United States Patent [19]

Krivec

[11] **3,910,198**

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[54] **CHAIN-DRIVEN DOG**

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[73] Assignee: **Rexnord Inc.**, Milwaukee, Wis.

[22] Filed: **Apr. 18, 1974**

[21] Appl. No.: **462,061**

Related U.S. Application Data

[63] Continuation of Ser. No. 315,694, Dec. 15, 1972, abandoned.

[52] **U.S. Cl.**..... **104/172 B;** 104/162; 104/172 BT; 198/170

[51] **Int. Cl.²**..... **B65G 17/42;** B65G 17/18

[58] **Field of Search**..... 104/172 R, 172 B, 172 S, 104/130, 162, 163, 147; 198/170

[56] **References Cited**

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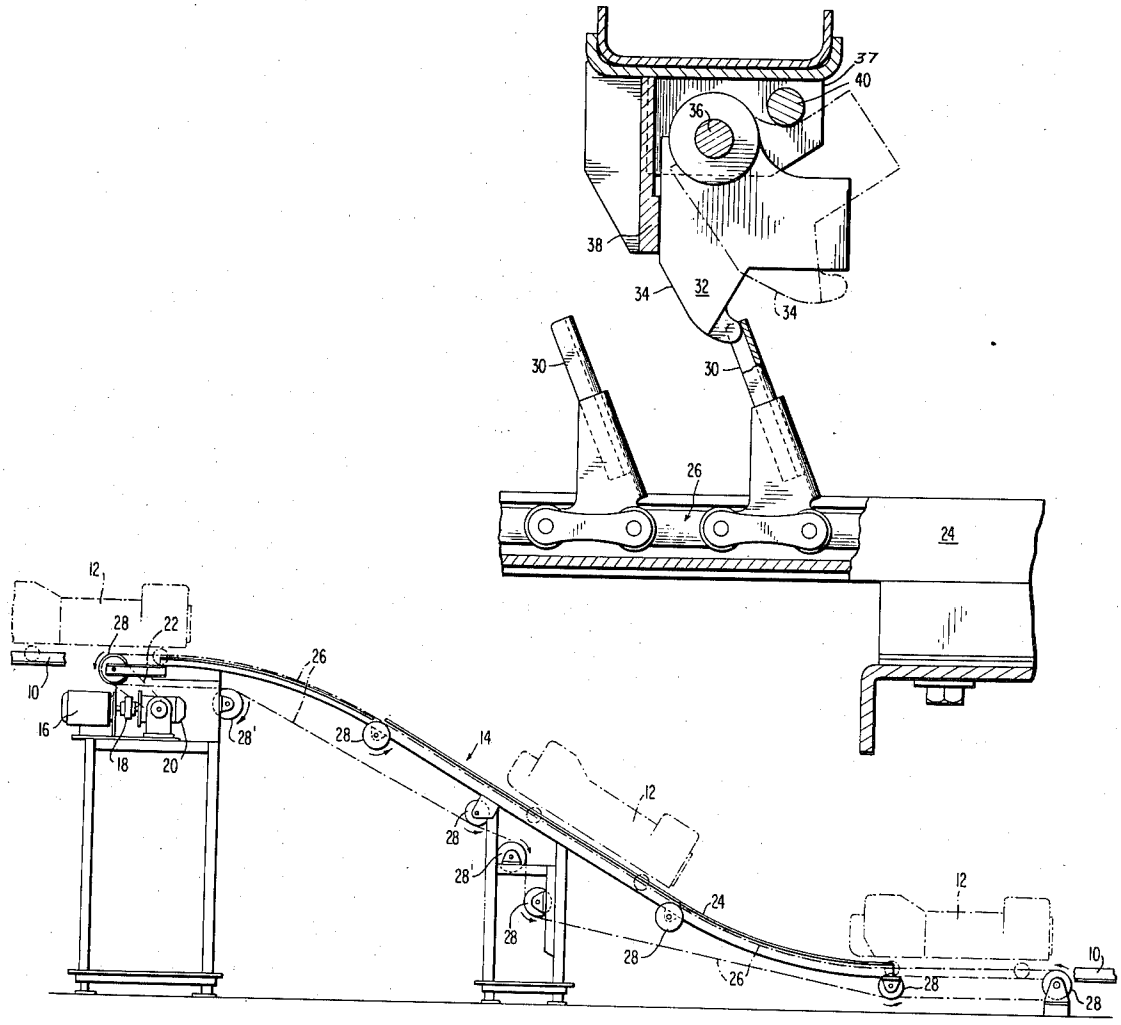
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

