United States Patent [19]

Allen

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[54] **METHODS OF SORTING OR SELECTING ARTICLES ON A CONVEYOR PATH AND APPARATUS USED THEREFOR**

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Sept. 8, 1969 New Zealand.....157715

[52] **U.S. Cl.**.....**104/88,** 214/11

[51] **Int. Cl.**.....**B65g 43/08**

[58] **Field of Search** 214/11; 198/38; 104/88

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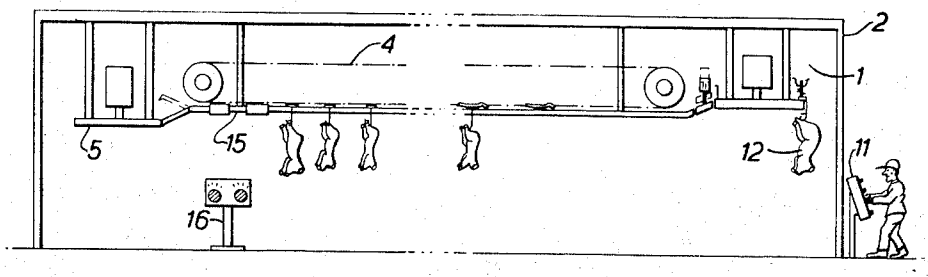
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Primary Examiner—Albert Makay
Assistant Examiner—John Mannix
Attorney—Holman & Stern

[57] **ABSTRACT**

The sorting and selecting of articles on a conveyor path in which a code carrying means is associated with an article moving along the conveyor path, a selected code on the code carrying means is set, with the code carrying means and articles associated therewith being moved along the conveyor path until the pre-set code on the code carrying means activates automatically a discharge means to discharge the article associated with the code carrying means from the conveyor path at the preselected position.

5 Claims, 16 Drawing Figures



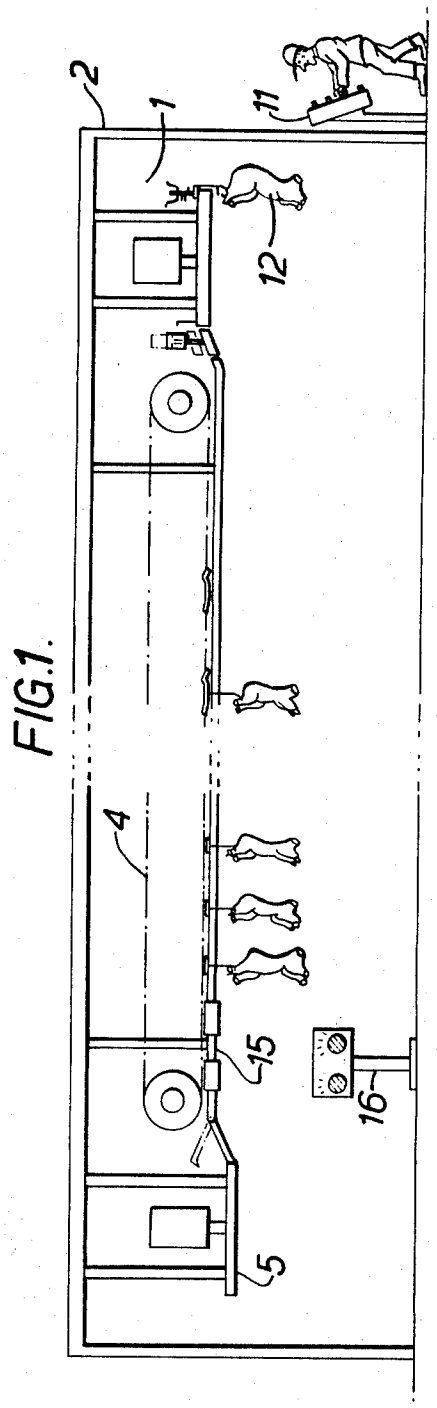


FIG.1.

