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W. J. LUECKEL

2,284,490

GRAVITY CONVEYER

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Fig. 1.

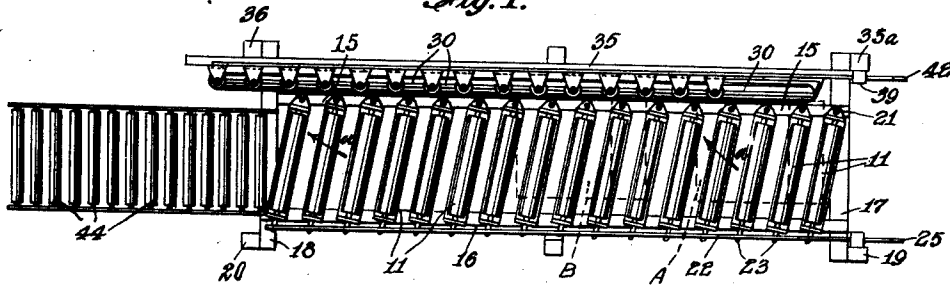


Fig. 4.

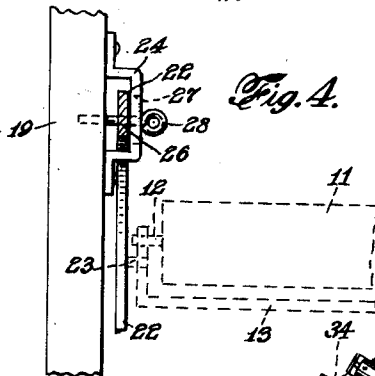


Fig. 2.

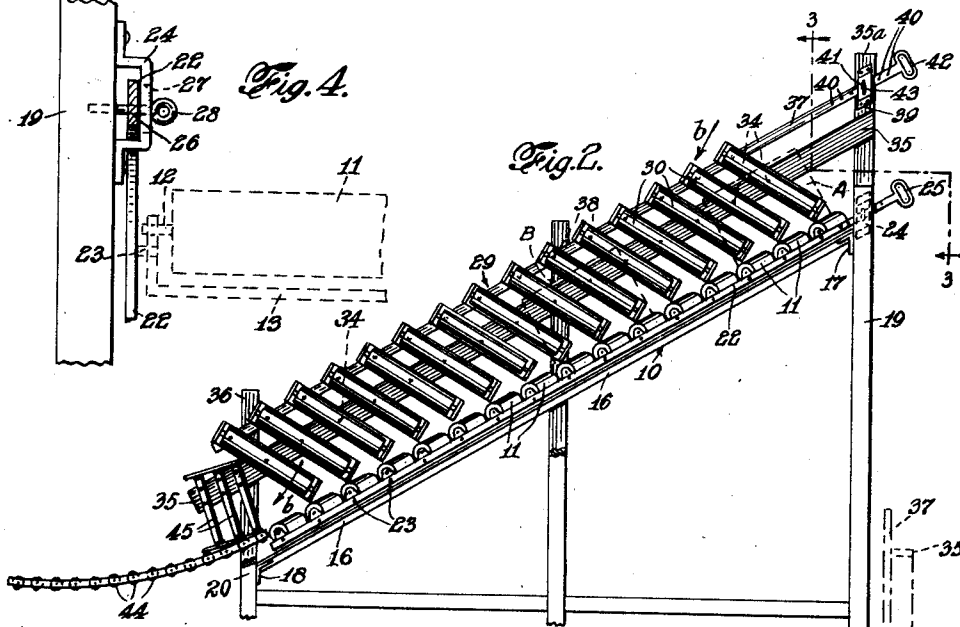


Fig. 3.

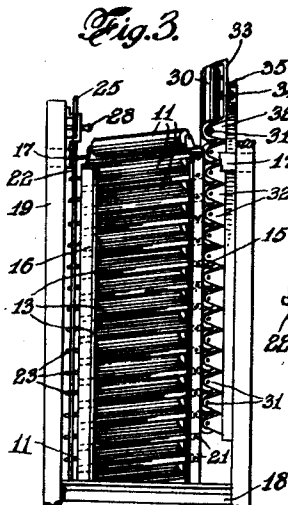
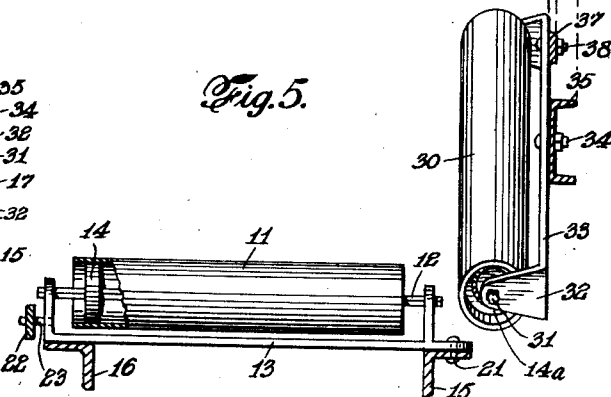


