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ARTICLE RELEASING DEVICE FOR INCLINED CHUTES OR ROLLERWAYS

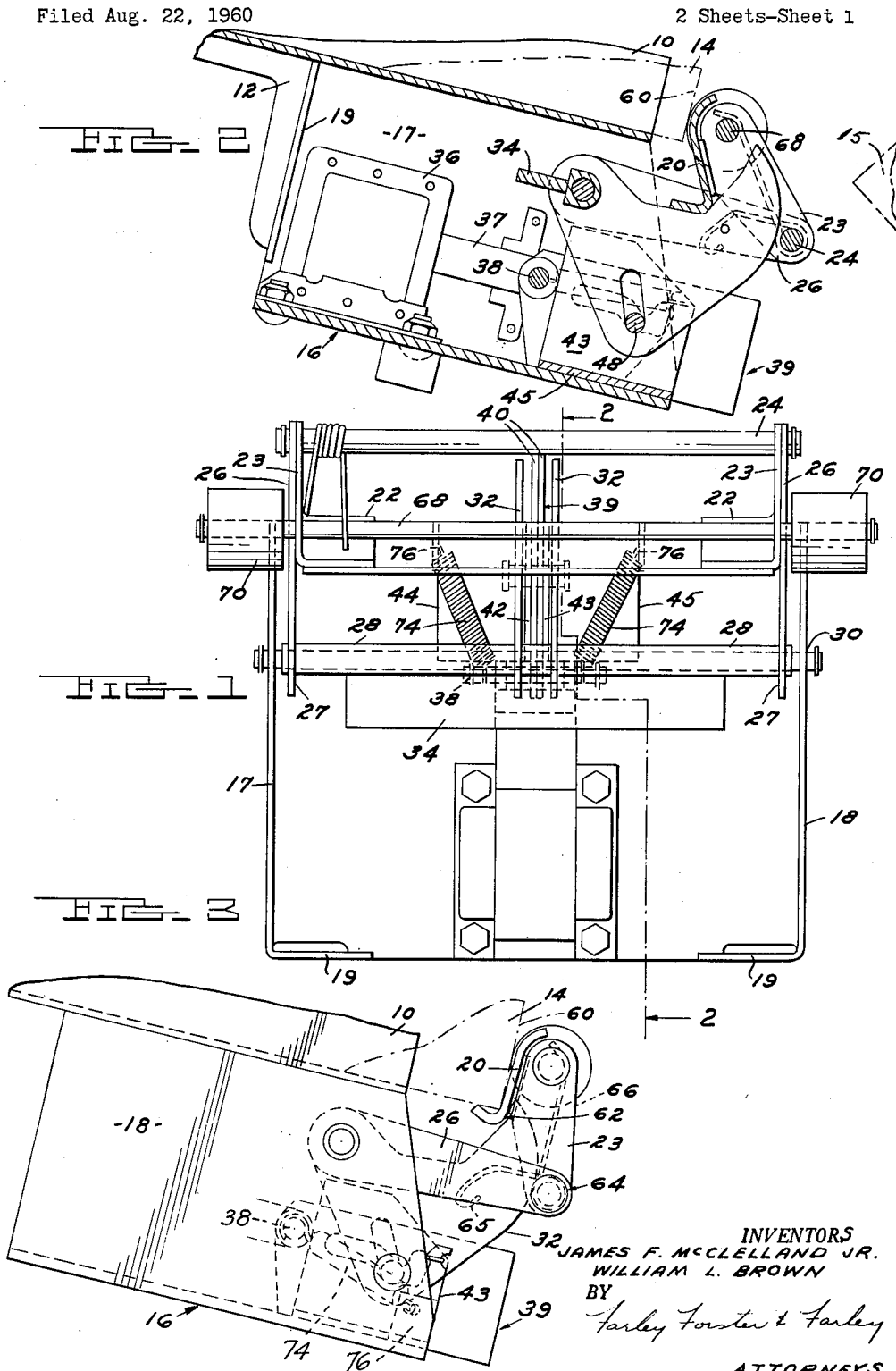
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FIG. 2

