Sept. 12, 1950 J. A. STAKE 2,521,876

APPARATUS FOR DETECTING LIGHTWEIGHT PACKAGES AND ARTICLES

Filed Feb. 17, 1945 2 Sheets-Sheet 1

Fig. 1.

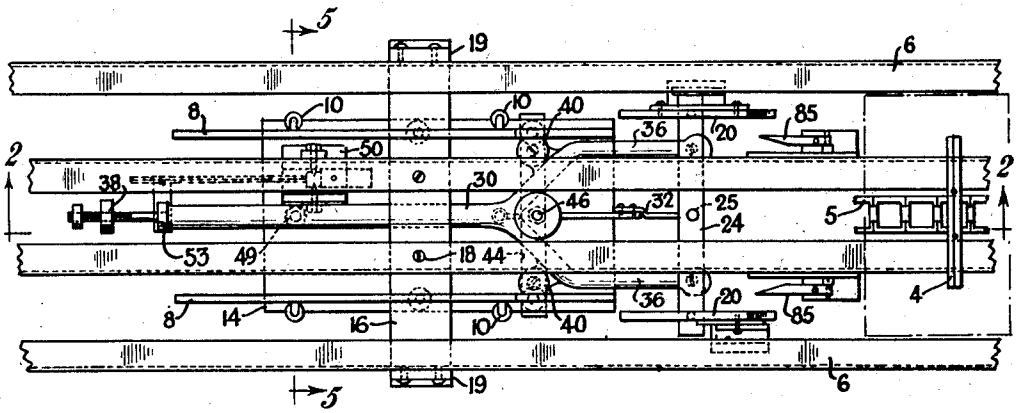
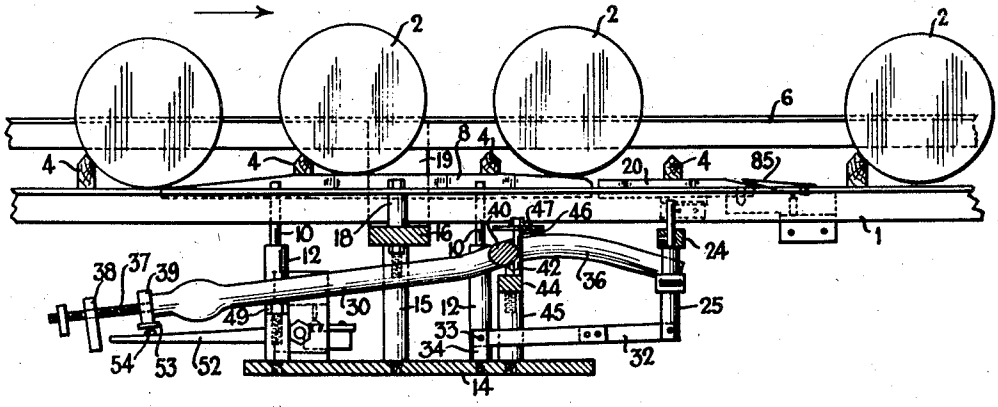


Fig. 2.



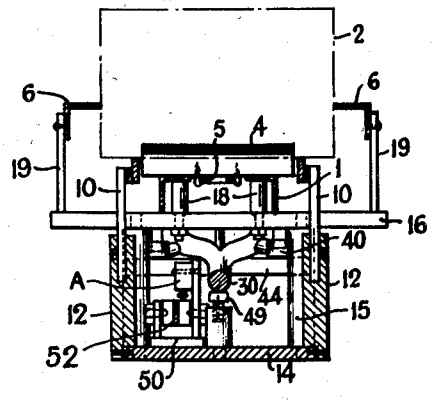


Fig. 5.

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Filed Feb. 17, 1945 2 Sheets-Sheet 2

Fig. 3.