In a unit carrier system in which a plurality of cars are driven over a trackway by means of the frictional interaction of reaction surfaces and propulsion wheels, apparatus for transmitting relatively large amounts of power to the cars. The apparatus comprises a dog pivotally mounted on the bottom of each car and a motor-driven endless chain carrying a plurality of cooperating pawls in the trackway. The car preferably enters the system at a speed in excess of the chain speed, and the dog is pivoted out of the way by the back of one or more of the pawls, but the car gradually loses speed until the front of one of the pawls overtakes the dog, forces it against a stop, and thereafter pushes the car along.

7 Claims, 6 Drawing Figures



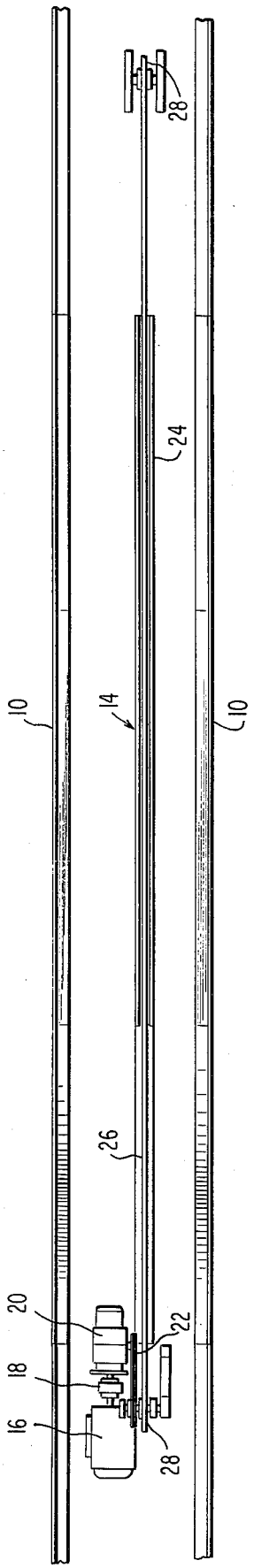
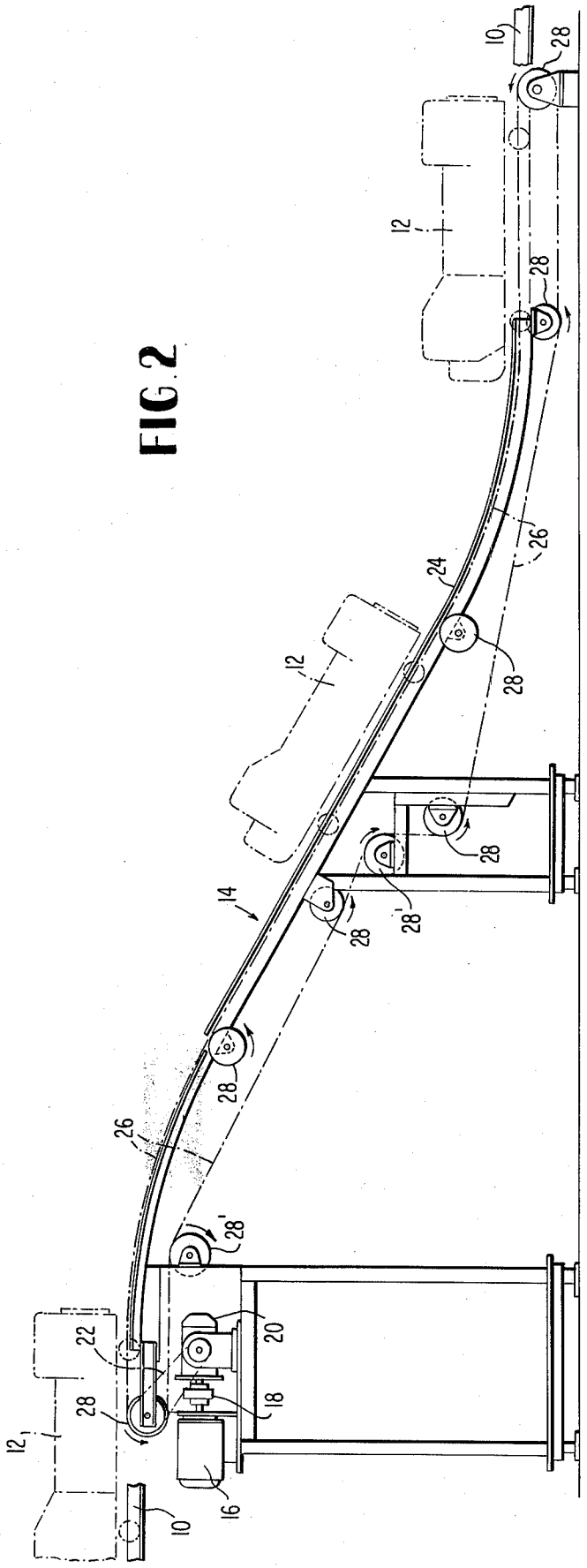