FIG. 1

FIG. 3



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FIG. 4

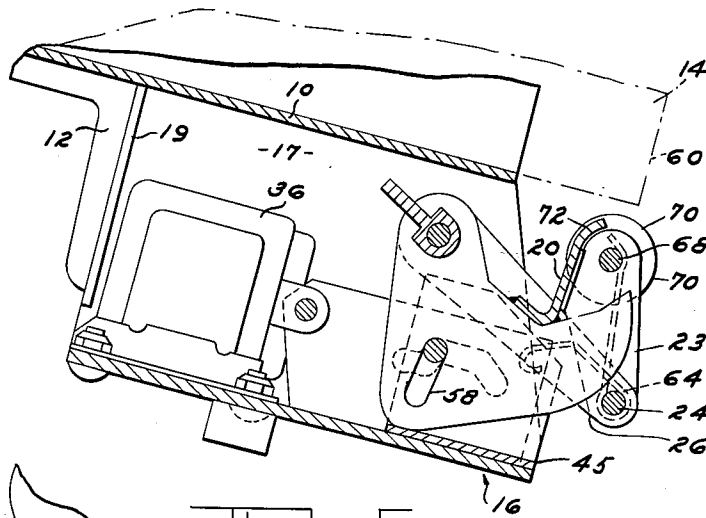


FIG. 5

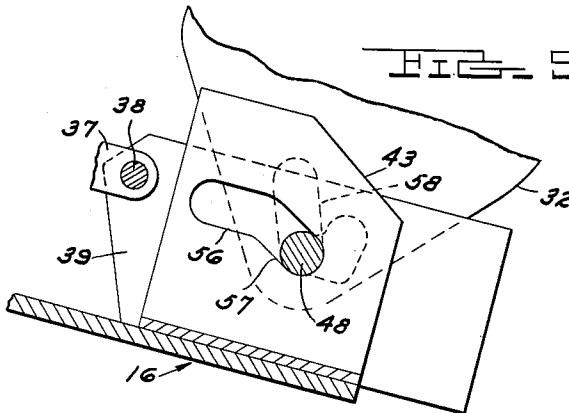
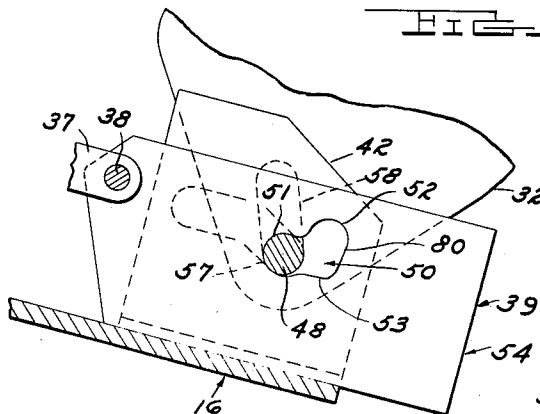


FIG. 6



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ARTICLE RELEASING DEVICE FOR INCLINED CHUTES OR ROLLERWAYS

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The present invention relates to improvements in the construction of a device for releasing articles singly from a support, such as an inclined chute or rollerway, on which articles are placed and normally urged towards the discharge end thereof.

Supports of this type are finding increasing use, for example, in installations for the warehousing of goods, where a plurality of such supports are employed, each adapted to hold a row of similar articles and each equipped with a releasing device at the discharge end thereof which when actuated permits a single article to be delivered from the support.

The release device of the present invention incorporates a number of desirable features not found in any prior device of this type of which we are aware. Among these features are: (a) An article blocking member or gate which acts to cushion the impact between an article and the release device; (b) A gate member which is placed into a position for engagement with the underside of an article immediately upon reaching a releasing or unobstructing position; (c) The action described in (b) above permits the device to be actuated by a momentary energization signal, since the article serves to hold the device in a releasing position once it has been moved thereto; (d) The gate member of the device which is normally urged to a blocking position and hence into engagement with the undersurface of a passing article, is provided with low friction article contacting means such as rollers to enable the passing article to move faster and away from a successive article, thereby insuring that the device will be returned to a blocking position for engagement with the next successive article; (e) An improved actuating mechanism is provided which positively locks the gate member in a blocking position until an actuating movement is initiated, and which then offers a high mechanical advantage for producing such movement; (f) Actuating movement of the actuating member includes an initial component or portion offering little resistance to movement and during which an unlatching action is accomplished. The device can thus be actuated by electrical means such as a solenoid of relatively small size.

Essentially the release device of the invention includes suitable frame structure for mounting the various components thereof, a gate mounted thereon by means which permit initial motion of this gate in the general direction of normally urged article movement on the support from an arresting position to a blocking position in which the gate is adapted to prevent further article movement, and for a second component of motion of the gate from the blocking position to a releasing position in which further article movement is unobstructed. Actuating means are included for moving the gate from the blocking to releasing position thereof. As the gate reaches a releasing position relative to an article, the gate is then moved by suitable means in a direction reverse to that of the aforementioned initial motion thereof to place the gate under an article, and is urged into engagement with the undersurface of the article by means which serve to normally urge the gate back to the blocking position thereof. The undersurface of the article is engaged by low friction means such as rollers on the gate whereby

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resistance to article movement is reduced so that a passing article will move faster than the next successive article and open a gap into which the gate will move back to the blocking position.