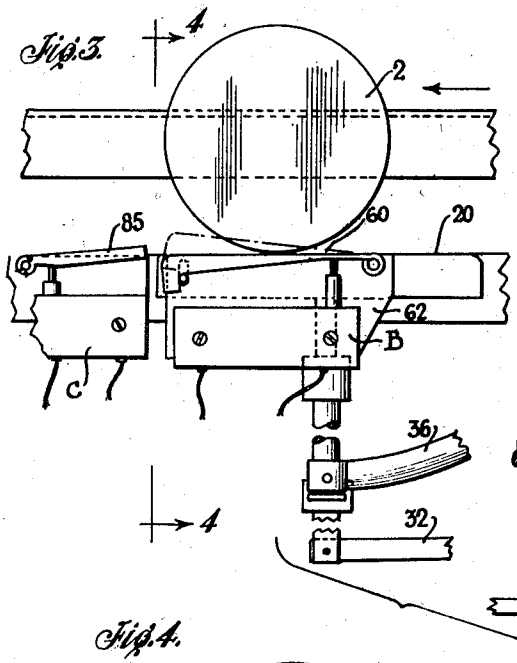


Fig. 6.

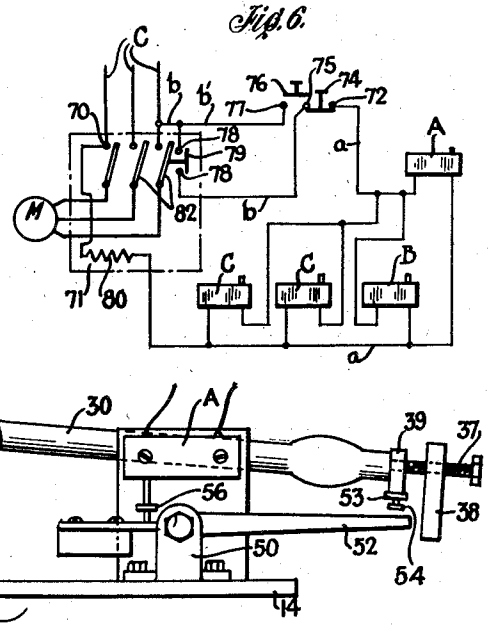
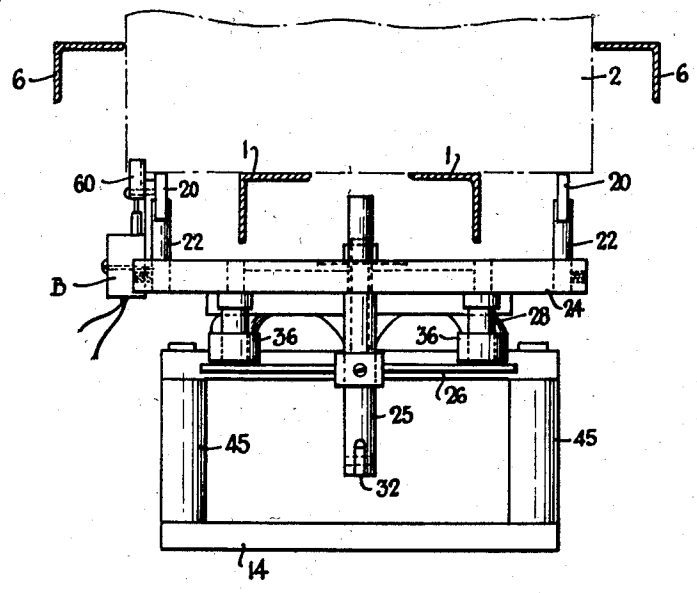


Fig. 4.



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UNITED STATES PATENT OFFICE

2,521,876

APPARATUS FOR DETECTING LIGHT-WEIGHT PACKAGES AND ARTICLES

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19 Claims. (Cl. 198—37)

1

The present invention relates to devices, to be incorporated in a conveying system, for detecting light-weight packages and articles as they pass along the conveyor. While the principles of the invention may be applied to a variety of conveyor systems, the invention is illustrated as associated with conveyors in which cylindrical containers are rolled in a horizontal path through the conveyor system. Conveyors of this type often are interposed between a container filling machine and a wrapping device which applies a cover about the filled container.

