 23***a*. The station of data transfer is designated with the reference numeral **35** concerning sub-classes. The reference numeral **36** designates the series parallel converter while the reference numeral **37** designates the coordinating unit. The circuit furthermore comprises a slide register **38**, a switch control **39**, a network **40** and a device **41** for checking the switch, said device being provided with means indicating the clogging of the switch and also being provided with a fast interrupter. Aside from the light barriers **24**, the said units are mounted in the switch-box. While the transport belt pair **29** feeds directly to the deposit station, the transport belt pair **30** picks up those seed bags which are to be decoded according to classes and sub-classes with usable and unusable contents.

The seed bags **6** received by the transport belt pair **30** and to be sorted further pass by a further light barrier **24** to a distributing switch **27***c* whereby the further transport of the seed bags **6** is effected either to the transport belt pair **42** or to the transport belt pair **43**. The switch **27***d* will at the end of the transport belt pair **42** distribute the seed bags **6** of one type by means of the transport belt pair **46** and **47** to the containers **44** or **45** of which, for instance, the container **44** receives the seed bags of all sub-classes of the respective type with still-germinable seeds, whereas the container **45** is intended to receive those bags which contain the crop or subclasses thereof of seeds which are no longer able to germinate. Also in this instance, the switch **27***d* is preceded by a light barrier **24** which brings about the adjustment of the switch in conformity with the reading by the reading heads **23** and **23***a* and shifts the individual addresses from one place on a slide register to another place. The associated unit **37** advantageously has its front plate provided with a peg-board on which the respective addresses pertaining to the different containers are determined and set. The said unit **37** comprises means which convert the read code into another code and check the same at this opportunity.

The seed bags which are not intended for the containers **44** or **45** are taken over by the transport belt **43**. The seeds bags received by the latter are by means of succeeding light barriers **24** and distributing switches **27***e*, **27***f* sorted in a corresponding manner and deposited. In FIG. 1, the respective containers for receiving the bags **6** with germinable contents are provided with a + sign, and the containers for the bags with a content which is no longer able to germinate are provided with a — sign. Care may be taken that misguided seed bags which were mistakenly guided by the distributing switch for sorting of its type are deposited in the container **33** at the end of the apparatus according to FIG. 3.

A sorting of those types of seeds which are in the deposit container **32** may be effected by once more passing the seed bags **6** through the apparatus. This operation yields the advantage that the apparatus can be limited

to a number of types which is less than the total number of types.

FIGS. 6–10 illustrate the line codification. According to these figures, the year code is formed by two lines in which instance, for example, two thin lines indicate the number 0, a thick line and a thin line indicate the number 1, a thin line and a thick line indicate the number 2, and two thick lines indicate the number 3, and these numbers are in this form read by the reading device in cooperation with the unit **37**.

The codifying scheme for the sub-class code is built up according to FIG. 7 in which individual numbers are composed of three lines each so that per each type, eight sub-classes per year or 32 sub-classes can be covered if in the last-mentioned instance the year code is omitted.

FIG. 8 illustrates an example of the line codification for the year number 2 and the sub-class 1.

According to FIG. 9, the numbers up to 999 for the types are indicated by five lines—three thin lines and two thick lines in different distribution.

FIG. 10 shows as an example the type number 120.

The thick lines advantageously have about three times the thickness of the thin lines. In the manner illustrated, the codification in addition to furnishing the information concerning the addresses for the bags, also permits the furnishing of information concerning the presence of a bag, the information of a rhythm, and the information concerning the proper functioning of the reading device.

The provision of the codifying lines on the folding flap edge of the seed bags **6** and the vertical suspension of the seed bags on the folding flap will, when passing said bags by a photoelectric reading device operating with reflex light, assure the maintenance of a proper distance.

As mentioned, the line codification is applied to the seed bags from the very start, for instance by printing, so that the distribution of the seeds in bags will be effected accordingly and later, in case of a return of the seed bags the sorting of the seed bags according to types and sub-classes with germinatable and no longer germinatable seeds can be effected in the manner described above. After the seed bags have been returned by the customer, they are subjected to a spot-check to determine whether the seeds are still able to germinate, and at this opportunity, the crops of certain years are from the very start eliminated if such crops have exceeded the permissible age at the time the next delivery is due.