10
14
10
28
24
26
20
22
18
16
28

FIG. 1


10
28
12
28
24
26
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28'
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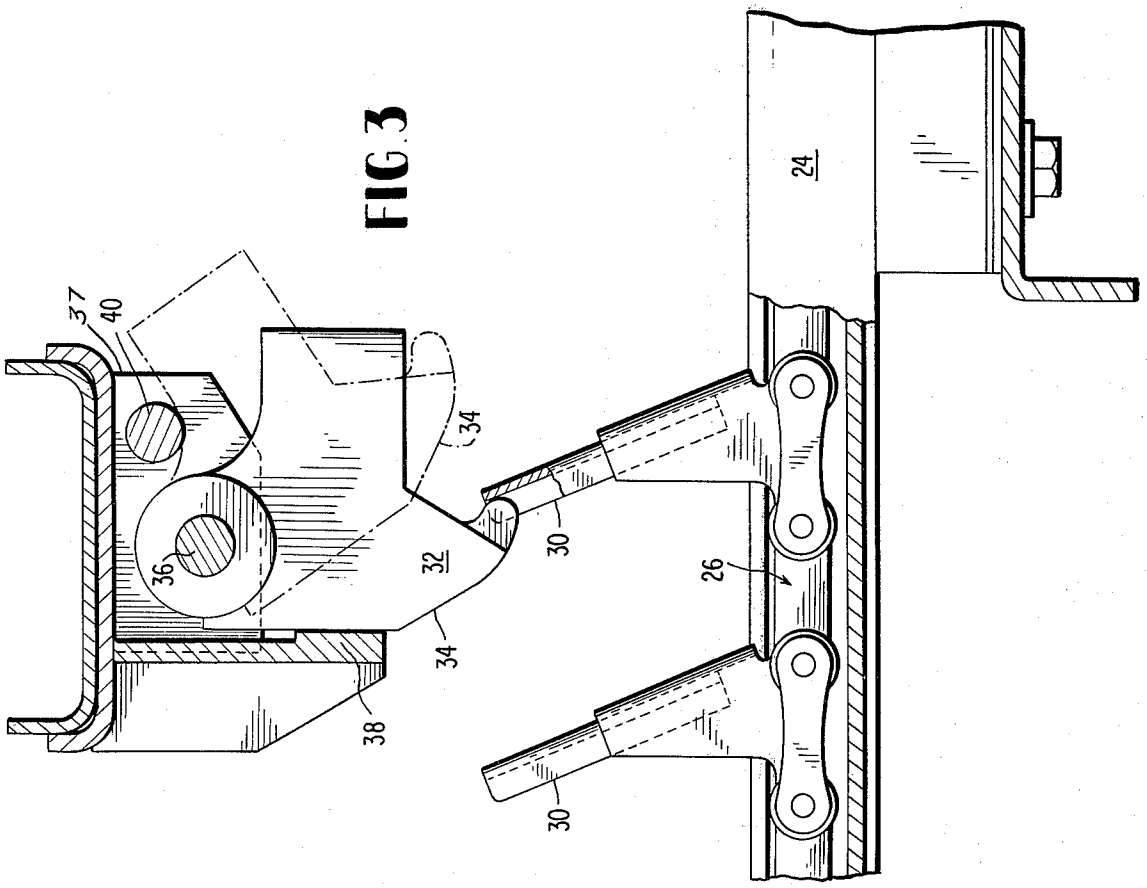
28'
20
22
18
28
12
16
10