In packaging such materials as cereals or the like it is essential that all of the packages contain the required weight of contents, and it is the purpose of the attachment shown and described herein to detect any light weight packages while on the conveyor.

The device shown herein automatically arrests the movement of the conveyor when an underweight package is found thereon and for this purpose there is located in the conveyor, a movable track section which is counterweighted so that packages which contain the correct amount (or an excess) will depress the track section and be passed in an uninterrupted stream along the conveyor. When a light weight container reaches the counterweighted track section the track section will not be depressed but the conveyor will stop, and the light weight container can be removed. This method of detecting under-weight containers requires that the conveyor be kept in motion at all times, except when a light weight package has passed or is passing over the movable track section.

The problem has been, therefore, to devise an attachment for a conveyor of the type described which will permit the conveyor to operate continuously when no package is on the movable track section and when a full weight package is passing over the track section, but will stop the conveyor when a light weight package passes over the track section.

The mechanism shown and described herein responds to the special and peculiar requirements set forth, for it will act to stop the conveyor only when the counterweighted section is not depressed although a container is passing over it.

The mechanism to accomplish this result is simple and effective and has been found to operate so as to detect unerringly packages which are within an ounce of the requisite weight. While the drawings and description illustrate the best known and preferred embodiment of the invention as it has been successfully employed in

2

actual mill operations, it is possible that details thereof may be modified or improved upon within the scope of the invention as set forth in the appended claims.

In the drawings:

Fig. 1 is a plan view of a section of a conveyor of the type in which cylindrical containers are rolled along a track, which has incorporated therein the counterweighted track section or weighing platform for detecting under-weight containers;

Fig. 2 is an elevation thereof, this view showing a container as it starts to roll on to the counterweighted track section. Parts of the device are shown in section;

Fig. 3 is a somewhat enlarged view of the device directly at the counterweighted section, this view being taken looking in the opposite direction from Fig. 2, and showing a full-weight container at the weighing point;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a section on the line 5—5 of Fig. 1; and

Fig. 6 is a diagram of the wiring for the various switches which control the operation of the conveyor driving motor.

The conveyor in which the invention is incorporated comprises two parallel supporting rails 1 over which the cylindrical containers 2 roll as they are propelled in the direction of the arrows in Figs. 2 and 3 by a series of transverse slats or pushers 4 carried by an endless chain 5 which moves between the rails 1. The chain is shown in Figs. 1 and 5, but is omitted from the other views so as not to confuse the illustration. Above the rails 1 are located the two side rails 6 for the ends of the containers. The conveyor is of a standard construction and is illustrated merely for the purpose of showing the application of the invention. The conveyor chain is driven by a motor indicated at M in Fig. 6.

As the containers approach the weighing station, which in the form of the invention illustrated herein consists of a counterweighted track section which acts as a weighing platform, they are pushed up onto two elevated parallel stationary rails 8, the discharge ends of which are downwardly inclined so that as the containers are about to pass onto the counterweighted track section, each container will roll ahead of its slat 4 and will pass of its own momentum onto and through the weighing section. This insures that the container is completely freed of the propelling mechanism, which is necessary in

order to obtain correct weighing of the package.

Each rail 8 is attached to two posts 10, the lower ends of which are seated in larger posts 12. The lower ends of the posts 12 are partially cut away to fit along the edges of a supporting plate 14 as shown in Fig. 5. This plate 14 supports the scale beam and its associated parts and is suspended by two posts 15 from a transverse beam 16. The beam 16 is secured to the rails 1 by bolts 18 and at its ends is provided with vertical arms 19 fastened to the side rails 6.