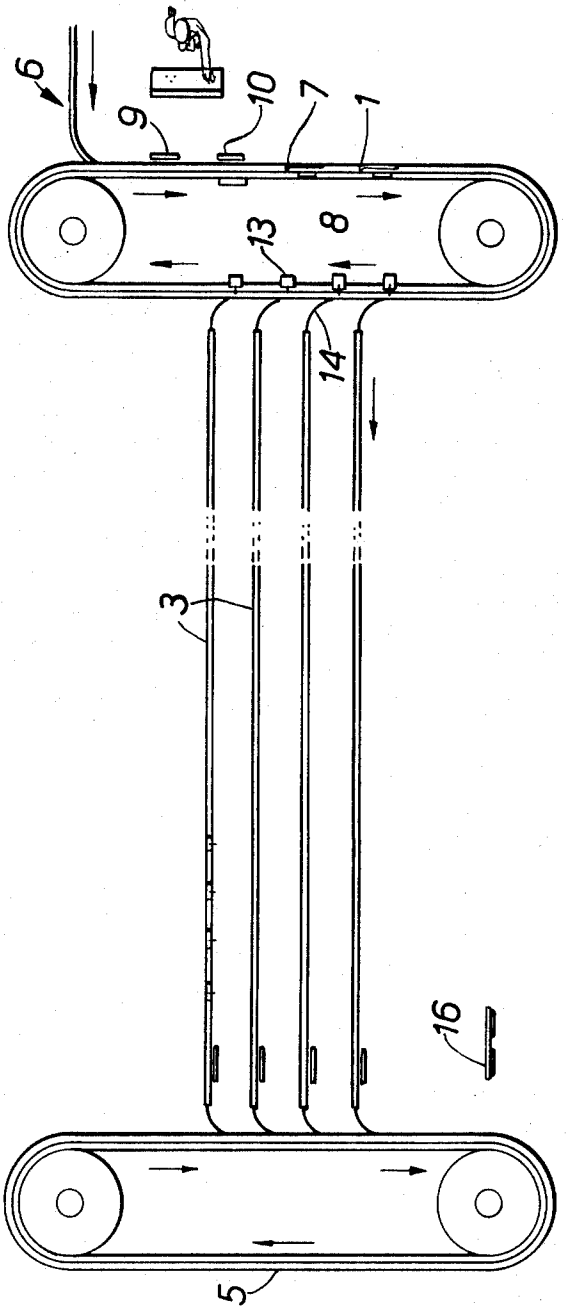


FIG.2.

FIG. 3.

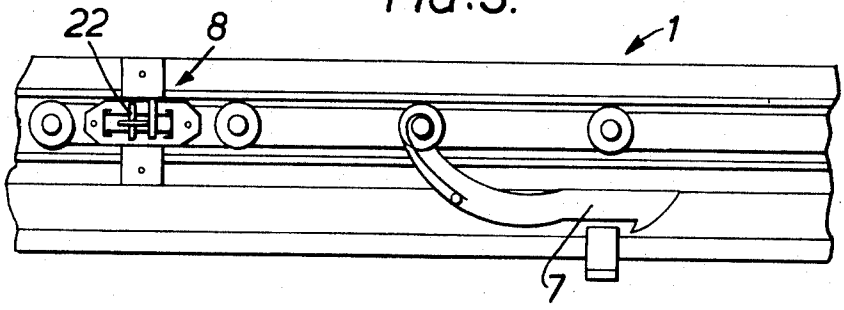


FIG. 4.

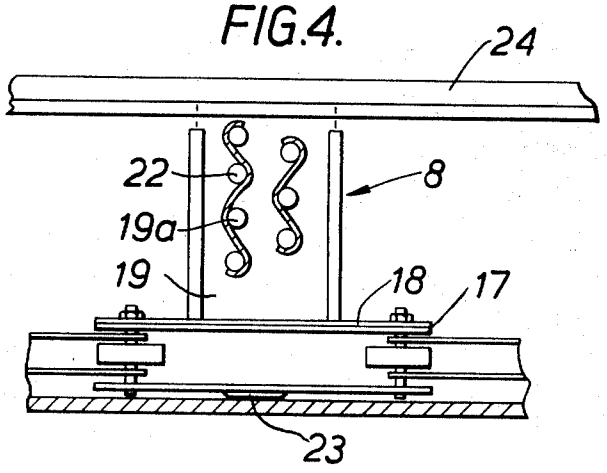


FIG. 5.

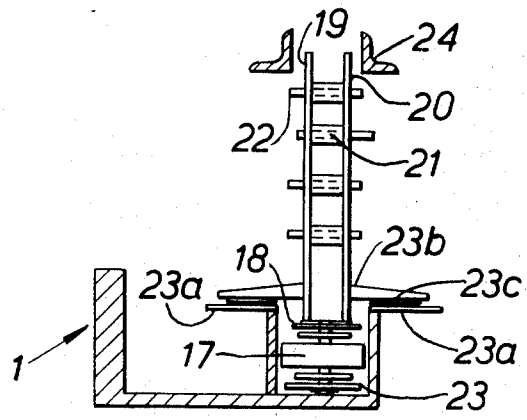


FIG. 6.

