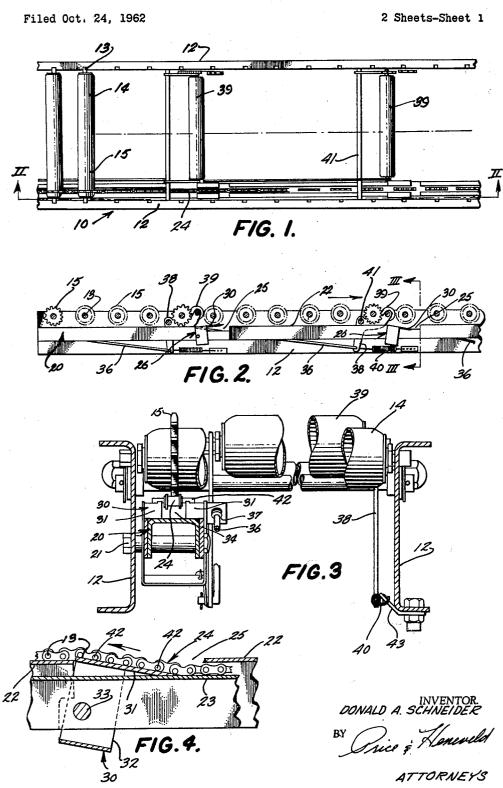
## Feb. 23, 1965

D. A. SCHNEIDER ACCUMULATOR CONVEYORS 3,170,561



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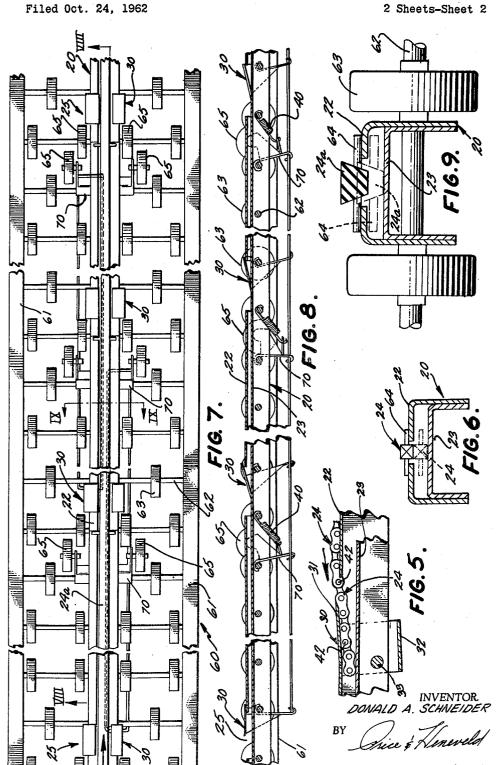
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D. A. SCHNEIDER

3,170,561

Filed Oct. 24, 1962

ACCUMULATOR CONVEYORS



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# United States Patent Office

### 3,170,561 Patented Feb. 23, 1965

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3,170,561 ACCUMULATOR CONVEYORS Donald A. Schneider, Ada Township, Kent County, Mich., assignor to The Rapids-Standard Company, Inc., Grand Rapids, Mich., a corporation of Michigan Filed Oct. 24, 1962, Ser. No. 232,746 18 Claims. (Cl. 198–127)

This invention relates to accumulator conveyors and more particularly to an accumulator conveyor in which 10 the power driven propelling member is positively supported from beneath by riding on a bi-level track or rail with means for shifting it between levels to regulate propulsion or non-propulsion of the articles.

This invention provides an accumulator conveyor oper- 15 ating mechanism which may be applied both to the type of conveyor in which the propelling member makes direct contact with the articles for propelling them, and to the power roll type of conveyor in which the propelling member drives the rollers which in turn propels the articles. 20 At the same time, it permits the shifting of the propelling member from one position to another to be carried out mechanically with minimal demand of pressure from the sensing devices. Thus, this conveyor can be operated by extremely light articles. This is made possible by the 25 fact that the propelling member is supported by a structure which is independent of the sensors and the sensors are only required to provide that amount of force necessary to redirect the path of travel of the propelling member 30from one supporting surface to another.

