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Wolbrink

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[54] **TRIP MECHANISM FOR CONVEYING APPARATUS**

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[52] **U.S. Cl.** **198/155**

[51] **Int. Cl.** **B65g 17/16**

[58] **Field of Search** 198/155

[56] **References Cited**

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3,167,192 1/1965 Harrison et al. ..... 198/155 X

Primary Examiner—Evon C. Blunk
Assistant Examiner—Hadd S. Lane
Attorney—Andrus, Sceales, Starke & Sawall

[57] **ABSTRACT**

A tilting tray trip mechanism for controlling a series of tray units includes a tripping plate pivotally mounted for positioning between a horizontal reset and an inclined set or trip position with a depending leg as a part of the latch means. A momentarily pulsed solenoid is connected to this leg and positively moves the elements to the trip position. A pivotally mounted latch arm is coupled to an opening in the leg and pivoted to abut the leg to mechanically hold the leg and plate in the set position. A reset arm is connected to the pivot support for the latch arm and is mechanically moved into the path of an inclined reset plate on the trailing end of the tray unit. The reset plate returns the reset arm and attached latch arm from latching alignment and positively pivots the leg and cam member to the horizontal reset position.

10 Claims, 6 Drawing Figures

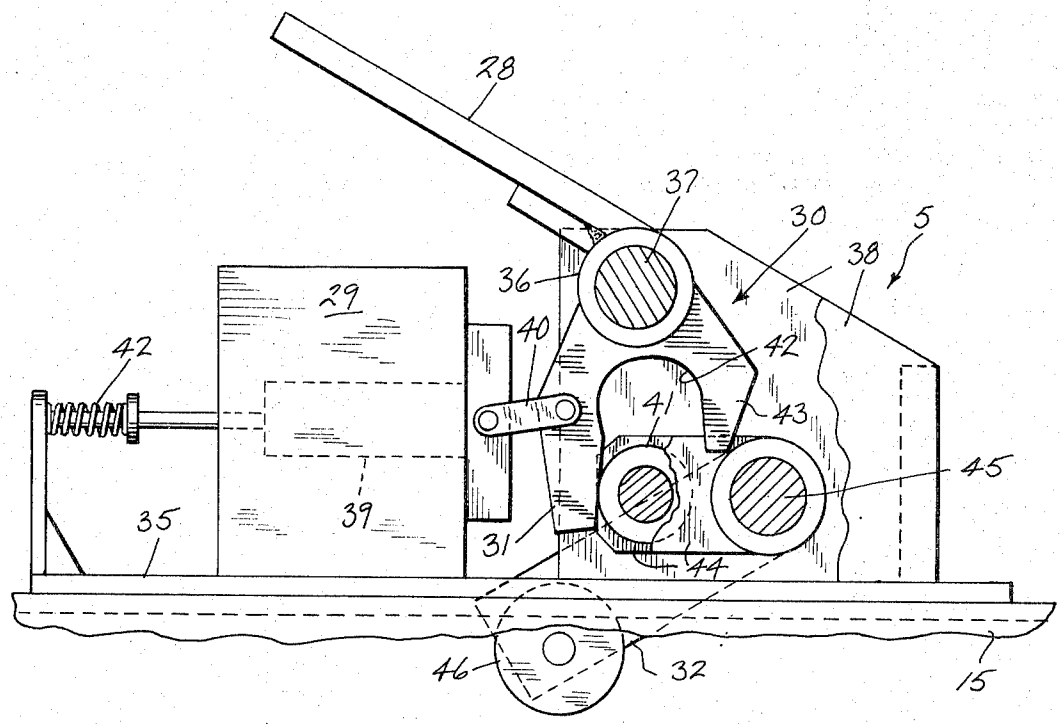

Fig. 1

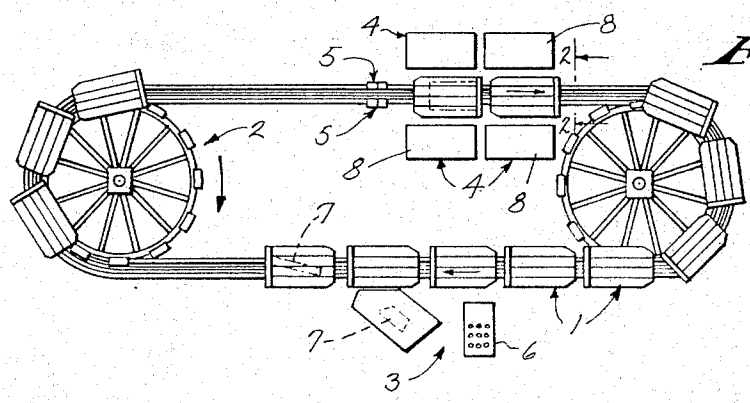
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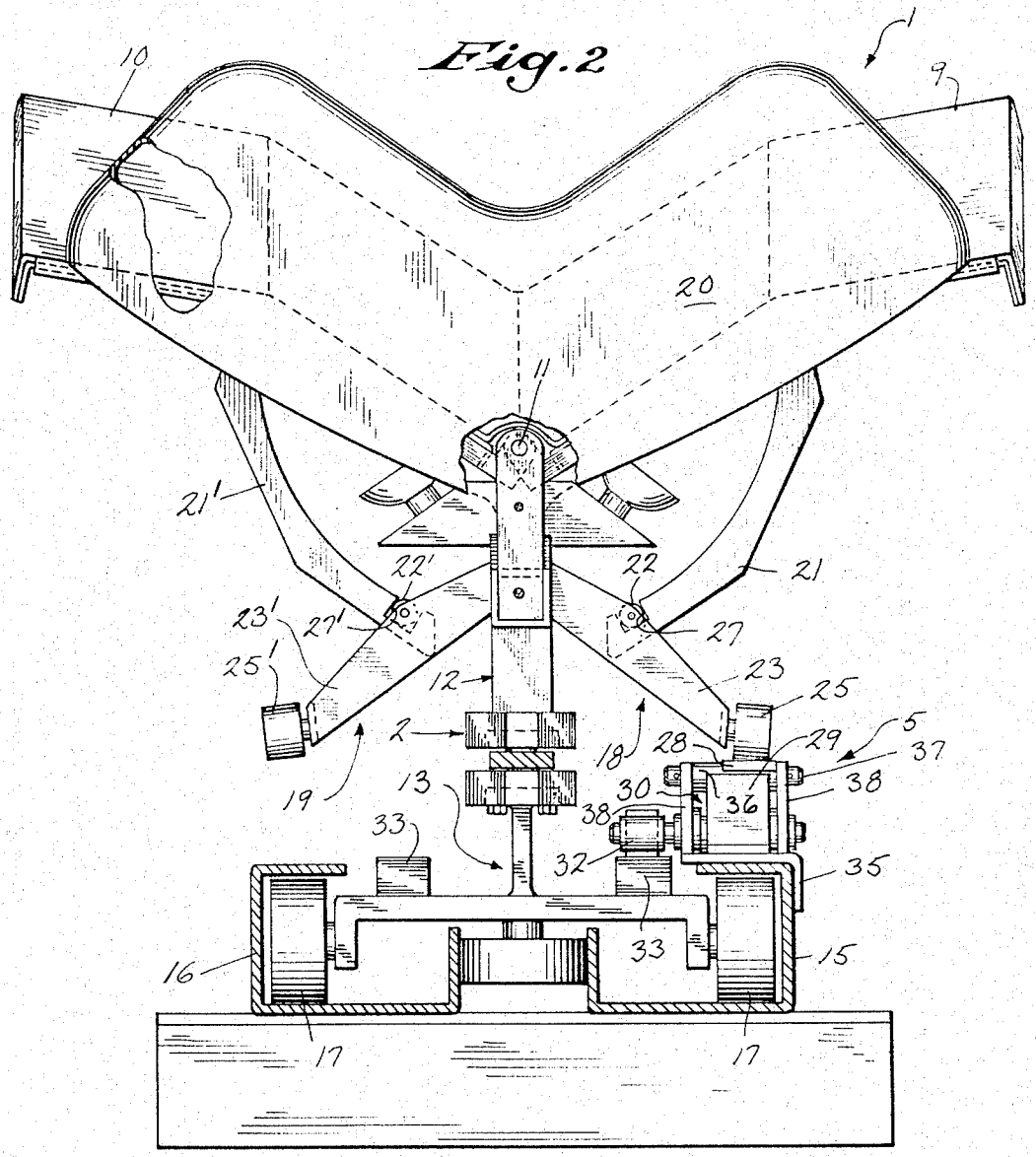
Fig. 2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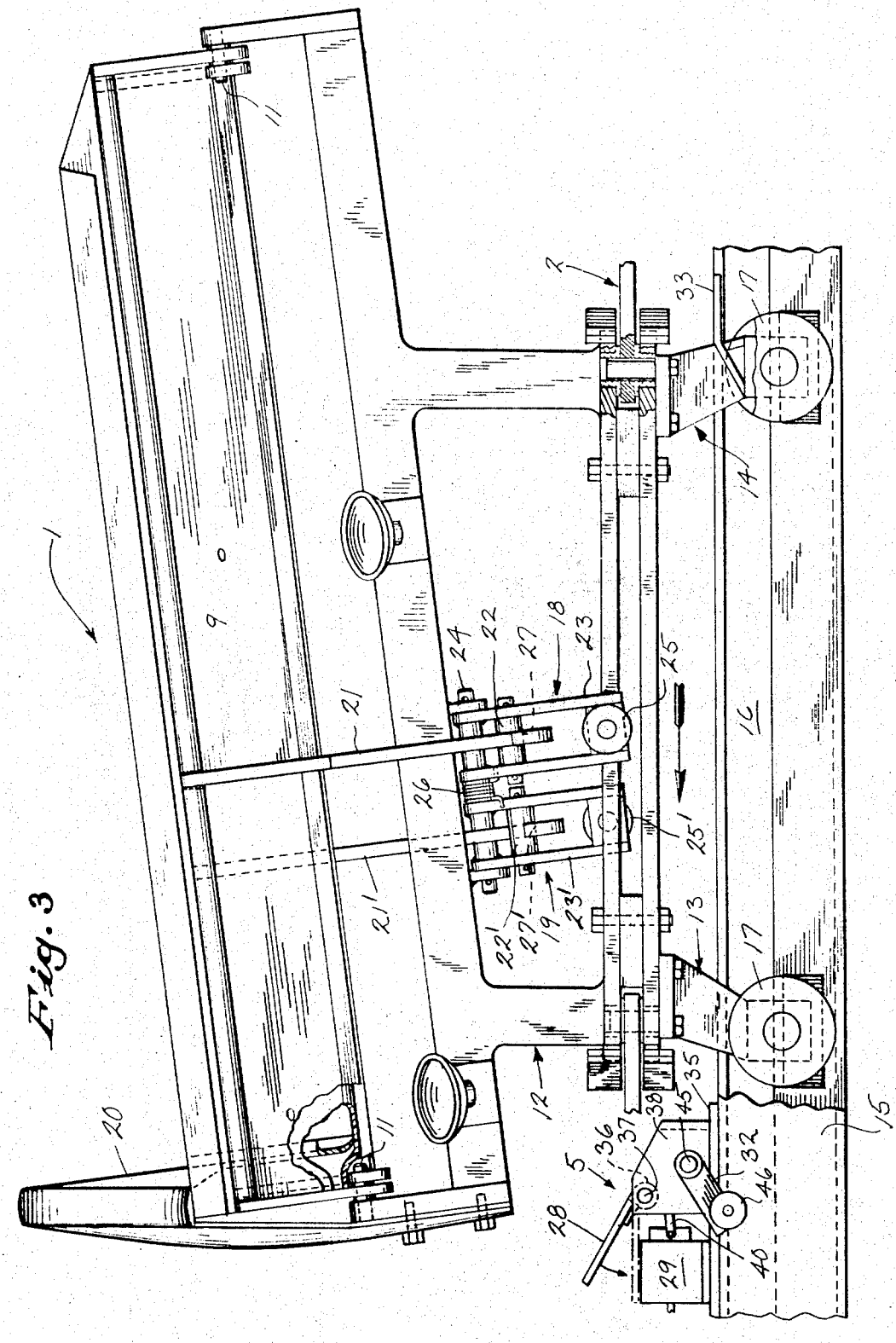
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Fig. 3