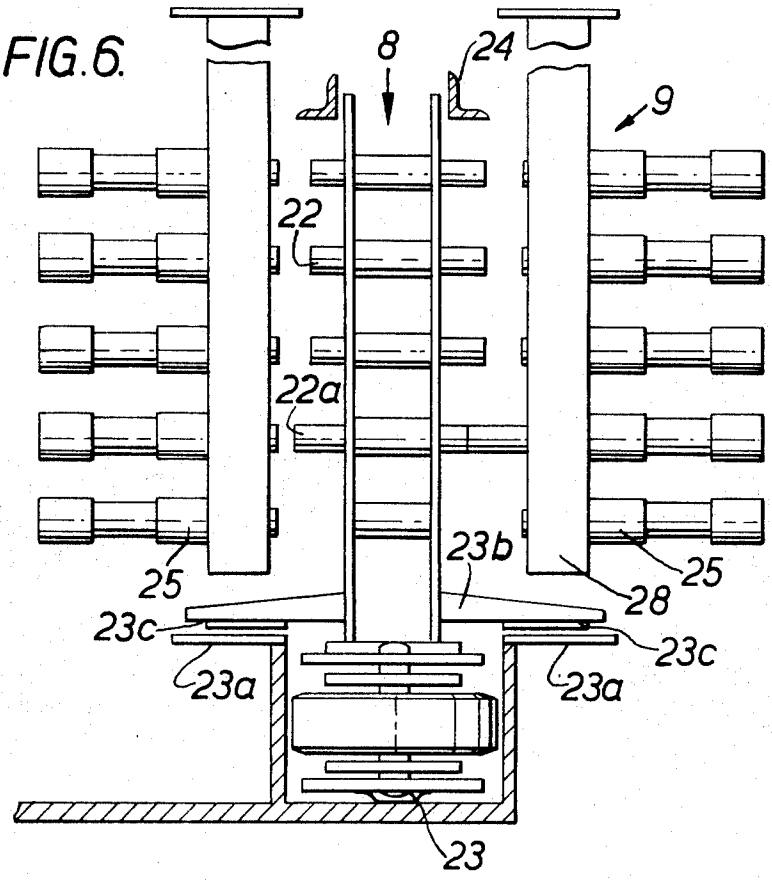
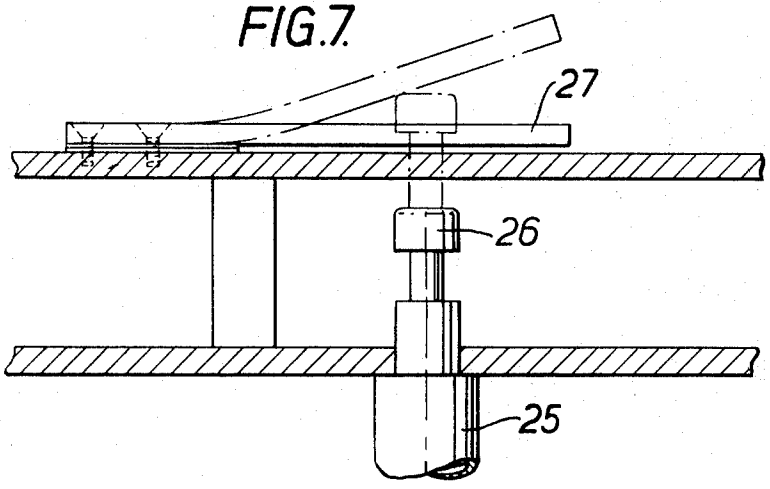


FIG. 7.



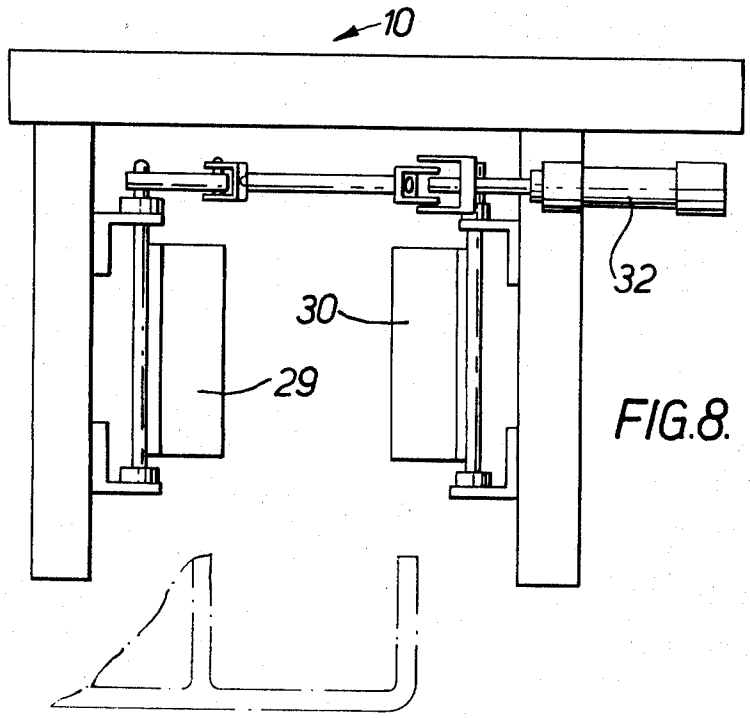


FIG.8.

FIG.9.

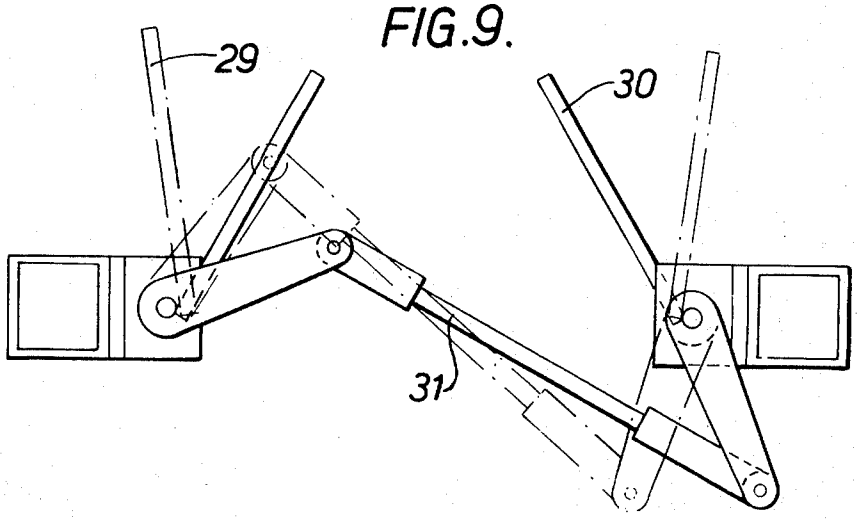


FIG.10.