Fig. 5.



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2,284,490

GRAVITY CONVEYER

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Application August 3, 1940, Serial No. 350,869

16 Claims. (Cl. 193—35)

My invention relates to improvements in means for transporting or conveying objects, articles or packages from one point to another in mills, factories, packing plants, or for other purposes, and the same has for its object to provide a simple, reliable and efficient apparatus which serves to automatically convey the package or other article over a route from a higher elevation to a lower elevation by gravity, and to control the speed or velocity thereof en route by a retarding effect thereon in opposition to the effect of the acceleration due to gravity.

Further, said invention has for its object to provide an apparatus of the character specified in which the retarding effect available is substantially augmented compared to that now available in practice to permit of the use of gravity conveyers having a correspondingly wider range of inclinations or grades for the descent of packages at desired controlled speeds.

Further, said invention has for its object to provide an apparatus of the character specified in which the speed retarding action thereof is imposed upon more than one of the surfaces of the package or other article to maintain the desired speeds.

Further, said invention has for its object to provide an apparatus of the character specified in which the speed retarding means thereof coact to exert said augmented retarding action upon the package, and also to retain the package or other article upon the conveyer during travel thereover.

Further, said invention has for its object to provide an apparatus of the character specified in which the retarding means are disposed in angularly related planes, and impose respectively, a downwardly directed pressure and a laterally directed pressure upon the package or other article to control the speed thereof.

Further, said invention has for its object to provide an apparatus of the character specified in which a frictional retarding action is exerted upon the bottom and upon a side of the package to control the speed thereof.

Further, said invention has for its object to provide an apparatus of the character specified in which the article supporting portion thereof, constituting one package retarding means, and the angularly disposed portion, constituting the other package retarding means, comprise rollers disposed at such angles to the line of direction of travel of the package that the rollers of each portion tend to force the package against rollers

of the other portion to render the joint retarding action thereof effective upon the package.

Further, said invention has for its object to provide an apparatus of the character specified in which the angularity of the rollers of either retarding portion, or both, may be adjusted or coordinated to control the retarding effect in accordance with the inclination of the conveyer, the weight of the package or other conditions.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends my invention consists in the novel features of construction, and in the combination, connection and arrangement of parts hereinafter more fully described and then pointed out in the claims.

In the accompanying drawing:

Figure 1 is a plan of one form of conveyer constructed according to and embodying my said invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is an end view, partly in section on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged detail of one of the roller shifting means, and

Fig. 5 is an enlarged detail of the roller supports or holding brackets.

Referring to the drawing, the conveyer comprises a downwardly inclining series of horizontally disposed parallel rollers 11 each journaled upon an axial shaft 12 which is secured at the ends thereof in a holding bracket or frame member 13. The several axial shafts 12 are preferably of hexagonal cross-section to be supported at the ends in correspondingly shaped openings in the frame members 13 for preventing rotation of the shafts. Ball-bearings 14 are interposed between each shaft 12 and the roller 11 proper.

The series of frame members 13 are supported at opposite ends thereof upon the downwardly inclined members 15 and 16, preferably of angular or channel cross-section, which are in turn supported at the upper and lower ends thereof upon the transverse angle members 17 and 18 secured to the vertical standards 19 and 20. The frame members 13 at the ends thereof supported by the member 15 are swiveled or pivoted at 21 to the latter for swinging movement of the frame members 13 in unison. Said frame members 13 are slidably supported at their opposite ends upon the member 16, so that the angular position of the rollers 11 relative to the line of direction of travel of the package or other article upon the

conveyer 10 may be adjustably varied for a purpose hereinafter described. The rollers 11 are preferably thus adjusted by an actuating member 22 pivotally connected at successive points 23 to the successive frame members 13 at the ends thereof which are slidably supported upon the member 16. The actuating member 22 extends through a guide 24 upon the upper portion of the contiguous standard 19 and terminates in a handle 25. The angular position of the rollers 11 may be varied, while retained in parallel relation, by grasping the handle 25 and moving the member 22 in or out. The member 22 is secured in adjusted position preferably by providing a longitudinal series of holes 26 therein adapted to register with individually aligned vertical slots 27 in the guide 24. The member 22 is locked to retain the rollers 11 in their various positions of adjustment by inserting a pin or other device 28 through the slots 27 and any opening 26 aligned therewith.