The movable weighing platform or track section, to which reference has been made, comprises two short rails 20 located immediately at the discharge end of the stationary rails 8. The rails 20 are supported in the upper ends of posts 22, the lower ends of which are secured in the ends of a transverse beam 24 which extends across the conveyor beneath the rails 1. At its center the beam 24 is fitted over the reduced end of the vertical shaft 25. Secured to the shaft 25 below the beam 24 is the transverse plate 26 and between the plate 26 and the beam 24 are located the two vertical pins 28 to which are secured the forked ends of the scale beam designated as a whole by the numeral 30.

At its lower end the shaft 25 is slotted to receive one end of a two-part link 32, the other end of which is pivoted at 33 to a post 34 rising from the plate 14. It is desirable that the containers roll of their own momentum over the counterweighted track rails and it may happen that the incline from the stationary rails may not be sufficient. The adjustable link 32 provides a means for tilting the rail section 20 slightly to give the needed acceleration to the containers.

Referring to the scale beam 30: The forward end of this member is provided with two parallel arms 36 which are attached to the pins 28 as has been described. At a point approximately one-third of its length the forks unite and form a single arm which extends toward the rear of the attachment where there is located a threaded pin 37 on which the adjustable counterweight 38 and an adjustable switch operating collar 39 are mounted. Closely adjacent the fork the scale beam is provided with two ears 40 which extend on either side thereof to provide the pivotal bearings for the scale beam. To support the scale beam two knife edged pivotal supports 42 are located beneath the ears 40, on a bridge piece 44 mounted on posts 45 rising from the plate 14. Also located on the bridge piece is a pin 46 which rises in the crotch of the fork and is surmounted by a plate 47, this member keeping the scale beam in correct position in the device. An adjustable stop 48 is located beneath the rear end of scale beam 30 to limit its downward movement.

Pivotally mounted in a bracket 50 at the rear of the plate 14 is a pivoted and counterweighted lever arm 52 which extends alongside the rear end of the scale beam. A plate 53 carried by the collar 39 extends over the upper edge of the arm 52 and in this plate is located the adjustable headed pin 54 against which the lever bears. It is possible by this mechanism to secure a fine adjustment of the parts and thus insure an accurate operation of the lever arm 52 which is thereby responsive to slight variations in the weight of the package. The opposite end of the arm 52 carries a pin 56 which operates a microswitch A carried by the bracket 58.

When no container is on the movable rails 20 and also when the container is under-weight so

that it does not overbalance the scale beam and depress the rails 20, the switch A is held open by the scale beam. When, however, the container is of the requisite weight the rails 20 are depressed until the containers rest on the rails 1. This causes the rear end of the scale beam to rise, and the switch A closes. The former condition is shown in Fig. 2 and the latter in Fig. 3.

Located on one of the movable rail sections 20 is the pivoted arm 60 which is held in raised position by a light spring so that it normally projects in the path of the container and will be depressed thereby. This lever 60 actuates a second switch B fastened on a plate 62 carried by the rail 20. This switch B is normally closed. When, however, a package rolls over the lever 60 the switch B will open and the circuit will be broken at this point, whether or not the container is normal in weight.

Referring to the circuit shown in Fig. 6, and disregarding for the moment the switches indicated at C therein: The switches A and B are located in parallel in the line *a* which, with the line *b* constitutes a shunt circuit from the main power lines *c*. If either or both the switches A and B are closed the shunt circuit is not broken. When there is no package on the rails 20, current will flow through the switch B which is closed at such a time, but when a full-weight package is on the rails 20 the switch A is closed and remains closed as long as the full-weight package is on the rails so that current in the line *a*—*b* can pass momentarily through either A or B.

Just as the container is about to roll off the rails 20 it will open the switch B and this will occur whatever be the weight of the container. It will thus be seen that if a container of the correct weight is on the scale, the switch A will sustain the current through the line *a*—*b* while the container is on the rails 20, but if the container is under-weight the current through the line *a*—*b* will be interrupted for the switch A is open, as normal, and the switch B is opened by the package. However, during the time when no container is passing over the movable track section, the current through the line *a*—*b* is sustained through the switch B.