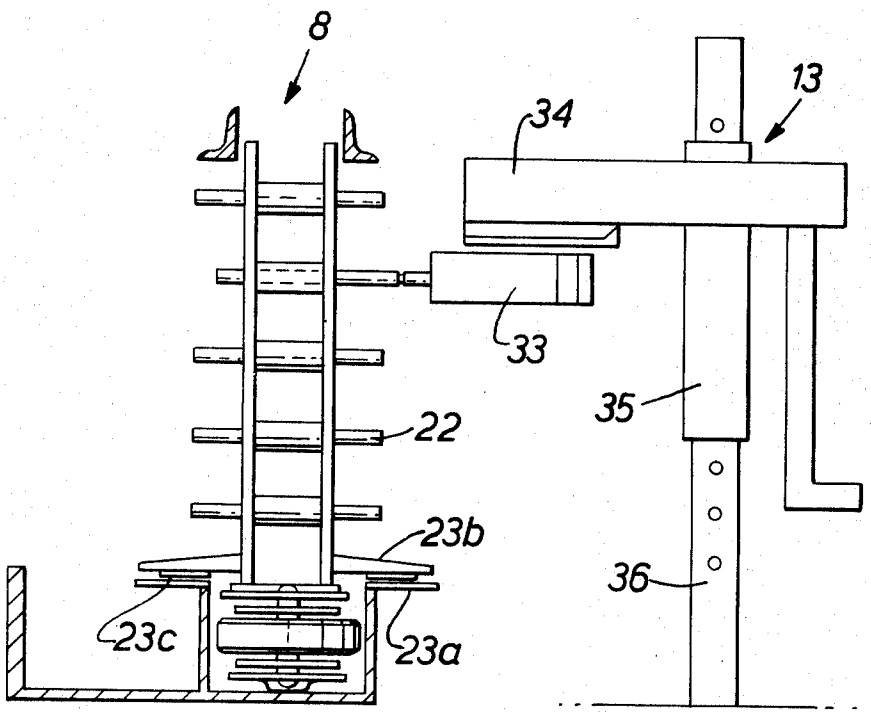


FIG.11.

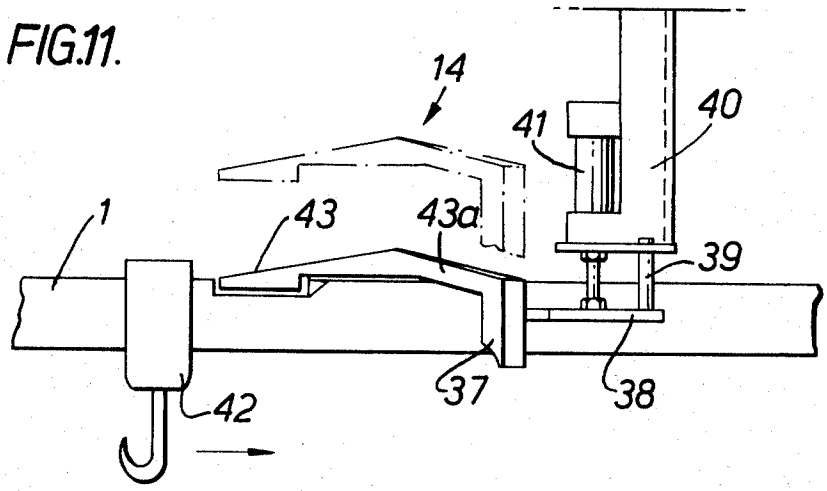


FIG.12.

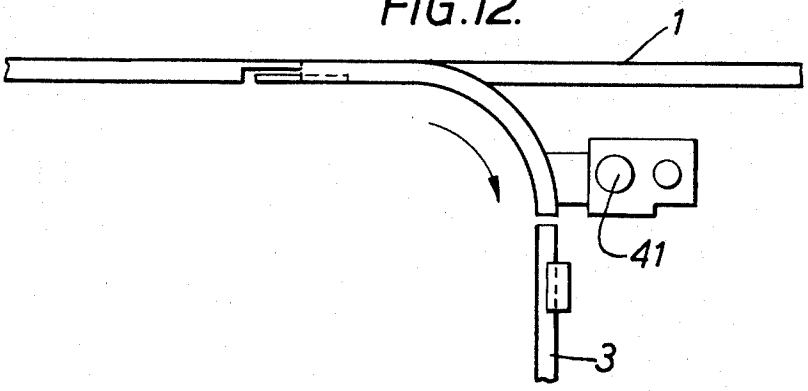


FIG.13.