In the present invention, the conveyer 10, in which the rollers 11 are disposed at an angle to a line normal to the line of direction of travel of the package, is associated with a similar package guiding member 29 disposed at right angles thereto at the side thereof adjacent to the ends of the rollers 11 contiguous to the pivots 21 above the level of the rollers 11 in order to receive the thrust of the package and frictionally engage the side of the package, the inclinations of the rollers 11 being such as to deflect or urge the package transversely to the direction of travel of the package into engagement with the lateral portion 29. The two members or portions 10 and 29 constitute mutually coacting means serving to exert a frictional speed retarding action not only upon the bottom of the package but also upon a side thereof whereby to render available a retarding action upon the package which is substantially greater than that which would be available if such retarding action were applied to the bottom or one side only of the package.

The laterally disposed speed retarding member or portion 29 preferably comprises a series of parallel rollers 30 disposed in a vertical plane. Each roller 30 is journaled upon an axial shaft 31, preferably of hexagonal cross-section for the same purpose as the shaft 12, secured in a frame member or holding bracket 32, similar to the bracket 13. Each roller 30 rotates upon ball-bearings 14^a as above described. The brackets 32 centrally of the base 33 thereof are pivotally supported successively at 34 upon the inclined channel or other member 35 secured at the upper end thereof to the vertical standard 35^a and at the lower end to the vertical standard 36.

The rollers 30 are adapted to be swung about their pivots 34 into various angular positions relative to the vertical by the actuating member 37 pivotally connected at successive points 38 to the upper ends of the members 33 and operating in a guide 39 on the standard 35^a. The member 37 is locked in position to retain the rollers in various adjusted angular positions by providing a series of holes 40 longitudinally therein adapted to register with vertical slots 41 in the guide 39. When the member 37 is moved in or out by the handle 42 it may be locked in any position by inserting a pin or other device 43 through the slots 41 and the hole 40 registering therewith.

When in an operative position for controlling the speed of the package the axes of the successive lateral rollers 30 in the vertical plane ex-

tend upwardly and forwardly, that is in the direction of the lower end of the conveyer 10, at inclinations to a line normal to the direction of package travel, and the axes of the horizontal rollers 11 of the conveyer 10 extend from the lateral rollers 30 transversely at an angle to a line normal to the direction of travel of the package and in the direction of the lower end of the conveyer 10. The axes of the rollers 11 and 30 disposed in right angular relation thus diverge in the direction of the lower end of the conveyer 10. With this arrangement the package engaging portion of the apparatus is increased to be effective not only upon the bottom of the package but also upon a side thereof for frictionally retarding the speed of the package, the portions 10 and 29 mutually coacting through the package so that a total speed retarding or braking effect can be produced which represents the sum of the individual retarding effects of the portions 10 and 29.

At the lower end of the conveyer 10 horizontal rollers 44 form an extension thereof to bring the package out into a horizontal or slightly inclined plane. The rollers 44 are in close relation to each other to prevent as much as possible the package at the forward lower edge thereof from digging in between the rollers. The vertical rollers 45 at the lower end of the lateral roller portion 29 are supported in stationary bearings and provide means for guiding the package until the package disengages the lowermost horizontal roller 11 and the lowermost side roller 30 to render the speed retarding action ineffective.

In operation, when the package in the position A starts sliding down the conveyer 10, the rollers 11, because of the angular displacement thereof from normal, tend to force or urge the package laterally against the rollers 30 in the vertical plane, as indicated at the position B, imposing a pressure through the package upon said rollers 30 in the direction of the arrow *a*. The rollers 30 in turn, because of the angular displacement thereof from normal, urge the package against the horizontal rollers 11 to impose pressure in addition to gravity thereon in the direction of the arrow *b*. The portions 10 and 29 thus coact to impose upon the bottom and the one side of the package, as the latter descends the conveyer or chute 10 under the influence of gravity, a substantial braking or frictional retarding effect in opposition to the effect thereon of the acceleration due to gravity in order to maintain the speed or velocity of the package within desirable limits.