The line *a* leads from a terminal 70 on a switchboard 71 to a terminal 72 at which is located the normally closed switch 74 which may be termed the stop switch. The other contact 75 of the switch 74 is also one contact of a normally open, push-button, starting switch 76. The second contact for the switch 76 is designated at 77. A line *b'* runs from the contact 77 to the line *b* just before it is joined to the main power line *c*. When both switches 74 and 76 are closed, the shunt circuit is complete. In the line *b* are located two contacts 78 for a magnetic switch 79. In the line *a* is located an energizing and holding coil 80 which, when energized, will hold the switch 79 closed. The switch 79 is connected directly to the main power switches 82 for the motor M. The switches 82 are provided with springs which tend to open them. As long as the shunt circuit is maintained, the switch 79 is held closed by the holding coil and the conveyor will continue to operate. The shunt circuit will not be broken unless both switches A and B are open, or the stop switch 74 is opened.

To start the conveyor while the parts are in the condition shown in Fig. 2, the operator momentarily depresses the push-button switch 76

which closes the magnetic switch 78 and starts the motor, and the main motor switch will remain closed as long as current is passing through the coil 80. When a full-weight package passes over the movable track section 20, it closes the switch A and the current is sustained through the lines *a* and *b*, although the switch B is temporarily opened by the passage of the package over it. However, before the package actually passes off the rail so that the switch A will open, the spring lever 60 has been freed and the switch B is again closed and the shunt circuit is not broken. If, however, the package is under-weight the circuit through the holding coil will be broken because both switches A and B will be open due to the fact that the scale beam did not move to close switch A and switch B was opened by the package.

To stop the conveyor at any time the operator presses the switch 74 and the shunt circuit will be broken at this point.

The switch B being a micro-switch is usually quite delicate in its operation and as it is carried on the movable rail section it sometimes will be opened by the jar when the rails 20 move upwardly as the package passes off them. In such case the conveyor will stop and a full package may be rejected. It has been found advisable, therefore, to guard against such an occurrence and for this purpose there have been located on the rails 1 immediately beyond the operating lever 60 for the switch B, a pair of micro-switches C operated by the light spring actuated levers 85. These levers are so located that they will be depressed by the container just after it passes off the lever 60 and before the package actually leaves the rails 20. As seen by an examination of Fig. 6, these switches C are also located in parallelism across the line *a*. These switches C are normally open and will be closed by the passage of the container. They serve to maintain the current in the holding coil 80 for the brief interval before the switch A opens by the action of the scale beam in the event the switch B has momentarily opened. After the packages have rolled over the levers 85 they are again picked up by the pushers 4.

It is believed that the operation of the mechanism and the circuits controlled thereby will be understood from the above description. It will have become apparent that after the conveyor has been started by the operation of the push-button switch 76, it will continue to operate so long as the containers are of adequate weight to depress the scale platform constituted by the movable track section 20. If, however, a container is underweight the scale beam will not depress and the switch A will not close and the circuit through the holding coil will be broken when the package opens the switch B. The conveyor will thereupon stop and the operator can remove the offending package which is the one which has just passed over the weighing platform. He then presses the switch 76 and the conveyor resumes operation. The auxiliary switches C represent a refinement of the invention and serve to correct inaccuracy in operation due to any momentary and accidental opening of the switch B. The push-button switch 74 provides the necessary control for stopping the conveyor at any time.

In describing the invention in its best known operating form it has been necessary to go into certain details of the device which are not essential to operative embodiments of the invention. It will be understood, therefore, that the invention may be altered as to non-essential details without sacrificing any of its benefits. The invention is primarily intended for detecting abnormal weight containers of cylindrical form which will roll onto the weighing section of a conveyor, but the principles thereof may be applied to other types of containers. The invention is also adapted to detect light-weight articles of any nature and is not necessarily restricted to the handling of containers or packages.