Fig. 6

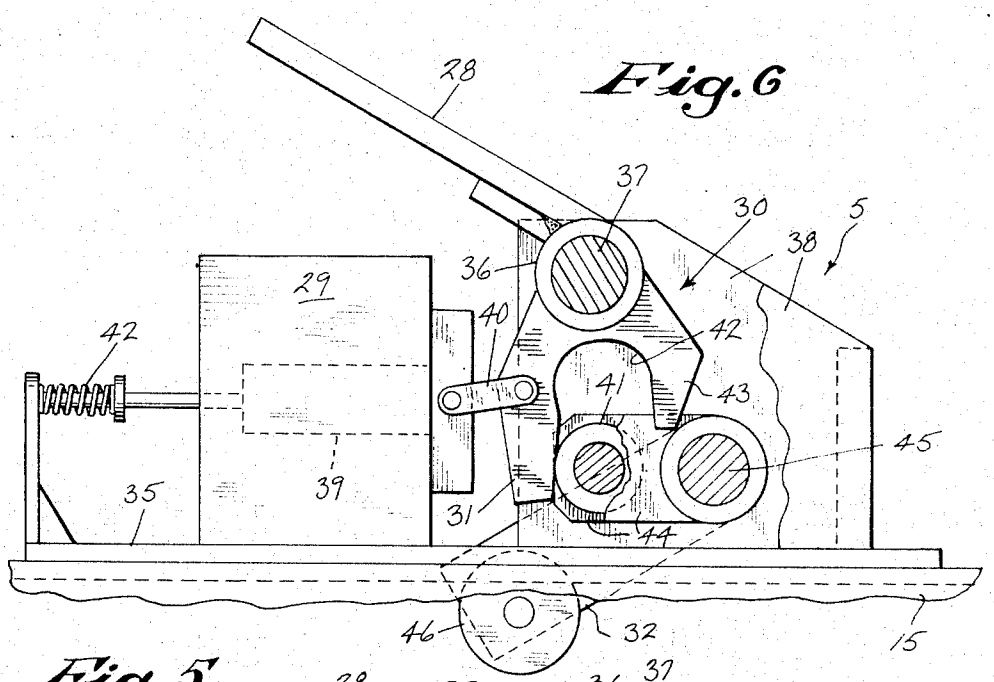


Fig. 5

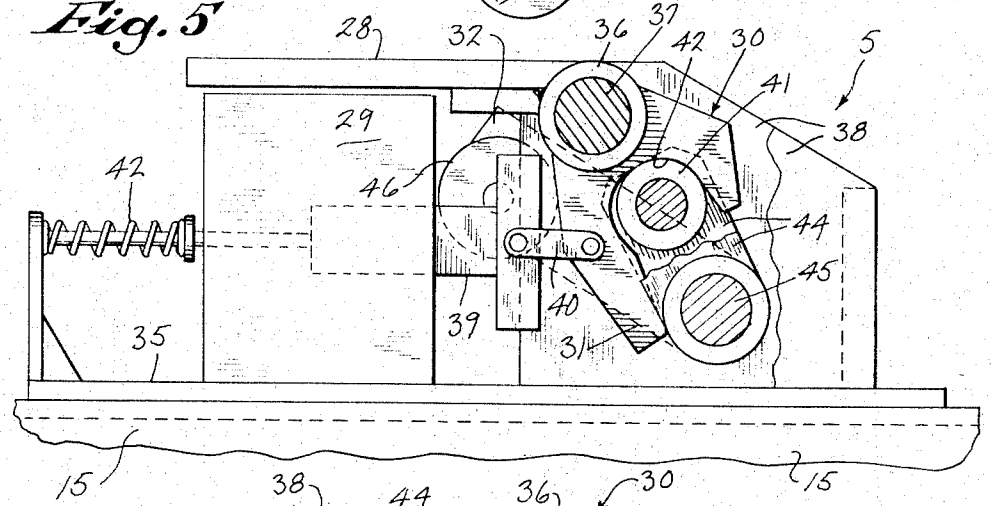
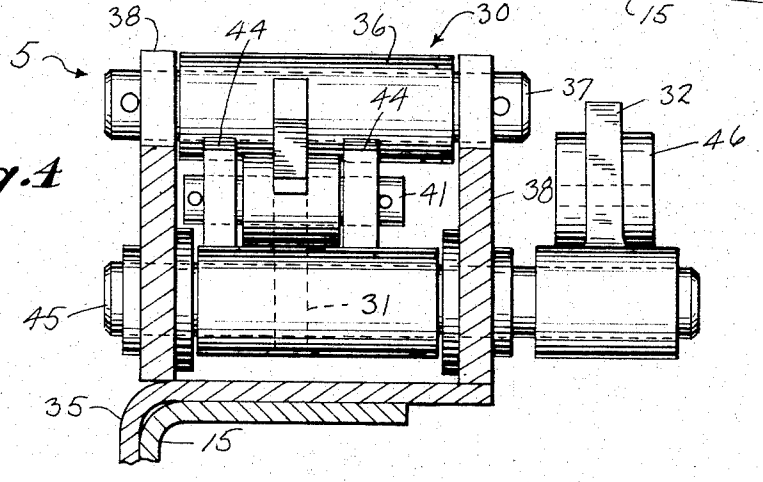


Fig. 4



TRIP MECHANISM FOR CONVEYING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a tripping mechanism for a tilting support type conveying system and particularly to a tripping mechanism for selective actuation of a plurality of sequentially moving interconnected load carrying and support structures.

The development of modern merchandising systems has required development of various conveying apparatus to accommodate the rapid retrieval and distribution of a plurality of different load items with conveyance to one or more receiving stations.