When this invention is applied to the power roll type of conveyor, it provides accumulation in combination with a positive drive for rollers. Thus, the rollers are given positive actuation rather than depending upon a frictional engagement for their movement. As is shown 35 in the following specification, this involves a positive drive utilizing a chain which necessitates full engagement between the chain and the driven sprocket. This is important to proper chain and sprocket operation.

40The invention also provides these advantages in combination with a structure in which the operating zones may be of any selected length. In other words, an entire length of conveyor may be operated simultaneously by a single sensing unit or in a single length of conveyor a 45 number of sensing units may be provided, each one controlling a short operating zone. Thus, each of the zones can be operationally independent of all other zones.

These and other objects and purposes of this invention will be clearly understood by those acquainted with the 50 design and utilization of conveyors upon reading the following specification and the accompanying drawings.

In the drawings:

FIG. 1 is a fragmentary, plan view of a power roll conveyor equipped with this invention with a majority of 55 the rollers omitted for the sake of clarity;

FIG. 2 is a fragmentary, sectional, elevation view taken along the plane II-II of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken along the plane III-III of FIG. 2;

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FIG. 4 is an enlarged fragmentary sectional view showing the propelling member changing elevations while traversing a ramp with the ramp lowered;

FIG. 5 is an enlarged fragmentary sectional view showing the propelling member traversing a ramp with the 65 ramp raised:

FIG. 6 is an enlarged sectional elevation view of the rail with the propelling member illustrated in solid lines raised and in phantom lines lowered;

FIG. 7 is a fragmentary plan view of this invention 70applied to a wheel conveyor:

FIG. 8 is a fragmentary sectional elevation view taken

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along the plane VIII-VIII of FIG. 7 omitting the propelling member; and

FIG. 9 is an enlarged fragmentary sectional view taken along the plane IX-IX of FIG. 7 showing the propelling member in raised position in solid lines and in lowered position in phantom.

In executing the objects and purposes of this invention, there is provided a conveyor having an article conveying surface, which in one form of this invention, consists of a plurality of power driven rollers, each equipped with a sprocket on one end. A chain serves as the power driven propelling member. The sprockets engage the chain, driving the rollers.

The chain is supported by a rail characterized by an upper and a lower guide surface. When the chain is riding on the upper guide surface, it is raised into engagement with the sprockets to drive the rollers. When the chain is riding on the lower guide surface, it is disengaged from the sprockets. The upper guide surface is interrupted at intervals along the conveyor and at each interruption a ramp is provided which may be shifted between raised and lowered positions. As the chain, riding on the lower guide surface, approaches the ramp, it will be raised to the upper guide surface, if the ramp is lowered. If the ramp is raised, the chain will continue to travel on the lower guide surface. When the chain is travelling on the upper guide surface and approaches a raised ramp, the chain will be guided beneath the ramp and thus shift down to the lower guide surface. If the ramp is lowered, the chain will continue to travel along the upper guide surface. At spaced intervals along the conveyor, sensing devices are provided which are connected to the ramps and control the ramps' position and thus determine the engagement or disengagement of the chain with the sprockets.

When this invention is applied to a gravity wheel type of conveyor, the same principles are employed except that the propelling member makes direct contact with the articles for the purpose of moving them along the conveyor. In this case, when the propelling member is travelling on the upper guide surface, it is in driving contact with the articles and when it is travelling on the lower guide surface, it is disengaged from the article.

Referring to the drawings, and specifically to FIG. 1, the numeral 10 refers to a power roll conveyor having a pair of side frame members 12 between which extend a plurality of axles 13 spaced at regular intervals along the length of the conveyor. On each of these axles, a roller 14 is rotatably mounted. Suitable bracing is provided to keep the side frame members 12 properly spaced and rigidly aligned. This is not illustrated since it is conventional and well-known in the art. The frame and rollers and the manner in which they are mounted on the frame is also conventional and therefore further description is not considered necessary.

Adjacent one end, each of the rollers 14 is equipped with a sprocket 15 (FIGS. 1, 2 and 3). Beneath the sprockets 15 is a rail member 20, best seen in FIG. 4. The rail member is secured to the adjacent side frame member by any suitable means such as the bolts 21 (FIG. 3). The rail 20 forms a bi-level track, having an upper support surface 22 and a lower support surface 23. These support surfaces are spaced vertically to permit the chain 24 to travel on the lower support surface, beneath the upper support surface with sufficient vertical clearance to eliminate interference between it and the upper support surface.