What is claimed is:

1. In a conveyor system for handling containers, a conveyor for propelling containers through the system, a motor for driving the conveyor, a movable counterweighted track section in the system, said track section being adapted to be depressed only by a full-weight container, a main power switch for the motor, means actuated by the movement of a container over the track section to open the switch, and a device for holding the power switch in closed position if the track section is depressed.

2. In a conveyor system for handling containers, a conveyor for propelling containers through the system, a motor for driving the conveyor, a movable counterweighted track section in the system over which the containers are moved by the conveyor, said track section being depressible only by full-weight containers, a main power switch for the motor, a holding coil for keeping the power switch closed, a circuit for the holding coil, a normally open switch and a normally closed switch in parallel in the circuit, said normally open switch being closed when the track section is depressed, and said normally closed switch being opened by the container on the track section.

3. In a conveyor system for handling containers, a conveyor for propelling containers through the system, a motor for driving the conveyor, a movable counterweighted track section in the system over which the containers are moved by the conveyor, said track section being depressible only by full-weight containers, a main power switch for the motor, a holding coil for keeping the power switch closed, a circuit for the holding coil, a normally open switch and a normally closed switch in parallel in the circuit, said normally open switch being closed when the track section is depressed, and said normally closed switch being in the path of a container while it is moving over the track section, and movable to open position by the container.

4. A conveyor system as described in claim 2 having an auxiliary normally open switch in parallel with the other switches in said circuit, said auxiliary switch being closed by the container as it leaves the movable track section.

5. A conveyor system as described in claim 3 having an auxiliary normally open switch in parallel with the other switches in said circuit, said auxiliary switch being closed by the container as it leaves the movable track section.

6. A conveyor system for handling cylindrical containers, a stationary track section and a movable counterweighted track section in the system, a conveyor for rolling the containers over said track sections, a downwardly inclined discharge end for the stationary track section so that the containers roll ahead of the conveyor and across the movable track section, said movable track section being depressed only when a full-weight container is rolling thereover, and means associated with the movable track section

for causing the conveyor to operate continuously when no container is on it and when it is depressed by a full weight container.

7. A conveyor system for handling cylindrical containers, a stationary track section and a movable counterweighted track section in the system, a conveyor for rolling the containers over said track sections, a downwardly inclined discharge end for the stationary track section so that the containers roll ahead of the conveyor and across the movable track section, said movable track section being depressed only when a full-weight container is rolling thereover, and means associated with the movable track section for causing the conveyor to operate continuously when no container is on it and when it is depressed by a full-weight container, but to cease operating when an underweight container is on the movable track section.

8. In a conveyor system for handling containers, a weighing section in the system, means for moving the containers over the weighing section, said means comprising a conveyor and a motor to drive the conveyor, and two switches adapted to control the motor, one of said switches being closed only when a container of predetermined weight is on the weighing section, the second switch being closed at all times except when a container is on the weighing section.

9. In a conveyor system for handling containers, a weighing section in the system, means for moving the containers over the weighing section, said means comprising a conveyor and a motor to drive the conveyor, and two switches adapted to control the motor, one of said switches being closed only when a container of predetermined weight is on the weighing section, the second switch being normally closed and located at the weighing section in the path of a container, and opened by the movement of the container over the weighing section.

10. In a conveyor system for handling containers, a weighing section in the system, a conveyor for moving the containers over the weighing section, a motor to drive the conveyor, a circuit to control the motor, two switches in parallel in the circuit, one of said switches being closed only when a container of predetermined weight is on the weighing section, the second switch being located on the weighing section, and actuating means for the second switch adapted to open said switch by contact with a container while it is on the weighing section.