The initial component of gate motion in the general direction of normally urged article movement is resiliently resisted in order to absorb the shock of impact between an article and the release device. The reverse of this initial component of motion, acting in response to movement of the gate to releasing position relative to the article, acts to position the gate underneath the article thereby positively insuring that the gate can not prematurely return to a blocking position, that the gate can be actuated by a momentary energization of actuating device, and, in combination with the normally urged gate movement back to blocking position, insures that the gate will contact the undersurface of a passing article and be brought to a blocking position for engagement with a successive article.

In the preferred construction to be disclosed herein, the gate is pivotally mounted on a link which in turn is pivotally secured to the frame structure of the device so that the initial shock absorbing gate movement referred to above is accomplished by pivotal movement of the gate on the link and releasing movement accomplished by pivotal movement of the link on the frame structure.

Actuating mechanism provided for moving the gate between blocking and releasing positions includes a suitable actuating device such as a solenoid, means for locking the gate in blocking position until the solenoid is actuated, and means for moving the gate to releasing position after the locking means has been released.

The foregoing and other features will be explained in greater detail in connection with the following description of the presently preferred embodiment of the invention disclosed in the accompanying drawings which consist of the following views.

FIGURE 1, a top plan view of the device;

FIGURE 2, a sectional elevation taken along the line 2—2 of FIG. 1 showing the device as installed at the discharge end of an inclined support such as a chute and showing the positions of the parts at the moment of contact by an advancing article;

FIGURE 3, a side elevation of the structure shown in FIG. 2 with the device appearing in the blocking position thereof;

FIGURE 4, a sectional elevation similar to FIG. 2 but showing the device in the releasing position thereof; and

FIGURES 5 and 6, enlarged sectional elevations showing details of the actuating mechanism which is pictured in the blocking position thereof in each of these views.

FIGURES 2, 3 and 4 each include a showing of the discharge end of an inclined article support such as a chute 10 which is mounted on supporting structure including a cross-member 12 adjacent the discharge end, the chute 10 being adapted to support a row of articles or packages 14. One package is to be delivered off the discharge end each time the device of the invention is actuated. A package being discharged or released is indicated at 15 in FIG. 2.

The releasing device has its various components mounted as an assembly on suitable frame structure which in the construction shown consists of a channel-shaped sheet metal member 16 having side walls 17 and 18 and a pair of end flanges 19.

Article movement is controlled by a gate member 20 mounted on the inwardly turned tab 22 (FIG. 1) of a pair of arms 23 which are pivotally carried on a cross-pin 24. Pin 24 is in turn mounted between a pair of links 26, each secured at their other end 27 to a sleeve

28 which is pivotally carried on a second cross-pin 30 mounted between the sides 17 and 18 of the frame member 16. A pair of operating arms 32 are also secured to the sleeve 28 intermediate its ends, and the sleeve, along with the connection of the arms thereto, is reinforced by a plate 34.

In the construction shown, means for actuating the gate member 20 include a solenoid 36 whose movable member or core 37 is connected by a pin 38 to an actuating member 39 which consists of a pair of plates 40 placed in side-by-side relation and riding in a channel formed between the upstanding legs 42 and 43 of a pair of angle members 44 and 45 which are secured to the frame member 16. The portions 42 and 43 of the angle members 44 and 45 will be termed guide members since they serve to define the direction of sliding movement of the actuating member 39. These guide members 42 and 43 lie intermediate the actuating member 39 and the operating arms 32 which are carried by the mounting structure for the gate member 20. Each of the three members, the actuating member 39, the guide members 42 and 43 and the operating members 32 is slotted, all slots being engaged by a single pin 48.

This construction is shown in detail on an enlarged scale in FIGS. 5 and 6 which are each fragmentary views taken substantially as indicated by the section line 2 of FIG. 1. In FIG. 5 the right hand operating arm 32 (see FIG. 2) is removed so that the right hand guide member 43 appears in full line. The actuating member 39 lies behind this guide member and the left hand arm 32 lies behind the other guide member 42. In FIG. 6 the right hand guide member 43 is removed so that the actuating member 39 appears in full line followed by the left hand guide member 42 and the left hand operating member 32. FIGURE 4 shows a side elevation of the complete assembly except that the parts are in releasing instead of blocking position as in FIGS. 5 and 6.