When the actuating member 22 is moved downwardly to decrease the angular relation of the rollers 11 to the line of travel, the pressure exerted by the package against the roller portion 29 is increased and vice-versa. When the actuating member 37 is moved downwardly to decrease the angular relation of the rollers 30 to the line of travel, the pressure exerted thereby through the package against the rollers 11 is increased, and vice-versa. Either set of rollers 11 and 30, or both, may thus be adjusted for controlling the retarding effects exerted thereby and coordinating the same to maintain desirable package speeds in accordance with the requirements of use and the characteristics of the conveyer as to inclination and length.

By subjecting the package, as in my invention, to a retarding action imposed upon more than one side thereof, as upon the bottom and one side of the package, a correspondingly great-

er maximum retarding effect becomes available for maintaining desirable speeds, thereby allowing the use of conveyers varying in length and inclination over a wider range for the free descent of the package by gravity at controlled speeds. For example, conveyers embodying my invention having an inclination of thirty degrees or more are rendered available for delivering packages to their destination at adequately controlled speeds.

In my invention the package retarding portions 10 and 29 interact upon each other through the package to render each portion operative to exert a retarding action upon the package, and also to retain the package in place upon the conveyer during the descent of the package.

Having thus described my said invention, what I claim and desire to secure by Letters Patent is:

1. An apparatus of the character described comprising inclined conveying means including roller portions in angularly related planes engageable with the bottom and a side of the article to be conveyed, the rollers of each portion being angularly displaced from the normal to the direction of travel and having their outer ends diverging and forwardly directed to exert, upon the rotation of said rollers, a pressure on the article urging the latter in the direction of the other roller portion, and vice versa.

2. Apparatus of the character described comprising an inclined gravity conveying means including roller portions in angularly related planes engageable with the bottom and a side of the article conveyed, said portions having the rollers thereof disposed angularly relative to the direction of travel with their outer ends diverging and forwardly-directed to render said portions coactively effective in subjecting said article at a plurality of its surfaces to a retarding action.

3. An apparatus of the character described comprising gravity conveying means including roller portions in angularly related planes engageable with the bottom and a side of the article to be conveyed, the rollers of each portion being disposed in angular relation to a line normal to the direction of travel of the article and having their outer ends directed forwardly in the direction of travel to exert respectively a retarding action upon the bottom and side of the article.

4. An apparatus of the character described comprising gravity conveying means including roller portions in angularly related planes engageable with the contiguous surfaces of the article to be conveyed, the rollers of each portion being disposed in angular relation to a line normal to the direction of travel of the article and being directed to exert respectively a retarding action upon said surfaces of the article, and means for varying the angular position of the rollers of at least one of said portions relative to said normal line.

5. An apparatus of the character described comprising gravity conveying means including roller portions in angularly related planes engageable with the bottom and a side of the article to be conveyed, the rollers of each portion being disposed in angular relation to a line normal to the direction of travel of the article and being directed to exert respectively a retarding action upon the bottom and side of the article, and means for varying the angular position of

the rollers of said portions relative to said normal lines.

6. An apparatus of the character described comprising gravity conveying means including roller portions in angularly related planes engageable with the bottom and a side of the article to be conveyed, the rollers of each portion being disposed in angular relation to a line normal to the direction of travel of the article and being directed to exert respectively a retarding action upon the bottom and side of the article, and independently operable means for differentially varying the angular position of the rollers of said portions relative to said normal lines.

7. An apparatus of the character described comprising an inclined gravity conveying means including angularly related roller portions engageable with the bottom surface and a side surface of the article to be conveyed, the rollers of the portion engaging the bottom surface being disposed at an angle tending to urge the article in the direction of the other roller portion, and the rollers of said other portion being disposed at an angle tending to urge said article in the direction of the first-named portion, and said roller portions interacting through said package to exert a retarding action upon said angularly related surfaces for controlling the speed of the article descending the conveying means.

8. An apparatus of the character described comprising an inclined gravity conveying means including a transverse article supporting roller portion and a roller portion at one side thereof disposed in a vertically extending plane for engagement with the contiguous side of the article conveyed, the rollers of each of said portions extending from the contiguous margins of said portions outwardly and forwardly at an acute angle to the normal to the direction of travel.