In particular distributing and sorting conveying devices have been devised for receiving a plurality of elements and distributing them to a plurality of different unloading or receiving stations in accordance with a predetermined plan. Tilting tray structures have been developed including a plurality of tray carriers interconnected to a common chained drive for movement in a generally horizontal plane between one or more loading stations and a plurality of unloading stations. Each of the trays is mounted for tilting to opposite sides for the selective discharge of the load thereon. A memory input unit at the loading station provides for automatic actuation of an unloading device and a particular unloading station for tilting such conveyor at such selected unloading station. Typical conveying systems of the above type are shown in the Speaker et al. U.S. Pat. No. 3,510,014, Bishop et al. U.S. Pat. No. 3,269,520 and the Imsberger U.S. Pat. No. 3,150,763. In the Speaker and Bishop patents individual tray structures are centrally, pivotally mounted to a carriage which, in turn, is interconnected to a chain drive. The several tray structures are mounted and latched in a horizontal transporting position. At an unloading station, a tripping assembly in the form of a latch release and positive tilting mechanism is provided which moves into the path of a selected tray assembly and provides automatic releasing of the latching structure and positive tilting of the interconnected tray structure.

An improved split V-shaped tray conveying system is disclosed in the co-pending application entitled "CONVEYING APPARATUS INCLUDING TILTING SUPPORT STRUCTURES," Ser. No. 242,330 which was filed on the same day as this application and is assigned to the same assignee. Each tray member is individually pivoted and includes a latch means selectively holding the members in a transport position and releasing of one-half of the load support for discharging of the load.

Although the horizontal tray supporting devices of the prior art with the double tilt to the respective sides have provided a satisfactory discharge system for distributing conveyors or the like, the tripping devices have generally been of a positive action type with the tripping mechanism held in the trip position by continued electrical, pneumatic or hydraulic applied to the set means of the devices. Such units have a continuous power demand and must be especially constructed to absorb relatively large shock loads, particularly with the increase in speed of operation with more recent designs. Present tripping devices also generally require a second controller action to provide a timed and synchronous release of the set device and are not, therefore, particularly adaptable to a wide range of operating speeds and particularly to high speeds such as desired for high speed sorters and the like.

SUMMARY OF PRESENT INVENTION

The present invention is particularly directed to an improved pulsed activated and mechanically latched and reset tripping assembly for conveying system for selective unloading of a plurality of sequentially moved load structures.

Generally in accordance with the present invention the trip mechanism or assembly includes a tripping member selectively positioned between a reset or normal position and a trip position. The tripping member is interconnected with a latch element of a mechanical latch means. A pulse activated set mechanism is coupled to the integrated unit to simultaneously set the cam member to a trip position and actuate the latch mechanism to a mechanical latching position. Simultaneously a reset element of the latch mechanism is moved from a normal position to a latch resettable position. The apparatus is thus in a condition to effectuate a trip of the load means as it passes the trip mechanism. The load means includes a member physically engaging the reset element of the latch means to positively cause it to move to the reset position and mechanically resetting the latch means of the trip mechanism.

In the preferred and particularly novel construction of the present invention, the cam member is pivotally mounted for positioning between the reset and the trip position with a depending leg as a part of the latch means. A solenoid or other pulse responsive device is connected to this leg and upon being activated, positively moves the interconnected latch leg and the cam member to the trip position. A latch arm is pivotally mounted and selectively positioned between holding position in which it is aligned with the latch leg to positively hold the latch leg against movement and acts as a stop if the cam member tends to pivot to the reset position. A reset arm is connected to the pivot support for the latch leg and is mechanically moved with the latch leg to engage the latch leg and establish a positive mechanical support. The arm is pivoted in the set position in the path of an inclined reset plate on the load means to the trailing side of the tray latch means. The reset plate moves the reset arm to the reset position thereby causing the latch arm to move from the latching alignment. Further, the last latch movement of the latch arm is coupled to the latch leg and positively pivots the leg and cam member to the reset position. Thus, a pulsed actuation results in the setting of the latch arm to the latch position where it is maintained until such time as mechanically reset by interengagement of the load support means with the reset arm.

The pulse mechanical holding and reset trip assembly has been found to provide a very reliable and relatively inexpensive trip apparatus particularly suited to high speed sorting devices and the like such as shown in the previously identified copending application and patents.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings furnished herewith illustrate preferred embodimets of the present invention in which the above advantages and features are clearly disclosed as well as others which will be readily understood from the following description of the illustrated embodiments.