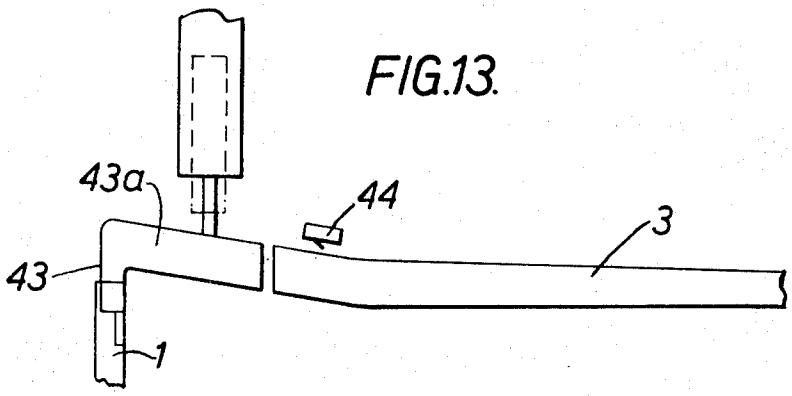


FIG.14.

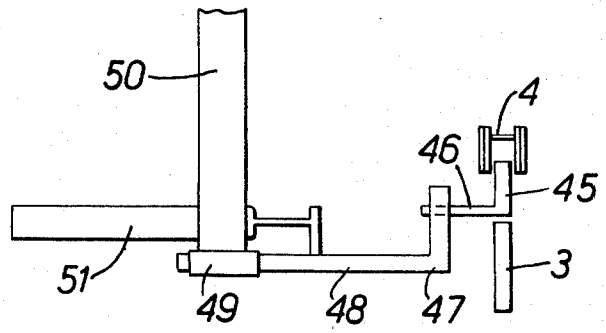


FIG.15.

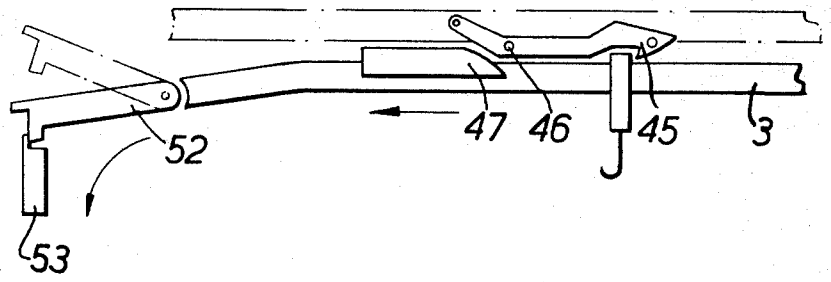
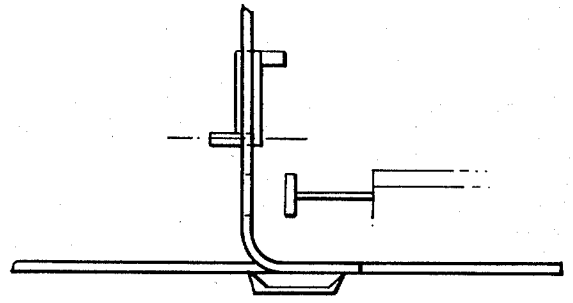


FIG.16.



METHODS OF SORTING OR SELECTING ARTICLES ON A CONVEYOR PATH AND APPARATUS USED THEREFOR

This invention relates to methods of sorting and selecting articles on a conveyor path and/or apparatus used therefor.

In many instances it is desirable to control the movements of articles through a conveyor system so that the articles may be sorted into the groups ready for storage or further treatment. An example where such sorting and storage would be beneficial is the Freezing Works Industry, where the carcasses are graded and must be sorted in accordance with the grading allotted by the grader. It is desirable for the grader to be able to code the articles so that they will automatically be selected into groups depending upon the particular coding allotted.

It is therefore an object of the present invention to provide a method of sorting and selecting and spacing articles on a conveyor path and/or apparatus used therefor which will go a considerable way to meeting the abovementioned *desiderata*.

Accordingly in one aspect the invention consists in sorting and selecting articles on a conveyor path said method comprising the steps of associating code carrying means with an article being moved along a conveyor path, setting a selected code on said code carrying means, moving the articles in association with the code carrying means along the conveyor path until the pre-set code on the code carrying means automatically activates a discharge means to discharge the article associated with the code carrying means from the conveyor path at the pre-selected position.

In a further aspect the invention consists in apparatus for sorting and selecting articles on a conveyor path said apparatus comprising a conveyor path, conveyor mechanism associated with said conveyor path and including a number of conveying attachments to move articles along said conveying path, a plurality of code carrying means mounted on said conveying mechanism and arranged so that a code carrying means is associated with each article being moved along said conveyor path by the conveying attachments, a code setting station to set a selected code on the code carrying means moving through said code setting station prior to moving the article to which the code applies along the conveying path, and a discharge means activated by the pre-set code carried on said code carrying means to discharge the article associated with code carrying means from said conveyor path at a preselected position.