9. An apparatus of the character described comprising an inclined gravity conveying means including roller portions disposed in right angular relation for engagement with the bottom and lateral surfaces of the article conveyed, the rollers of each of said portions being disposed in parallelism and extending from the contiguous margins of said portions outwardly and forwardly at an acute angle to the normal to the line of travel, means for supporting each roller of at least one of said portions for movement to various angular positions relative to said normal, and means pivotally connected to said several last-named means for actuating said several last-named means in unison while maintaining the parallel relation of the rollers actuated.

10. An apparatus of the character described comprising an inclined gravity conveying means including angularly related roller portions engageable with the bottom and side of the article conveyed, the rollers of each of said portions extending from the contiguous margins of said portions outwardly and forwardly at an angle to the normal to the direction of travel for causing said portions to interact through said article for retaining the article upon the conveying means and retarding the speed thereof.

11. An apparatus of the character described comprising an inclined gravity conveying means including angularly related roller portions engageable with the bottom and side of the article conveyed, the rollers of each of said portions extending from the contiguous margins of

said portions outwardly and forwardly at an angle to the normal to the direction of travel for causing said portions to interact through said article for retaining the article upon the conveying means and retarding the speed thereof, means at the lower end of said transverse retarding portion having rollers disposed close together in right angular relation to the direction of travel for receiving the article and directing the same into the horizontal, and means at the lower end of the lateral retarding portion having rollers normally disposed for guiding the package at the side until the retarding and deflecting action upon the package ceases.

12. An apparatus of the character described comprising inclined gravity conveying means including roller portions disposed in angularly related planes for engaging the bottom and side of the package conveyed the rollers of said portions having their outer ends in diverging arrangement and directed forwardly in the direction of travel the rollers of the bottom engaging portion being disposed at an angle tending to urge the package towards the side engaging roller portion, and the rollers of the side engaging portions being disposed at an angle tending to urge the package downwardly towards the bottom engaging portion, whereby to subject the engaged surfaces of the article to a speed retarding action.

13. An apparatus of the character described comprising a plurality of roller portions engageable with two adjoining angularly-related walls of an article to be conveyed; one of said roller portions having the outer ends of its rollers extending downwardly and forwardly in the direction of travel of the article and serving to support and advance the article thereon and to urge the same against the other of said roller portions, and said other roller portion disposed in a vertical plane at substantially right angles to said first-named roller portion, and forming a guide wall having the outer ends of its rollers extending forwardly in the direction of travel of the article and serving to urge the article against said first-named roller portion and cooperate therewith to retard the advancing movement of the article.

14. An apparatus of the character described comprising a plurality of roller portions arranged

at right angles to each other and forming a conveyor of substantially L-shape in cross-section engageable with two adjoining walls of an article to be conveyed; the rollers of the horizontal member of said L-shape conveyor being disposed at an angle to the normal to the direction of travel and serving to advance the article thereon and to urge the same laterally against the vertical member of said L-shape conveyor, and the rollers of said vertical member being disposed at an angle relative to the normal to the direction of travel and serving to guide and urge the article downwardly against said horizontal member and cooperate therewith to retard the advancing movement of the article.

15. An apparatus of the character described comprising an inclined gravity conveyor including a supporting frame having fixed and movable members, a series of rollers arranged in parallelism on said supporting frame, the rollers of each series being individually pivotally secured to one of said fixed frame members and having their outer ends pivotally secured to one of said movable frame members with the rollers of each series disposed at an angle to the normal to the direction of travel, means for actuating said movable frame members to move the outer ends of each series of rollers in unison to vary the angular positions of said rollers relative to said normal, and means for securing said movable frame members to adjusted position.

16. An apparatus of the character described comprising an inclined gravity conveyor including a supporting frame having fixed and movable longitudinal members, a series of bearings arranged substantially transversely of said longitudinal members; the bearings of each series being pivotally secured to one of said fixed, longitudinal members, and having their outer ends pivotally secured to their respective movable longitudinal member, rollers revolvably supported in said bearings and arranged at an acute angle to the normal to the direction of travel, means for actuating said movable, longitudinal members to shift the outer ends of said roller bearings to vary the angular positions of said rollers relative to said normal, and means for securing said movable, longitudinal members to adjusted position.

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