In the drawings:

FIG. 1 is a diagrammatic top view of a sorting apparatus;

FIG. 2 is a vertical section through a load tray unit taken generally on line 2—2 of FIG. 1;

FIG. 3 is a side elevational view of the unit shown in FIGS. 1 and 2;

FIG. 4 is an enlarged end elevational view of the trip mechanism shown in FIG. 3;

FIG. 5 is an enlarged side elevational view taken with parts broken away to more clearly showing the tripping unit shown in FIGS. 1 – 3 in the reset position; and

FIG. 6 is a view similar to FIG. 5 showing the set position.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring to the drawings and particularly to FIGS. 1 – 3, the present invention is shown applied to selectively actuate a plurality of tray support or unit assemblies 1 interconnected to an articulated chain drive 2. The tray assemblies 1 are disposed to move in a horizontal plane as a continuous closed loop for transfer between a loading station 3 and a plurality of unloading stations 4, which may be provided to the opposite sides of the conveying path. At each of the unloading stations, discharge actuating or tripping assemblies 5 are constructed in accordance with the teaching of the present invention and are provided at the opposite sides of the path for selected coupling to an aligned tray unit 1 and when actuated tilts a tray unit 1 to a discharge position. Each of the discharge actuating assemblies 5 may be selectively controlled from a selection control unit 6 provided at the loading station 3. Thus, the control unit 6 will normally provide for a manual or automatic input in accordance with a predetermined unloading station identification which is inserted into a memory unit which retains the control signal until the loaded tray unit 1 is in predetermined alignment with the selected unloading station 4, at which time the discharge actuating assembly 5 is automatically and properly operated to tilt the tray unit 1 for discharging of a load 7 to the receiving means 8. The present invention is particularly directed to the construction of the tripping or actuating for a tray unit 1. The interconnection of the individual units to the drive, the construction of the loading and unloading means as well as the memory control unit may take any desired form or construction and, consequently, no further description is give other than as required to clearly describe the preferred construction of the present invention.

Referring particularly to FIGS. 2 and 3, each of the tray assemblies 1 is preferably constructed in accordance with the co-pending application entitled Conveying Apparatus Including Tilting Support Structures, Ser. No. 242,330, which was filed on the same day as this application and assigned to the same assignee, includes a pair of members 9 and 10 which are separately and individually pivotally mounted as by pivot pins 11 to a carriage unit 12 which, in turn, is interconnected to the drive chain 2.

Generally, the carriages 12 are provided with guide wheel assemblies 13 and 14 with a pair of side tracks 15 and 16 within which the support wheels 17 are located for guided movement about the sorter loop.

The tray members 9 and 10 are similarly supported in a transport position by a separate latch assembly 18 and 19 as shown most clearly in FIGS. 2 and 3. The units 1 are inclined longitudinally of the direction of movement with the leading end lower than the trailing end such that the load 7 tends to slide forwardly against a front wall 20. The latch means 18 and 19 provide for the individual pivotal support of each of the tray members 9 and 10 of each tray assembly 1. Means 18 is described with corresponding primed members applied to means 19. In particular, the latch means 18 for tray member 9 includes a curved latch arm 21 secured to the tray member 9 and curving downwardly and inwardly beneath a roller latch pin 22 which is pivotally mounted to carriage 12. The latch pin 22 is journaled in a latch lever 23 which is pivotally mounted on a pivot shaft 24 secured to carriage 12 and projects outwardly with the outer end carrying a lever wheel 25. A coil spring 26 encircles the shaft 24 and resiliently urges the lever 21 and pin 22 toward the inner edge of the arm 21. A notch 27 is provided in the inner edge of the corresponding latch arm 21. In the transport position, the pins 22 and 22′ are located in the corresponding notches 27 and 27′ and hold the tray members 9 and 10 raised and in the transport position. The trip actuating assemblies 5 include an inclined cam member 28 adapted to be selectively positioned in the path of a tray latch lever wheel 25 to pivot the lever 23 upwardly. When a pin 22 is thereby pivoted outwardly from the corresponding notch 27, the corresponding arm 21 and attached tray member 9 is free to drop under the force of gravity created by the tray member and any load thereon which is applied on the tray member in the illustrated embodiment of the invention.

The illustrated tripping assemblies 5 in accordance with a preferred construction generally includes a solenoid coupled to the cam member 28 and defining a part of a pulsing means for momentary actuation and positioning of the cam trip member in a raised or tripping position, as shown in FIG. 3. A mechanical latch means 30, most clearly shown in FIGS. 5 and 6, is interconnected or coupled to the cam member 28 and includes a latch member 31 actuated by the pulsed operation to establish a mechanical latch of the cam member 28 in the tripping position. The latch means 30 also includes a reset member 32, shown as a pivotally mounted arm or lever, which is positioned into a cam member resetting position as a result of the movement of the cam member 28 to the latched position of FIG. 6. A cam reset means 33 shown as an inclined plane member in FIG. 3 is provided on each of the carriages 12 and in particular the trailing wheel portion of the carriage 12. The reset member 33 is located to pass through the position of the reset lever 32 with the cam member latched in the raised position as shown in FIG. 3. Thus, as the carriage moves past an actuated trip mechanism 5 the tilting wheel 25 of lever 23 first engages the cam surface 28. As a result of the mechanical latch, the cam member 28 is firmly held in a raised position and results in the release of the tray latch mechanism 18 and the dropping of the corresponding tray member 9. Immediately after the release of the tray latch mechanism, the cam reset means 33 on the trailing portion of the corresponding tray unit 1 will engage the reset lever 32 positively causing it to reset to the raised position and returning the cam member 28 to the normal standby position as shown in FIG. 5 and thereby resetting the apparatus for subsequent similar operation.