The slots referred to above which are engaged by the pin 48 include an L-shaped slot 50 (as best shown in FIG. 6) formed in the actuating member 39. This slot 50 has a locking portion 51 which is occupied by the pin 48 as the parts appear in FIG. 6, an operating portion 52, and an intermediate portion 53, at least a part of which extends generally in the direction 54 of actuating movement of the member 39. The guide members 42 and 43 are each provided with a dog-leg shaped slot 56 having an offset portion 57 which corresponds to the offset between the locking and operating portions 51 and 52 of the actuating member slot 50. The operating members 32 are each provided with a straight slot 58, designed to produce releasing movement of the gate mounting structure in response to movement of the actuating member 39 in the desired amount and at a high mechanical advantage.

The operating motions of the gate member 20 are shown in sequence in FIGS. 2, 3 and 4. In FIG. 2, the gate member is shown in what will be termed an arresting position and is just being contacted by the leading face 60 of an advancing article 14. Further advance of the article is permitted by the gate member moving from this arresting position to the blocking position shown in FIG. 3, motion of the gate member between its arresting and blocking position taking place in the general direction of movement of the article on the support 10 until restricted by engagement between the gate member 20 and a stop formed as a portion 62 of the operating arms 32. This initial motion of the gate member is opposed by suitable means such as the hairpin spring 64 which is carried by the cross-pin 24 and has one leg 65 engaging one of the links 26 and another leg 66 engaging a cross-pin 68 carried between the arms 23. Thus the initial gate member movement serves to cushion or absorb the impact between an article and the release device.

When an article, such as the article 14, is to be released from the support 10, an energizing signal is supplied to the solenoid 36 resulting in a downward movement of

the gate member 20 to a releasing position shown in FIG. 4. As soon as the gate member reaches a releasing position where it is in unobstructing relation with the leading face 60 of the article 14, it is moved by the spring 64 in the reverse direction of its initial movement to place the gate member immediately below the undersurface of the article being released. These releasing and reverse movements are aided by the provision of a pair of rollers 70 mounted at the ends of the cross-pin 68 carried by the arms 23. An arcuate upper portion 72 of the gate member 20, formed on a radius less than that of the rollers 70, insures that all contact between an article and the gate will be through the rollers 70. As soon as the gate member reaches the position shown in FIG. 4, the solenoid 36 can be de-energized, and return springs 74 (FIG. 1) constantly urge all the parts of the mechanism back to a return position. These springs 74 are carried between ears 76 on each of the angle members 44 and 45 and the pin 38 connecting the solenoid plunger 37 and the actuating member 39. As a consequence of this normally urged return movement, the rollers 70 of the gate member push upwardly on the undersurface of the passing article, acting as a partial support offering decreased frictional resistance to article movement, and therefore, the article 15 being released tends to move faster than the following article 14, creating a gap through which the gate member will be brought by the return springs 74 back to an arresting position in advance of the leading face of the immediately following article 14.

In the return position of the actuating mechanism, the gate mounting means are positively locked in a blocking position. Referring to FIG. 6, the pin 48 has been moved by the return movement of the parts it engages to the locking position shown. Any force transmitted to the pin through the operating arms 32, as by contact of an article with the release device, is transmitted to the pin through the slot 58 in the operating arm 32 and absorbed by the portion 57 of the slots in the guide members 42, 43, this portion 57 being formed so as to be tangent to the line of force resulting from the application of a force to the gate member 20. Movement of the pin out of locking position is positively prevented by engagement with the end of the portion 57 of each guide member slot which defines the limit of radially outward movement of the pin in the slots 58 of the operating arms and by engagement with the locking portion 51 of the actuating member slot 50 which prevents any radially inward movement of the pin in the slots 58. Hence it is impossible to move the gate member from blocking to releasing position, except by operation of the actuating mechanism.

When this mechanism is actuated, the member 39 is moved to the left from the position shown in FIGS. 5 and 6 and during the first part of this movement the pin 48 passes through the intermediate portion 53 of the slot 50 which is designed to displace the pin from its locked position with high mechanical advantage. The pin then moves along the inclined portion 57 of the slot 56 in the guide members and along the portion 80 of the slot in the actuating member until it reaches the operating portion 52 of the slot 50, these movements being accompanied by movement of the pin along the slot 58 in the arms 32 producing pivotal movement of the arms about the cross-pin 30. The portion 53 in the slot 50 intermediate the locking portion 51 and operating portion 52 thereof acts at least in part as a lost motion connection between the actuating member 39 and the pin 48, permitting initial movement of the actuating member by the solenoid under very little resistance. Consequently the solenoid plunger moves to a position of relatively high efficiency before any appreciable resistance to its movement is encountered. This lost motion unlatching action, particularly in combination with the high mechanical advantage obtained by the arrangement of slots, makes a solenoid particularly suited for use as an actuating device, and furthermore a solenoid of relatively low force.