As outlined above, simultaneously with passing the seed bags **6** by the reading heads **23** and **23***a* of the reading device **34**, the number of types may be registered by means of a punch-card or strip, subdivided in conformity with delivery groups, and thereupon the counting may be effected by electronic means in order in this way numerically to register the sorted seed bags to evaluate the same for later delivery to the customer. Inasmuch the units required for these operations are well known as to structure and manner of employment, a detailed description and illustration thereof appear to be superfluous.

What is claimed is:

1. A method of sorting seed bags which comprises; applying code marks to one side of each bag at one end thereof, suspending and conveying the bags by engagement of the bags in a laterally extending region below the code marks and above the other end of the respective bags, photoelectrically scanning the coded regions of the thus suspended bags during said conveying thereof by a photoelectric scanning device sensitive to the said code marks, conveying the bags following the said scanning to a plurality of distributing gates, and controlling the said gates in conformity with the coded information detected on the respective bags during the scanning of the bags.

2. A method according to claim **1** in which said code marks are in the form of lines extending angularly to said direction of conveying and spaced in the direction of said conveying and having selected widths in the direction of conveying.

3. A method according to claim **2** which includes detecting the approach of a respective bag to a said gate and releasing the gate for movement to the position determined by the scanning of the respective said bag in response to said detection.

4. A method according to claim **3** in which the said bags are supplied in groups, and which includes the step of counting the bags following the said scanning thereof.

5. In an apparatus for sorting seed bags which are coded on one side near one end by spaced code lines extending in the longitudinal direction of the bags; conveyor belt means adapted for suspending the bags by engaging the bags in a lateral region beneath the coded one end of the bags and above the other ends thereof and operable for conveying the bags while thus suspended in the lateral direction of the bags, photoelectric scanning means adjacent said belt means for scanning the coded regions of said bags and sensitive to said code lines, said conveyor means comprising an input conveyor and a plurality of distributing conveyors branching off therefrom, a depositing station at the end of each distributing conveyor for receiving seed bags therefrom, a gate at the entrance end of each distributing conveyor having a first position wherein bags enter the respective distributing conveyor and a second position wherein bags bypass the respective distributing conveyor, and control means for moving said gates between their said positions and under the control of said scanning means.

6. An apparatus according to claim **5** in which said belt means comprises pairs of belts running in face to face relation.

7. An apparatus according to claim **6** in which said input conveyor is preceded in the direction of bag movement by a single belt member having perforations therein subjected to suction so that bags are grasped by the single belt member and moved thereby to the input conveyor.

8. An apparatus according to claim **5** in which said scanning means comprises a pair of reading heads in adjacent relation and spaced a short distance in the direction of the length of said code lines, and means for comparing the data detected by said reading heads to compensate for errors in the coding.

9. An apparatus according to claim **5** in which each distributing conveyor leaving a said gate deviates from the path of the conveyor approaching the gate at an angle of up to about 30°.

10. An apparatus according to claim **9** in which each gate has a single conveyor on the input side and a pair of conveyors on the output side, and each said gate comprises a wedge shaped member having a point end facing the end of said conveyor on the input side of the gate and tiltable to cause a bag emerging from the input conveyor to pass along one side or the other of said wedge shaped member.

11. An apparatus according to claim **10** in which the side faces of said wedge shaped member are curved so as to guide the bags smoothly from the input conveyor to the respective one of the pair of conveyors, and curved guide strips adjacent the side faces of said wedge shaped members and spaced therefrom to guide the bags along the respective side faces of said wedge member.

12. An apparatus according to claim **11** in which the input conveyor comprises support pulleys for the belts thereof and resilient means supporting said pulleys so that a folded or otherwise disordered bag which is too thick to pass safely through the apparatus will cause separating movement of said pulleys, the first said gate to which said input conveyor leads supplying a discharge conveyor in one position, and means responsive to said

separating movement of said pulleys for operating said first gate into said one position so that disordered bags will be rejected from the apparatus.

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U.S. Cl. X.R.

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