Thus, the present invention in particular provides a pulse set with a mechanical reset requiring minimum power consumption and reliable operation of the tripping mechanism.

More particularly in the illustrated embodiment of the invention, each illustrated assembly 5 includes a support bracket 35 secured to the upper surface of the track 15 to properly locate the cam member 28 in longitudinal alignment with the path of the wheels 25 of the tray latch mechanism 18 and 19. The cam member 28 is shown as a plate-like member having a pivot bushing 36 on one end pivotally journaled upon a pivot shaft 37 which, in turn, is supported between a pair of sidewall brackets 38 projecting upwardly from the mounting plate 35. The latch element 31 is an pivot arm or lever integrally affixed to the pivot bushing 36 of the cam member 28 and depends downwardly therefrom between the supporting walls 38. The solenoid 29 is mounted beneath the cam member 28 with a spring loaded armature 39 extending outwardly and pivotally connected by a link 40 to the depending element 31. The solenoid armature 39 is normally biased outwardly as by a spring 42 to resiliently urge the cam member 28 to the normal standby position as arm 31 tends to pivot counterclockwise as viewed in FIG. 5. When the solenoid 29 is energized, the armature 39 is retracted and pivots arm 31 clockwise, thereby raising the cam member 28 to the trip position of FIG. 6.

The mechanical latch means 30 in the illustrated embodiment of the invention includes a latch pin 41 aligned with the side of the pivot arm 31 opposite the solenoid 29. The arm 31 is in the form of a plate-like member which projects over the pin 41 and includes a generally circular recess 42 aligned with the pin and defining an outer guide leg 43 of a somewhat shorter length and spaced from the pivot arm 31. The latch pin 41 is secured between the outer ends of a pair of parallel arm members 44, the opposite ends of which are journaled between the support walls 38 upon a support shaft 45 for pivotal positioning of the pin 41 between the positions of FIGS. 5 and 6. The shaft 45 is rotatably journaled in walls 38 and projects outwardly through the inner support wall. The reset arm 32 is fixed to the extension of the shaft 45 to correspondingly position the shaft 45 and the arm 44. The reset arm 32 extends outwardly therefrom with a curved bearing member 46 secured in the outer lower corner of the arm to provide a bearing engagement with the inclined cam reset member 33. A spring 46 is coupled between the reset arm 32 and the support wall 38 to continuously urge the arm 32 to the normal reset to set position, as shown in FIG. 5. In this position, the reset arm 32 is raised upwardly out of the path of the reset cam 33 and the latch roller or pin 41 is pivoted upwardly into the recess 42 in the underside of the latch arm or plate 31. The upward pivotal movement positively rotates the latch arm 31 to positively move and hold the cam plate or member 28 in the rest or standby position.

When the solenoid 29 is momentarily energized, a positive pulling force on the arm 31 results in a positive pivoting of arm 31 and the cam member 28 clockwise to the trip position as shown in FIG. 6. The positive pivoting force also causes the latch pin 41 to pivot downwardly into alignment with arm 31 and mechanically locks the cam member in the raised position of FIG. 6. In this position, the reset arm 32 has been pivoted downwardly into the normal path of a reset cam 33. The arm 31, as shown, includes a slight inclined face abutting the pin 41 which in combination with the gravity forces establishes a reliable mechanical latch of the device in the set position. In addition, a bias spring may be employed if desired.

Thus, once the solenoid 29 is energized, and only momentarily, the trip mechanism is positioned as in FIG. 6 and which position is mechanically held until such time as the reset arm is positively rotated to the reset position. In operation, control 6 or the like momentarily energizes the solenoid just before the desured tray unit 1 moves into alignment with the cam member 28 to provide for the desired tilting action. The mechanical latch maintains a very firm reliable support to positively release the tray units. As the cam member, in essence, need only release the latch mechanism it does not have to positively carry a load for any given period and it will provide a very reliable smooth operation. Further, the trip mechanism is almost instantaneously reset such that successive tray units can be conveniently actuated for discharging of successive loads into a corresponding receiving means. In addition, as the passage of the trailing edge resets a tripped cam unit, there is no possibility of inadvertently tripping the following tray unit.