One preferred form of the invention will now be described with reference to the accompanying drawings in which:

FIG. **1** is a diagrammatic elevation of the sorting and selecting apparatus according to the present invention,

FIG. **2** is a diagrammatic plan view of the apparatus shown in FIG. **1**,

FIG. **3** is a detailed plan view showing code carrying means associated with a conveying unit on the coding conveyor.

FIG. **4** is a side elevation of the code carrying means.

FIG. **5** is an end elevation of the code carrying means.

FIG. **6** is an end view showing the code setting station.

FIG. **7** is a detail of the code setting station.

FIG. **8** is partly diagrammatic end view of the code cancelling station.

FIG. **9** is a plan view of the code cancelling gates and operating mechanism.

FIG. **10** is an elevation of a discharge activating means.

FIG. **11** shows a feed out switch.

FIG. **12** is a plan view showing the association of the feed out switch and stacking conveyor with the coding conveyor.

FIG. **13** is a side view of FIG. **12**.

FIG. **14** shows the release means for controlling the discharge of articles from the storage rail.

FIG. **15** is a side view of the switch from the storage conveyor to a transporting conveyor, and

FIG. **16** is a plan view of FIG. **15**.

In the preferred form of the invention the general arrangement of the apparatus is illustrated in FIGS. **1** and **2**. A coding conveyor **1** is supported upon a suitable structural framework **2** and has a continuous horizontal path about which articles may be moved as will be described further herebelow. At right angles to the coding conveyor **1** are a plurality of storage rails **3** having a stacking and spacing conveyor **4** associated therewith. The storage rails can in turn be discharged onto a transporting conveyor **5** to move the selected and sorted groups of articles for delivery for storage in cool stores of Freezing Works.

The present invention is designed particularly for use in sorting carcasses into various grades in a freezing industry. Although it will be appreciated that the principle of the invention could be applied in any industry where it was desired to sort or select articles.

The carcasses to be graded travel along a feed-in rail **6** to be delivered on to the coding conveyor **1**. The type of conveyor mechanism used in the coding conveyor has been described in our New Zealand Patent specification No. 142611 and at the portion of the conveyor where the articles are fed in the conveyor could operate as a queuing conveyor so that the articles fed in would be picked up by a conveying unit **7**. Each conveying unit would have associated therewith a code carrying means **8** and once an article was engaged with the conveying unit **7** the conveyor would operate as a fixed conveyor, that is the conveying unit would not disengage from the article being conveyed until it had reached the discharge point.

The code carrying means **8** is moved passed a code setting station **9** where an operator by activating a control panel **11** can set the code carrying means with a selected code which will control the discharge point of the article from the conveyor. Immediately beyond the code setting station **9** is a cancelling station **10** whereby the operator can cancel the code should an incorrect code have been set on the code carrying means.

The conveying unit **7** moves the carcass **12** around the coding conveying **1** until the code carrying means activates the activating switch **13** which will operate a feed-off switch **14** to move the carcass **12** on to the selected one of the storage rails **3**. The carcass will then be moved along the storage rail by the conveyor **4** which may either be a queuing conveyor or a pulse conveyor and when the storage rail is full or when desired a discharge control means **15** can be activated by a control panel **16** so that the articles will be fed from the storage rail on to the further conveyor, **5**.

FIGS. 3 and 5 illustrate in more detail the code carrying means 8. The code carrying means is mounted on top of the conveyor chain 17 and comprising a base plate 18 from which two vertical plates 19 and 20 extend. These plates are spaced apart by bushes 21 through which pins 22 may slidably move. The pins are arranged so that once set it requires a considerable force to alter the position thereof, for example by having spring members 19*a* engaging about the pins. Any suitable other arrangement for controlling the movement of the pins in this way may also be used. A plurality of coding pins 22 are carried on the code carrying means 8 and once again this number may be varied, depending upon the size and number of discharge points required to be fed using the coding conveyor. The horizontal conveying chains are supported in a channel with rollers and skids 23 in the normal manner. It is important to ensure that the height at which the code carrying means is moved about the conveyor, does not vary substantially. To this end, horizontal platforms 23*a* may extend on either side of the portion carrying the rollers of the conveyor rail, and support members or arms 23*b*, extend from the member 8 and are arranged to engage with the platforms 23*a*, preferably with a wear pad 23*c* provided between the arms and the upper surface of the platform 23*a*.

Also the top of the code carrying means is confined within the guiding rails 24, particularly over the portions of the conveying path where the code carrying means will be set or will activate a discharge switch.

It will be appreciated that while one preferred form of coding means has been described in detail with reference to FIGS. 3 to 5, this is by way of example only.

FIGS. 6 and 7 illustrate the code setting station 9. The code setting station is mounted so that the code carriers will move there through and can be operated so that a pin or pins 22 will be moved to represent a code which will control the discharge point of the article from the coding conveyor. The coding station 9 can have two banks of pneumatically operated cylinders 25 which align with the pins 22 on the code carrying member 8 and can displace the pins 22 from a central position towards one or other side. Each pneumatic cylinder 25 has an operating head 26 arranged to engage with a wiping arm 27 which is projected out from the side 28 of the inner face of the frame of the coding station 9, so that one end of the pin 22 will engage therewith and as code carrying means are there passed the pin will be displaced away from the wiping 27 to project as is illustrated with the pin 22a in in FIG. 6. A simple code may be used, that is where only one pin is displaced or a compound code where two or more pins are displaced. The complexity of the coding will once again be dictated by the number of discharge points from the coding conveyor.