At periodic intervals along the conveyor, the upper support surface 22 is interrupted, creating a gap 25. A ramp 30 is mounted at each of the gaps 25. Each of the ramps consists of a supporting bracket 32 and a pair of ram plates 31 mounted thereof. The ramp plates 31 are spaced apart to provide an open channel 34 (FIG. 3) at the center of and running longitudinally of the ramp. This channel is of sufficient width to permit the central body of the propelling member or chain 24 to move  $_5$ through it. The ramp bracket 32 is supported for pivotal movement on any suitable means such as the stud 33.

Each of the ramp brackets is shiftable by a pivoting action about the bolt 33 from a lowered position as illustrated in FIG. 4 to a raised position as shown in FIG. 5. 10 In the lowered position, the free ends of the ramp plates 31 rest on the lower guide surface 23. In raised position, the ramp is inclined slightly upwardly above horizontal. As shown in FIG. 5, in this position the free end of the ramp is slightly above the pins on the chain. It will be 15 noted that the underside of the free end of the ramp is tapered, permitting it to rest more closely on the lower guide surface, and facilitating the guiding of the chain beneath the ramp when the ramp is raised.

The ramp is actuated by a rod 36 which is rockably 20 secured to a laterally projecting ear 37 on one side of the ramp bracket 32 (FIG. 3). This rod in turn is connected to a pivoted bracket 38 having on one of its arms a sensing roller 39 (FIG. 2). The bracket may be pivoted by any suitable means such as the shaft 41. The sensing 25 roller is normally held in raised position where it is slightly above the top surface of the rollers 14 by the bias imparted by the spring 40. One end of the spring is anchored to a side rail by suitable means such as the plate 42 (FIG. 3). In this position the ramp is lowered. When the sensing roller 39 is depressed, the hanger 38 is pivoted, rocking the ramp 30 from its lowered to its raised position. As soon as the sensing wheel 39 is released, it will automatically rise under the bias of the spring 40 which simultaneously lowers the operatively associated ramp.

As is best seen in FIGS. 3 and 6, the chain 24 at periodic intervals has riders or cross pins 42. The ends of these pins project a substantial distance on each side of the chain and are wider than the channel 34 in both 40 the ramp and the upper guide surface 22 of the rail 20. These pins serve as the vertical support for the chain when it is riding either on the ramps or on the upper guide surface (FIG. 6). When the chain is riding on the lower guide surface 23, the chain actually rests on the surface and the pins are temporarily inoperative (FIG. 6). When 45 the ramp is lowered, the chain body itself enters the channel 34 in the center of the ramp but the pins engage the ramp plates 31 causing the chain to automatically follow the ramp up from the lower guide surface 23 to the upper guide surface 22. This operation is illustrated in FIG. 4. 50

When the ramp 30 is raised, it projects somewhat above the horizontal whereby the pins engage beneath the ramp surface forcing the chain to move downwardly from the upper guide surface 22 to the lower guide surface 23. This operation is illustrated in FIG. 5. When the chain <sup>55</sup> is travelling along the upper guide surface 22 and crosses a gap 25 where the ramp 30 is lowered, the chain will simply continue to travel along the upper guide surface 22. Any tendency of the chain to sag or drop because of the lack of support in the area of the gap, will automatically be taken care of by the pins coming to rest on the inclined ramp plates 31 which automatically again raise the chain into travelling position along the upper guide surface 22.