Applicants have found that the momentary pulse setting and mechanical latch with the rapid reset by the load unit itself permits application to very high speed sorters such as disclosed in the above identified copending application and the previously issued patent referred to above, and the like. In addition, and related to high speed capability of the present invention is the opportunity to space successive load units closer together because the trip mechanism is returned positively. Otherwise, closely spaced trays particularly with short trays result in too short a time-space between trays for the action of the "normal" gravity type return as well as the spring or other power returned trip mechanisms.

Although the illustrated embodiment of the invention has been found to provide a highly improved practical application in high speed sorters and the like various modifications can of course be employed. For example, the apparatus can be energized through other than electronic means such as pneumatic and/or hydraulic systems. Further, any other form of suitable mechanical latch mechanism can or could be applied within the broad concepts of the present invention.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims, particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A trip mechanism for a conveying apparatus having a pivotally mounted load support means moving between a loading means and a receiving means and a releasable load latch means with a movable release element following a predetermined path past a receiving means, comprising a trip means operable to engage and actuate said load latch means, a pulsed set means responsive to a momentary pulse to actuate the trip means to a trip position, a mechanical latch means coupled to and actuated to a set position with said trip means actuated to the trip position and mechanically holding the trip means in the actuated condition independently of the pulsed set means, and reset means

coupled to said mechanical latch means to release said set mechanical latch means.

2. The trip mechanism of claim 1 having reset operating means attached to said load support means for actuating said reset means immediately following the actuation of the load latch means.

3. A trip mechanism for a conveying apparatus having a pivotally mounted load support means moving between a loading means and a receiving means and a releasable load latch means with a movable release element following a predetermined path past a receiving means, comprising a trip member movably mounted for positioning in a first position in spaced relation to said path and in a second position located within said path for engaging said release element, a pulsed set means coupled to the trip member to said second position, a mechanical latch means coupled to said trip member and actuated with said trip member to a set position and mechanically holding the trip member in the second position, and reset means coupled to said latch means to release said set latch means and being positioned in response to setting of said latch means in the path of a trailing portion of a load support means to reset the latch means as the support means moved thereby.

4. The trip mechanism of claim 3 wherein said trip member is one element of a cam and follower assembly with the other element attached to the load latch means as said release element.

5. The trip mechanism of claim 3 having a latch lever secured to said plate and forming a part of said mechanical latch means, a latch element pivotally mounted and coupled to the latch lever and movable between a first position permitting pivotal movement of the latch lever and trip member and a second position engaging said latch lever to mechanically hold said latch lever and trip member against movement, said latch element being moved by said latch lever to said second position, and said reset means including a reset member coupled to said latch element and moving therewith, said reset member being located in the path of said trailing portion of the support means.

6. The trip mechanism of claim 3 wherein said trip member is pivotally mounted between a horizontal position and an inclined position corresponding to said first and second positions, said pulsed set means includes an electromagnetic means coupled to the trip member and responsive to a momentary pulse to move the trip member to said inclined position, said latch means includes a latch element moved into an abutting stop relation with respect to said trip member to prevent the trip member from moving from the inclined position, and said reset means includes a lever connected to said latch element and positively moving the latch element from said abutting stop to release said set latch means, said reset lever being positioned in response to setting of said latch means in the path of a trailing portion of a load support means to reset the latch means as the support means moves thereby.

7. The trip mechanism of claim 3 wherein said trip member includes a metal plate pivotally mounted for movement to an inclined position corresponding to said second position, said set means being coupled to said plate for positively pivoting said plate to said inclined position, a latch element movably mounted and movable between a first position permitting pivotal movement of the trip member to the second position and a second position mechanically holding said trip member in said inclined position, said latch element being resilient urged to said second position, and a reset lever of said reset means connected to said latch element and moving therewith, said reset lever being located in the path of said trailing portion of the support means and moved to reset said latch element from second position to said first position.

8. The trip mechanism of claim 3 wherein said latch lever is a U-shaped member having an arm secured to said metal plate, said latch element including a pin member disposed within the U-shaped member, and a movable pin mounting means for said pin member for movement into the base of the U-shaped member to permit movement of the plate and for movement in alignment with said arm to prevent movement of the plate.

9. The trip mechanism of claim 8 wherein said set means includes an electromagnetic means having an armature connected to said arm for positively pivoting said plate to said inclined position, said pin mounting means having a pivot arm movable between said first position locating said pin within said recess of the trip member and said second position with said pin aligned with said latch lever to mechanically hold said arm and trip member in said inclined position, and said reset member of said reset means being a pivot lever connected with said pivot arm and being located in the path of said trailing portion of the support means with the pin in said second position.

10. The trip mechanism of claim 5 wherein said reset member is coupled to the same load support means actuated by the trip member.

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