The operator standing at the control panel 11 by pressing buttons or switches on the control panel can energize a selected cylinder or cylinders 25 to set the required code dependant upon the particular carcasses moving past on the conveyor.

It is possible for the operator to set an incorrect code and for the coding member to have moved through the station before the error is corrected. Therefore, it is necessary to provide a concelling station 10 illustrated in FIGS. 8 and 9. The cancelling station 10 simply comprises of two pivotly supported gates 29 and 30 controlled through a linkage 31 so that upon operation of the pneumatic cylinder 32 the gates will close to a position that such any code setting of the pins in either direction on a code carrying device has moved through the cancelling station the gates 29 and 30 will move from the inoperative position shown in dotted outline in FIG. 9.

FIG. 10 diagrammatically illustrates the discharge control means 13. The discharge mechanism is fitted before each of the storage rails 3 and has a switch 33 supported on an arm 34 mounted on a sleeve 35 which can be set to a predetermined position on a column 36. The position will correspond with a pin 22 carried by the coding carrying means 8 but as the code carrying means is moved around the conveyor 1 the pin 22a which has been set at the coding station will engage with the appropriate pre-set switch 33 to activate the associated feed-off switch 14.

The feed-out switch 14 is more particularly illustrated in FIGS. 11 to 13 of the accompanying drawings. The switch blade 37 is carried upon an arm 38 which has a guiding pin 39 associated with support bracket 40. The switch blade may be pivotted or may be raised or lowered by the pneumatic cylinder 41 from a position shown in dotted outline on FIG. 11, to a position illustrated in full line on FIG. 11. When in the lower position the skid 42 used to carry the carcass 12 along the rail 1 will move up the inclined slope 43 of the switch blade to disengage from the rail of the conveyor 1 and to move around the switch blade 37 onto the storage rail 3.

The cylinder 41 is activated by the switch 33 so that the switch blade will be in a position as illustrated in FIG. 11 to remove the skid 42 and carcass supported thereon from the rail of the conveyor 1. The switch blade 37 is arranged so that there is a downward slope 43 away from the rail 1 and the conveyor and skid will slide down this slope and onto the rail 3 which also has the initial portion thereof with a slight slope.

The lead-in on the switch blade 37 is recessed into the rail as illustrated in FIGS. 11 to 13, and this facilitates the transference of the carrier 42 onto the switch 37.

A further switch 44 is provided, for example, adjacent to the top of the rail, so that as the skid moves past the switch the pneumatic cylinder will be operated to once again move the switch blade 37 to a position away from the rail of the conveyor 1. This means that once an article has been discharged from the coding conveyor the switch blade 37 is again returned automatically to a position so that any other article moving along the conveyor not intended for discharge along that particular storage rail may move past the storage rail until the code carrying member 8 operates the appropriate discharge switch.

It is desirable for the discharge switches to be capable of manual operation and the conveying attachments allow articles to be manually pushed through the conveyor so that the conveyor can be cleared in the event of a mechanical or electrical failure.

The carcasses 12 stacked on the storage rail 3 may be selectively discharged onto the conveyor 5 and the discharge control means 15 and switch are illustrated in FIGS. 14 to 16 in the accompanying drawing.

As previously stated each rail 3 has a stacking conveyor4 associated therewith. In one form of stacking conveyor, conveying members 45 are arranged to engage with the skid and to leave the skid and hence the carcasses supported thereby closely stacked along the rail. Each conveying member 45 has a pin 46 projecting therefrom and by supporting a plate 47 beside the rail the pin 46 will engage with the inclined face thereof and ride up so that the conveying member 45 is disengaged from the skid. Subsequent members will operate to deposit the skid in a stacked relation relative to the other skids and then ride over the remaining skids on the storage rail. The conveyor will not move the front skid to the end of the rail until the plate 47 has been removed. The plate 47 is supported on an arm 48 slidably mounted in a sleeve 49 supported from the frame 50 and a pneumatic cylinder 51 is arranged to control the reciprocal movement of the plate 47 from a position where the plate will engage with the pins 46 to a position free from the pins 46. The movement of the plate 47 is controlled from the control panel 16. Here again the complexity of the control system will depend to some extent upon the number of storage rails provided.

In this context it should also be mentioned that the type of conveyor used with the storage rails should be simple and involve the minimum of expense.

Once the plate 47 has been removed from the skids and carcasses attached thereto will be moved to the end of the rail 3. The rail 3 is inclined downwardly slightly and the carcasses will slide under their own weight down on to the switch member 52 which is normally biased to the upper position shown on the dotted outline in FIG. 15 but upon a skid moving on to this member will be lowered to the position in engagement with rail 53 of the conveyor 5. The switch blade 52 is also shaped so that the skid will be turned around on to the rail giving a feed-in action. This conveyor 5 may also be a queuing conveyor and the skids with the carcasses attached will be taken and delivered to, for example, a cool store in the Freezing Works.