FIG. 2

FIG. 3



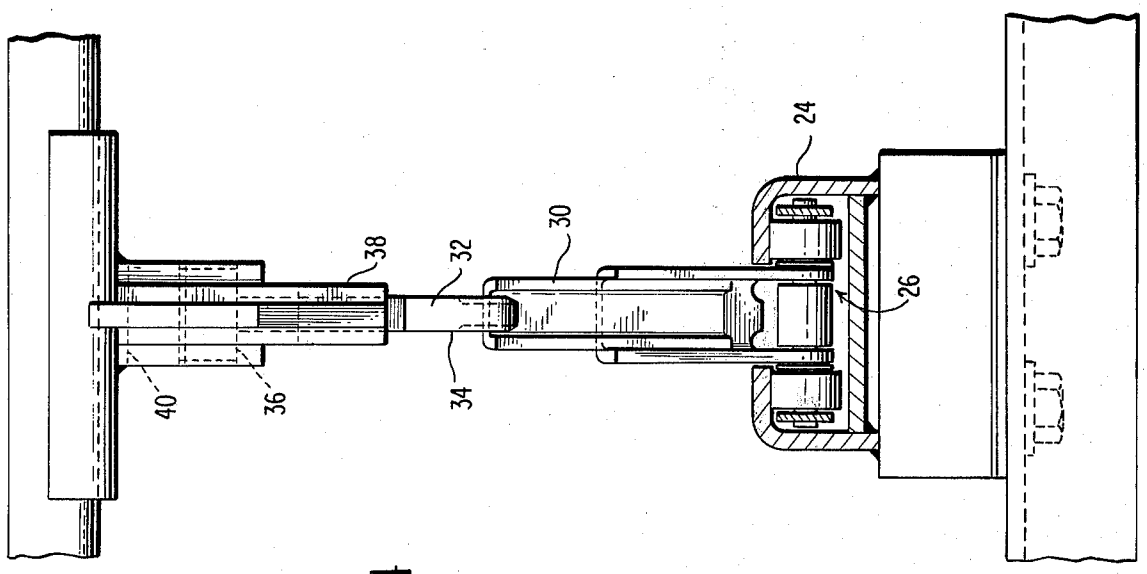


FIG. 4

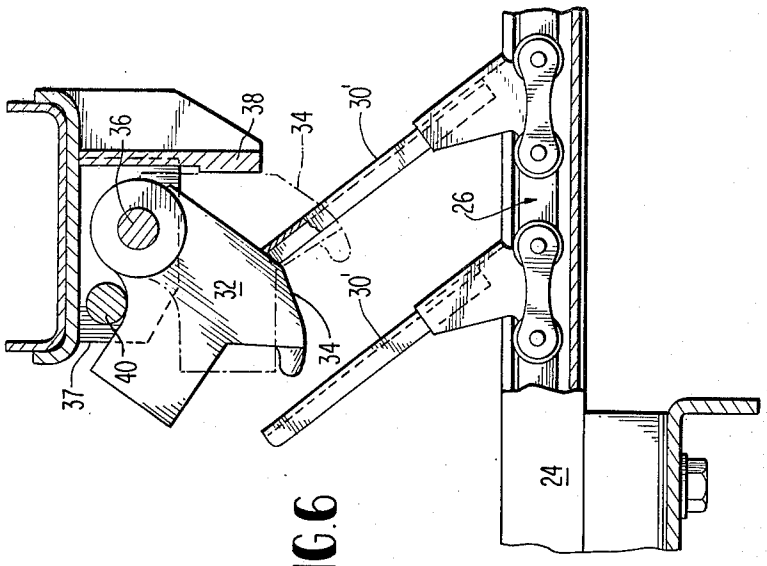
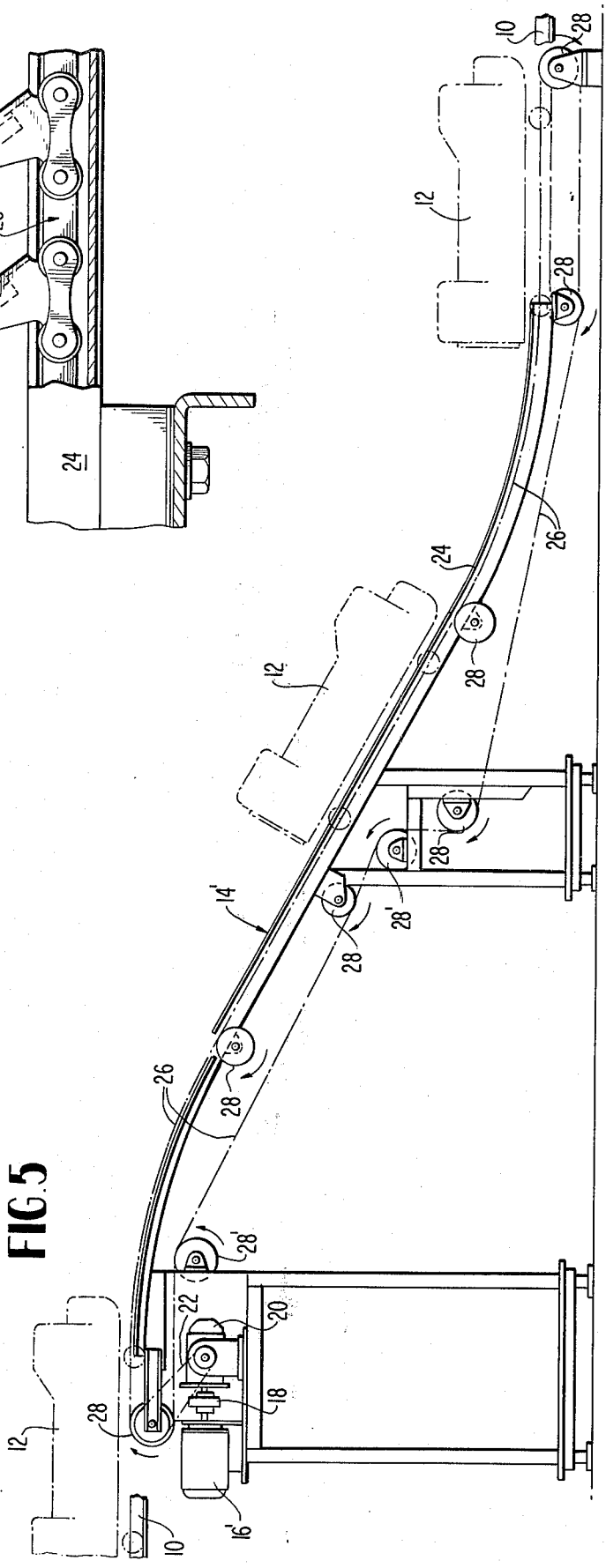