The form of construction illustrated and described is capable of handling a wide range of sizes and weights of articles. However, use of the essential features of the invention is of course not confined to any size or weight of article or even to the particular design of the release mechanism disclosed. These essential features include the shock absorbing action of the gate member, the reverse movement of the gate member into overlapping relation with the undersurface of an article as soon as it reaches a releasing position, the use of low friction rolls to allow the first package to move faster, thus creating a gap between the first and second packages in combination with the positively urged return movement which insures the device reaching a blocking position in advance of the approach of the following article, and the positive locking, easily operated, high mechanical advantage nature of the mechanism for moving the gate member between blocking and releasing positions.

While preferred embodiments have been described above in detail, it will be understood that numerous modifications might be resorted to without departing from the scope of the invention as defined in the following claims.

We claim:

1. Article releasing mechanism for use with a support on which an article is placed for normally urged movement in one direction comprising frame structure for said releasing mechanism, gate means, means mounting said gate means on said frame structure for initial motion in the general direction of normally urged article movement on said support in response to engagement of said gate means by said article from an arresting position to a blocking position in which said gate is adapted to prevent further article movement and for motion of said gate means from said blocking position to a releasing position in which further article movement is unobstructed, actuating means for moving said gate means from the blocking to the releasing position thereof, means for producing the reverse of said initial motion of said gate means in response to said gate means reaching the said releasing position thereof, and means normally urging said gate means from the releasing position thereof to the blocking position thereof.

2. Article releasing mechanism according to claim 1 further characterized by said gate means including roller means mounted for engagement with at least the undersurface of an article passing over said gate means while in the releasing position thereof.

3. Article releasing mechanism according to claim 1 wherein said gate mounting means comprises link means pivotally carried by said frame structure, arm means pivotally secured to said link means and connected to said gate, stop means defining the said arresting and blocking positions of said gate relative to said link means, and said reverse motion means being interposed between said link means and said arm means.

4. Article releasing mechanism according to claim 3 further characterized by said actuating means comprising an actuating member, means for moving said actuating member on an actuating stroke, a guide member carried by said frame structure adjacent the path of movement of said actuating member, an operating member secured to said gate means, a slot formed in each of said actuating, guide and operating members and a pin engaging said slots, said slots being formed so as to produce motion of said gate means from blocking to releasing position in response to movement of said actuating member on an actuating stroke.

5. Article releasing mechanism according to claim 4

further characterized by the said slot in said actuating member having first and second portions defining respectively latched and operating positions of said pin, and a portion intermediate said latched and operating portions providing a lost motion connection between said pin and said actuating member.

6. Article releasing mechanism according to claim 1 further characterized by said actuating means comprising an actuating device having a member movable on an actuating stroke in response to the energization of such device, an actuating member connected to said movable member, an operating member secured to said gate means, a guide member carried by said frame structure adjacent the path of movement of said actuating and operating members, and pin and slot means in said actuating, operating and guide members for producing releasing motion of said gate means in response to energization of said actuating device, said pin and slot means including portions for preventing movement of said gate means from the blocking position thereof until said actuating device is energized.

7. Article releasing mechanism according to claim 6 wherein the means for moving said gate means from the releasing to the blocking position thereof comprises a spring means acting to normally urge said actuating member to the return position thereof.

8. Article releasing mechanism for use with a support on which an article is adapted to be placed for normally urged movement in one direction comprising frame structure for said releasing mechanism, gate means, means mounting said gate means on said frame structure for motion from a blocking position in which said gate means is adapted to prevent further movement of an article on said support to a releasing position in which further article movement is unobstructed by said gate means, actuating means for moving said gate means between said blocking and releasing position, said actuating means including an actuating member, means for moving said actuating member on an actuating stroke, an operating member secured to said gate means, a guide member carried by said frame structure adjacent the path of movement of said operating member, means connecting said operating and actuating members, said guide and operating members including surfaces engageable by said connecting means when said gate means is in its blocking position, for preventing releasing movement of said gate means until said actuating member is moved on an actuating stroke.

9. Article releasing mechanism according to claim 8 wherein said means connecting said actuating and operating members comprises a slot formed in each and a pin engaging said slot.

10. Article releasing mechanism according to claim 9 wherein the said slot in said actuating member includes a portion extending in the general direction of actuating movement of said member, said portion providing a lost motion connection between said actuating member and said pin.

11. Article releasing means according to claim 10 wherein said means for moving said actuating member comprises a solenoid and means for connecting said solenoid to said actuating member.

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