The switch member 52 includes a station bar thereon so that if any conveying unit is moved past the switch when in the down position delivering a carcass or other unit being carried on to the conveyor rail, the conveying unit will release the article being carried and will commence a queuing action.

By using the present invention an operator at the coding panel is able to determine the path of the carcass on to the storage rail and at intervals either the same operator or another operator can control the discharge of the grouped and graded carcasses into the cool store. It will be appreciated that the present invention enables grading and sorting to be performed simply and efficiently.

The preferred embodiment of the invention above described has utilized mechanical operation and pneumatic cylinders and air circuitary to control the position of the various components. The Freezing Industry is one where it is necessary to maintain a high degree of cleanliness and conveyor apparatus must be able to be hosed down for cleaning without in any way affecting the operation of the coding or various other operating components necessary for the invention.

The principle embodied in the invention could, however, be applied using electrically operated components for example, with electrically operated components replacing the pneumatic cylinders and air circuitary or with a different type of coding associated with the code carrying member which could be sensitive to beams of light, force fields or other similar devices where a particular setting on one member can be selectively used to activate another member, controlling the point of discharge from the conveyor.

What I claim is:

1. Apparatus for sorting and selecting articles on a single rail conveyor path comprising: a substantially horizontal conveyor main rail having a plurality of branch rails extending therefrom, a continuous horizontal conveyor chain operating inside said main conveyor rail carrying attachments associated with the articles, a plurality of conveying attachments engaged with said conveyor chain and arranged to move the carrying attachments along said conveyor main rail, a plurality of code carrying means mounted on said conveyor chain, said code carrying means having a plurality of members mechanically movable in a lateral direction from a neutral position to a coding position, said code carrying means being arranged to be associated with an article being moved along said conveyor main rail by the conveying attachments, a code setting station including remotely controlled selectable setting means which can be activated so that a code will be set on the code carrying means as it moves through the station, at least two code cancelling means, one preceding the code setting station and one following the code setting station, the cancelling means following the code setting station being optionally activated by an operator and code cancelling means preceding the code setting station being continuously actived to clear any pre-set codes on the code carrying means, switch blades associated with each rail which, on activation, guide the carrying attachments in a lateral direction onto the branch rails, a plurality of code reading stations each corresponding to an individual switch blade which, upon mechanically decoding a unique code associated with their respective branch rail, activates the corresponding switch blade, said conveying chain being supported within a channel having rollers to minimize side movement, and supports along the base of the channel to minimize vertical movement and said code carrying means having support members engageable with supporting surfaces associated with said channel to support said code carrying members as they are moved along said conveying paths.

2. The apparatus as claimed in claim 1 in which the switch blade, on activation, descends from a position clear of the rails to engage at opposite ends with the main rail and with the branch rail to lift an approaching carrying attachment off the main rail and thence guide it laterally and downwardly onto the branch rail.

3. The apparatus as claimed in claim 1 in which said code carrying means comprises a support frame and said members comprise pins distributed in a vertical plane, slidably mounted and arranged to project from either side of the frame, frictional engagement means retaining the pins in the set position, said selectable setting means comprising a pivotal arm movable from a position parallel to the frame, frictional engagement means retaining the pins in the set position, said selectable setting means comprising a pivotal arm

movable from a position parrallel to the frame to an inclined position to engage with the pins and set a code onto the code carrying means, and a force generating means to move the arm to the inclined position.

4. Apparatus for sorting and selecting articles on a single rail conveyor path comprising: a substantially horizontal conveyor main rail having a plurality of branch rails extending therefrom, a continuous horizontal conveyor chain operating inside said main conveyor rail carrying attachments associated with the articles, a plurality of conveying attachments engaged with said conveyor chain and arranged to move the carrying attachments along said conveyor main rail, a plurality of code carrying means mounted on said conveyor chain, said code carrying means having a plurality of members mechanically movable in a lateral direction from a neutral position to a coding position, said code carrying means being arranged to be associated with an article being moved along said conveyor main rail by the conveying attachments, a code setting station including remotely controlled selectable setting means which can be activated so that a code will be set on the code carrying means as it moves through the station, at least two code cancelling means, one preceding the code setting station and one following the code setting station, the cancelling means following the code setting station being optionally activated by an operator and code cancelling means preceding the code setting station being continuously actived to clear any pre-set codes on the code carrying means, switch blades associated with each branch rail which, on activation, guide the carrying attachments in a lateral direction onto the branch rails, a plurality of code reading stations each corresponding to an individual switch blade which, upon mechanically decoding a unique code associated with their respective branch rail, activates the corresponding switch blade, the switch blade, on activation, descending from a position clear of the rails to engage at opposite ends with the main rail and with the branch rail to lift an approaching carrying attachment off the main rail and thence guide it laterally and downwardly onto the branch rail.

5. The apparatus as claimed in claim 4 in which said conveying chain is supported within a channel having rollers to minimize side movement and supports along the base of the channel to minimize vertical movement, and said code carrying means having support members engageable with supporting surfaces associated with said channel to support said code carrying members as they are moved along said conveying paths.

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