36
38
34
30'
26
32
30'
34
40
37
24

FIG.6


10
28
12
28
26
24
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14'
28'
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26
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28'
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18
12
28
16'
10

FIG.5

CHAIN-DRIVEN DOG

This is a Continuation of Ser. No. **315,694,** filed Dec. **15, 1972** now abandoned.

FIELD OF THE INVENTION

This invention relates generally to apparatus for transmitting power to the cars of a unit carrier system in which a plurality of cars are driven over a trackway, and, more specifically, to apparatus for changing the elevation of cars in a unit carrier system such as is disclosed in commonly assigned U.S. Pat. Nos. **3,621,790, 3,626,859,** and **3,650,216.**

BACKGROUND OF THE INVENTION

In friction-powered unit carrier systems such as are disclosed in the above-listed patents, the amount of normal force between the reaction tubes and the propulsion wheels is limited to something less than the weight of the cars in order to provide stable operation. This limitation in turn limits the accelerational capabilities of this drive technique to values less than that desirable at certain critical points in the system -e.g., where the cars have to climb steep inclines and where they must be accelerated from zero velocity in a queing station to the velocity of the cars on the main line. The present invention is designed to supplant the friction-powered drive apparatus at such critical points in the system, allowing the cars to be driven up a steeper incline or accelerated on to the main line more rapidly than they otherwise could be.

SUMMARY OF THE INVENTION

In a unit carrier system in which a plurality of cars are driven over a trackway by means of the frictional interaction of reaction surfaces and propulsion wheels, apparatus for transmitting relatively large amounts of power to the cars. The apparatus comprises a dog pivotally mounted on the bottom of each car and a motor-driven endless chain carrying a plurality of cooperating pawls in the trackway. The car preferably enters the system at a speed in excess of the chain speed, and the dog is pivoted out of the way by the back of one or more of the pawls, but the car gradually loses speed until the front of one of the pawls overtakes the dog, forces it against a stop, and thereafter pushes the car along.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of an incline incorporating the present invention.

FIG. **2** is a side elevational view of the incline shown in FIG. **1.**

FIG. **3** is a side sectional view of the engagement of a carmounted dog and a chain-mounted pawl in accordance with the present invention showing the chain-mounted pawl pushing the car-mounted dog against the forward stop.