When the chain is travelling along the upper guide surface 22, it is held in a position to engage the sprockets 15 of the rollers 14. Thus, the power of the chain is automatically transmitted to these rollers forcing them to rotate and propel any articles which may be resting upon them. When the chain is travelling on the lower guide surface 23, the chain is lowered sufficiently to completely disengage the sprockets 15. Thus, in those areas where the chain is so depressed, no propelling force will be delivered to the rollers. 75

Basically, the same principle is applied to the conveyor illustrated in FIGS. 7, 8 and 9. The conveyor 60 has a pair of side frame members 61 between which extend axles 62 rotatably mounting the conveyor wheels 63. In this conveyor, the guide rail 20 is relocated at the center of the conveyor and is raised so that its upper guide surface 22 is just below the level of the tops of the conveyor wheels 23 (FIG. 9). It also has periodic gaps 25. In this case the propelling member could be a chain identical to the conveying member 24 but for purposes of illustration it is shown to be a narrow V-type belt 24a. The belt, at spaced intervals along its length, has laterally projecting pins 64 which are similar in construction and function to the pins 42 associated with the chain 24.

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At each of the gaps 25, a ramp 30 is provided. The ramps are identical in every way and are operated in the same manner as the ramps illustrated in FIGS. 2 through The only difference in the structure being a relocation of the biasing spring 40 as is shown in FIG. 8 and the substitution of a pair of sensing wheels 65 for the sensing roller 39 to accommodate the belt 24a. The sensing wheels 65 are mounted in pairs on a pivoted hanger 70. As is illustrated in FIG. 9, the top surface of the belt 24a, when the pins 64 ride on the upper guide surface 22, is raised to a position slightly above the top surfaces of the conveyor wheels 63 where it will make positive engagement with articles resting on the conveyor track and thus propel them along the track. When the belt is lowered so that it is riding on the lower guide surface 23, it is depressed beneath the top surfaces of the conveyor wheels 63 and is disengaged from articles resting on the conveyor wheels.

It will be recognized that short rollers may be substituted for the conveyor wheels 63 on each side of the rail 20 in conveyor 60 without in any way changing the principle of this conveyor. In either the conveyors 10 or 60, each section of guide rail 20 between a pair of gaps 25 may be of any desired length. It may be as short as a foot or 18 inches or alternately, may be the length of an entire section of conveyor. This will depend upon the circumstances of the conveyor's utilization. Normally, the conveyor will have one of the sensing rollers 39 or sensing wheels 65 for each individual ramp 30. It is also entirely possible when desired, to connect several of the ramps to a single sensing or actuator device so that the depression of a single sensing device will effect simultaneous operation of several ramps. This again is merely a multiplication of the basic principle already illustrated.

In the operation of this conveyor, when an article trips or depresses one of the sensing devices by passing over the device, it automatically causes the associated ramp or ramps to shift its pivotal position. This is done against the bias of the spring 40. When the ramp is in raised position, which corresponds to the depressed position of the sensing device or actuator, the ramp does not have to support the weight of the chain or the belt, since the first oncoming pin to approach the ramp will pass beneath it and the propelling member will automatically move down to ride on the lower guide surface of the rail. When the ramp is in lowered position for raising the propelling member from the lower guide surface to the upper guide surface, the free end of the ramp rests on the lower guide surface and thus the actuation unit does not have to support the weight of the propelling member as it travels up the ramp. Thus, the spring 40 need only have sufficient strength to hold the sensing device and the ramp itself in raised position. This can be a very light spring and thus impose a minimum of resistance to depression of the sensing device. This permits the conveyor to be used with light and small articles since the sensing unit is sensitive and is readily actuated by a minimum of weight. When the sensing unit is initially depressed, should one of the supporting pins of the propelling member be in a 75 position to hold the ramp down, the continued movement

of the propelling member will swiftly remove the pin from the ramp, permitting it to complete its rise even though the weight of the article pressing down on the sensing device is insufficient to lift the propelling member. Thus, the delay will be only momentary and will not cause the article to hang up on the sensing unit and interfere with the continued operation of the conveyor.

It will be noted that the sensing devices are spaced along the conveyor from the zone or area which is affected by a shift in the position of the propelling member. In this manner, the particular article which triggers the sensing device does not thereby interrupt the delivery of propelling force to itself, but rather controls with the delivery of propelling force to articles in a different zone on the conveyor. When the sensing device is located 15 downstream of the zone where the propelling member is affected, this creates a zone of no propelling force behind the article, preventing following articles from being forcibly propelled against the article which is resting on the sensing unit. 20

In the case of the power roll conveyor, this invention provides a means of holding the chain, when it is on the upper guide surface, in positive engagement with the sprockets of the rollers. Thus, a positive and continuous drive is established without necessitating the exertion of 25 heavy pressures by the sensing unit to assure the engagement. Further, the chain is held tightly in engagement with the sprockets reducing wear and noise.