11. In a conveyor system for handling containers, a weighing section in the system, a conveyor for moving the containers over the weighing section, a motor to drive the conveyor, a circuit to control the motor, two switches in parallel in the circuit, one of said switches being closed only when a container of predetermined weight is on the weighing section, the second switch being located on the weighing section, actuating means for the second switch adapted to open said switch by contact with a container while it is on the weighing section, and an auxiliary switch also in parallel in the circuit, said auxiliary switch being located in position to be closed by the container as it leaves the weighing section.

12. A conveyor system as set forth in claim 10 in which means are provided to cause the containers to free themselves of the conveyor while they are passing over the weighing section.

13. In a conveyor system for handling cylindrical containers, a conveyor for rolling the containers through the system, a motor for driving the conveyor, a counterweighted track section in the system, said track section being in normally raised position but moved to a lowered position by a full weight container and means controlled by the position of the track section for shutting down the motor when an underweight container is on the raised track section.

14. In a conveyor system for handling cylindrical containers, a conveyor for rolling the containers through the system, a motor for driving the conveyor, a counterweighted track section in the system, said track section being in normally raised position but moved to a lowered position by a full weight container and means controlled by the position of the track section for shutting down the motor when an underweight container is on the raised track section and means for maintaining the motor in operation when the track section is in lowered position and also when no container is on the track section and while the track section is in its normally raised position.

15. An apparatus for detecting light-weight packages in a package conveying system, comprising a conveyor, power means for driving the conveyor, a counterweighted scale located in the conveyor, said scale being in a normally raised position but moved to a lowered position by a package of at least normal weight, means to cause packages of normal weight to move in a continuous stream over the scale while free of the conveyor, and means located at the scale and projecting into the path of the packages, said last named means including an arrester for the power means operative when a light-weight package is moving over the scale.

16. An apparatus for detecting light-weight articles in a conveying system, a conveyor, a weighing station in the system, a counterweighted platform at the station over which articles are passed by the conveyor, said platform being in normally raised position and not moved by a light weight article but moved to a lowered position by an article of full weight, means for driving the conveyor to pass full-weight articles through the station without interruption and means to control the conveyor driving means, said control means being responsive to the position of the platform and shutting down the driving means whenever a light-weight article passes onto the platform.

17. An apparatus for detecting light-weight articles in a conveying system, a conveyor, a weighing station in the system, a counterweighted platform at the station over which articles are passed by the conveyor, said platform being in normally raised position and not moved by a light weight article but moved to a lowered position by an article of full weight, means for driving the conveyor to pass full-weight articles through the station without interruption and means to control the conveyor driving means, said control means being reponsive to the position of the platform and shutting down the driving means whenever a light-weight article passes onto the platform but not interrupting the operation of the driving means when no article is on the platform.

18. An apparatus for detecting light-weight cylindrical articles in a conveying system, comprising a conveyor, driving means for the conveyor, a weighing platform in the system said platform being counterbalanced to be moved from a normally raised position to a lowered position by an article of the prescribed weight, but remaining in its raised position when a light

weight article or no article is on the platform, and means connected with the weighing platform for controlling the conveyor driving means, said last named means being responsive to the position of the platform and operative to arrest the conveyor whenever an article of light-weight is on the platform, but not interrupting the operation of the driving means when no article is on the platform or when an article of the prescribed weight is on the platform.

19. An apparatus for detecting light-weight cylindrical articles in a conveying system, comprising a conveyor, driving means for the conveyor, a weighing platform in the system said platform being counterbalanced to be moved from a normally raised position to a lowered position by an article of the prescribed weight, but remaining in its raised position when a light weight article or no article is on the platform, an inclined section in the system which causes the articles to roll onto the weighing platform of their own momentum and means connected

with the weighing platform for controlling the conveyor driving means, said last named means being responsive to the position of the platform and operative to arrest the conveyor whenever an article of light-weight is on the platform, but not interrupting the operation of the driving means when no article is on the platform or when an article of the prescribed weight is on the platform.

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