It will be seen from the above description that this invention provides an advanced construction for accumulator conveyors having a number of structural and functional advantages. It will be understood that various modifications of this invention may be made, each without departing from the principle of the invention. Each of these modifications as incorporate the principles of this 35 invention is to be considered as included in the following appended claims unless these claims expressly state otherwise.

I claim:

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401. In a conveyor having an article supporting and conveying track and a power driven propelling member for moving articles along said track; a support rail for said propelling member having a first pair of spaced guide surfaces forming a slot therebetween along the path of travel of said propelling member, said support rail also having a second guide surface, said first and second guide surfaces being spaced apart; said propelling member at spaced intervals having riders for engaging said first guide surfaces and supporting said propelling member on said first surfaces for travel therealong; said pro-50 pelling member being biased to travel along and be supported by said second surface; said propelling member, when supported by said first guide surfaces being in article propelling position and when supported by said second guide surface being in article non-propelling po-55 sition; movable means in one position engaging said riders and guiding them from said second guide surface to said first guide surfaces and in a second position guiding them from said first guide surfaces to said second guide surface; actuator means for shifting said means 60 between said positions.

2. A conveyor as recited in claim 1 wherein said propelling member is a belt and said riders are ears projecting laterally from each side thereof.

3. A conveyor as recited in claim 1 wherein said 65 propelling member is a chain and said riders are pins projecting laterally from each side thereof.

4. In a conveyor having an article supporting and conveying track and a power driven propelling member for moving articles along said track; a support rail 70 for said propelling member having a pair of upper guide surfaces forming a slot therebetween along the path of travel of said propelling member, said support rail also having a lower guide surface, said first and second guide surfaces being vertically spaced apart; said propelling 75

member at spaced intervals having riders for engaging said first guide surfaces and supporting said propelling member on said first surfaces for travel therealong; said propelling member being biased to travel along and be supported by said second surface; said propelling member, when supported by said upper guide surfaces being in article propelling position and when supported by said lower guide surface being in article non-propelling position; movable means in one position engaging said riders and guiding them and said propelling member from said lower guide surface to said upper guide surfaces and in a second position guiding them and said propelling member from said upper guide surfaces to said lower guide surface; actuator means for shifting said movable means between said positions.

5. A conveyor as recited in claim 4 wherein said propelling member is a belt and said riders are pins projecting laterally from each side thereof.

6. A conveyor as recited in claim 4 wherein said upper guide surfaces have several sections arranged in tandem each section being spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps each being longer than the spacing between said riders on said propelling member; said slot in said upper guide surfaces being narrower than said riders for receiving a portion of said propelling member when said propelling member riders are travelling on said upper guide surfaces; said movable means being ramps each having a central slot therein of the same width as said slot in said upper guide surfaces and aligned therewith; one of said ramps being mounted in each of said gaps; said ramps when raised to said second position being above said riders on said propelling member as it travels on said upper guide surfaces and urging said porpelling member downwardly from said upper surfaces to said lower guide surface.

7. A conveyor as recited in claim 4 wherein said upper guide surfaces have several sections arranged in tandem each section being spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps each being longer than the spacing between said riders on said propelling member; said slot in said upper guide surfaces being narrower than said riders for receiving a portion of said propelling member when said propelling member riders are travelling on said upper guide surfaces; said movable means being ramps each having a central slot therein of the same width as said slot in said upper guide surfaces and aligned therewith; one of said ramps being mounted in each of said gaps; said ramps when raised to said second position being above said riders on said propelling member as it travels on said upper guide surfaces and urging said propelling member downwardly from said uppersurface to said lower guide surface; each of said ramps when lowered into said one position engaging said riders on said propelling member as said propelling member travels on said lower guide surface and urging said propelling member to travel up said ramp to said upper guide surfaces.

8. A conveyor as recited in claim 4 wherein said propelling member when supported by said upper guide surfaces has its upper face in article contacting position substantially co-planar with the article supporting surface of said track and when said propelling member is supported on said lower guide surface said propelling member is below said article supporting surface and disengaged from articles on said track; said movable means being ramps and said upper guide surfaces having several sections arranged in tandem each section being spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps each being longer than the spacing between said riders on said propelling member; one of said ramps being mounted at each of said gaps; each of said sections constituting an operating zone whereby said conveyor

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has a plurality of said operating zones arranged in tandem along said conveyor; a plurality of said actuator means, one for each of said ramps, each of said actuator means being operatively independent of other actuator means whereby said operating zones are each operatively independent.

9. In a conveyor as recited in claim 4 wherein said conveyor track is characterized by a plurality of rollers and said propelling member is mounted beneath said rollers and when supported on said upper guide surfaces 10 makes driving engagement with said rollers and when supported on said lower guide surface is disengaged from said rollers.

10. A conveyor as recited in claim 8 wherein each of said actuator means has an article sensor situated in a 15 different operating zone than the operating zone affected by the ramp operatively associated with said actuator means.

11. In a conveyor as recited in claim 9 wherein said propelling member is a chain and each of said rollers 20 has a sprocket for engaging said chain.

12. In a conveyor having an article supporting and conveying track and a power driven propelling member for moving articles along said track; a support rail for said propelling member having a pair of upper guide 25surfaces forming a slot therebetween along the path of travel of the propelling member, said support rail also having a lower guide surface, said first and second guide surfaces being vertically spaced apart; both said first and second guide surfaces being adapted to support said 30 propelling member; said propelling member, when supported by said upper guide surfaces being in article propelling position and when supported by said lower guide surface being in article non-propelling position; movable means in one position engaging said propelling 35 member and guiding it from said lower guide surface to said upper guide surfaces and in a second position guiding it from said upper guide surfaces to said lower guide surface; actuator means for shifting said movable means 40 between said positions.

13. A conveyor as recited in claim 12 wherein said movable means is a ramp.

14. A conveyor as recited in claim 12 wherein said movable means is a ramp having one end substantially aligned with said first guide surfaces in both positions 45 and its other end resting on said second guide surface when said ramp is in said one position.

15. A conveyor as recited in claim 12 wherein said propelling member at spaced intervals along its length has laterally projecting riders; said upper guide surface <sup>50</sup> having several sections arranged in tandem, each spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps being of greater length than the spacing between said riders; one of said movable means being mounted at each of said <sup>55</sup> gaps.

16. A conveyor as recited in claim 12 wherein said

propelling member at spaced intervals along its length has laterally projecting riders; said upper guide surface having several sections arranged in tandem, each spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps being of greater length than the spacing between said riders; said movable means being ramps of substantially lesser length than said gaps, spacing the free end of each of said ramps from the end of the adjacent section of said first guide surfaces when said ramps are in said second position, said ramps in said second position engaging over said riders as said riders traverse said space between the end of the ramp and the end of the adjacent section of said upper guide surfaces; one of said ramps being mounted at each of said gaps.

17. A conveyor as recited in claim 12 wherein said upper guide surfaces have several sections arranged in tandem each section being spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps each being longer than the spacing between said riders on said propelling member; said propelling member having laterally projecting riders at spaced intervals along its length; said movable means being ramps; one of said ramps being mounted in each of said gaps; said ramps when raised to said second position being above said riders as said propelling member travels on said upper guide surfaces and urging said propelling member downwardly from said upper guide surfaces to said lower guide surface.

18. A conveyor as recited in claim 12 wherein said upper guide surfaces have several sections arranged in tandem each section being spaced apart from each adjacent section forming gaps therein at spaced intervals along said track, said gaps each being longer than the spacing between said riders on said propelling member; said propelling member having laterally projecting riders at spaced intervals along its length; said movable means being ramps; one of said ramps being mounted in each of said gaps; said ramps when raised to said second position being above said riders as said propelling member travels on said upper guide surfaces and urging said propelling member downwardly from said upper guide surfaces to said lower guide surface; each of said ramps when lowered into said one position engaging said propelling member as said propelling member travels on said lower guide surface and urging said propelling member to travel up said ramp to said upper guide surfaces.

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