FIG. **4** is a front sectional view taken along the lines IV—IV in FIG. **3.**

FIG. **5** is a side elevational view of a decline similar in plan to the incline shown in FIG. **2.**

FIG. **6** is a side sectional view of the engagement of a car-mounted dog and a chain-mounted pawl in accordance with the present invention showing the chain-mounted pawl pushing the car-mounted dog against the rear stop.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the present invention could be used at a queing station such as is described in commonly assigned U.S. Pat. No. **3,626,859** or at a merge such as is described in commonly assigned U.S. Application Ser. No. **325,059,** filed Dec. **14, 1972,** it finds its most ready application at trackway inclines because the car preferably enters the system at a speed in excess of the chain speed in order to minimize the shock when the chain and pawl take over the powering of the car. Accordingly, the preferred embodiment described herein utilizes the present invention at a trackway incline.

FIGS. **1** and **2** show such an incline in the tracks **10.** The incline begins with a level section of track, so that the unit carriers **12** (shown in phantom on FIG. **2** only) may be transferred from the drive system operative elsewhere in the system to the drive system operable on the incline before the actual ascent begins. To accomplish this, the linear velocity of the latter should preferably be slightly less than that of the former, as will become obvious as the description of the incline drive system progresses. Following the initial level section of the track, there is a **30°** curved portion, a straight portion at a **30°** angle to the ground, another **30°** curved portion, and a short level terminal portion.

Set approximately midway between the tracks **10** is an apparatus **14** embodying the present invention. This apparatus comprises a motor **16,** a coupling **18,** a gear box **20** for reducing the rotational speed of the output of the motor **16,** a power transmission means **22** which can be either two sprockets and a chain or two sheaves and a belt, and a chain and sprocket system powered by all of the foregoing. This chain and sprocket system comprises (**1**) a chain guide **24** (best seen in FIG. **4**) which guides the chain **26** in a fixed relationship relative to the bottom of the cars **12** as they enter and leave the incline and as they ascend the curved portions of the incline and (**2**) a series of sprockets **28** and **28'** which guide the chain on the flat portion of the incline and on the chain's return path. It should be particularly noted that the central portion of the sprockets **28',** which are on the outside of the chain envelope, have to have their central portions cut away to accomodate passage of the pawls **30,** best seen in FIGS. **3** and **4.**

FIGS. **3** and **4** show the engagement of one of the pawls **30** with a dog **32** in detail. A dog **32** is mounted on the bottom of each car **12** in any appropriate manner and comprises a pivoting finger **34,** shown in FIG. **3** both in its down position (solid line) and its up position (broken line). The finger **34** rotates freely about the shaft **36,** which journalled in a housing **37,** from a position against a forward stop **38** to a position against a rear stop **40.** It should be noted that the axis of the shaft **36** is set forward of the point of the finger **34** when in its down position. This configuration prevents binding between the bottom of the tip of the finger **34** and the top of the pawl **30.**

The pawl **30** is shown as an insert in the chain **26.** This is because chains of the shape of chain **26** are commercially available, but the pawl **30** could as well be manufactured integrally with the chain **26** so far as the present invention is concerned.

The chain **26** is shown in FIG. **4** moving in a chain guide **24** having both a top and bottom engagement surface. However, it will be obvious that only a bottom

surface is strictly necessary at the top of the incline and only a top surface is strictly necessary at the bottom. The chain guide **24** is mounted between the tracks **10** in any suitable fashion, as, for instance on cross ties.

In operation, the chain **26** is driven at a constant speed which is preferably slightly slower than that of the cars prior to and after the incline. As the car enters the incline, therefore, the dog will override the first couple of pawls, the finger **34** being forced from the down position towards the up position by the back of each successive pawl. However, since the car is bereft of its normal driving power, its velocity is gradually reduced by friction and by gravity until the speed of the car is just less than the speed of the chain.

At that moment, the front of one of the pawls overtakes the dog, forces it against its forward stop **38,** and the chain takes over the driving of the car. At the upper end of the incline, the speed of the normal driving apparatus is again preferably slightly faster than that of the chain, thus providing smooth disengagement of the dog from the chain.

It should also be noted that the same dog can be used as a positive retardation means on declines to prevent excessive gravity acceleration. Such a decline is shown in FIG. **5,** and the engagement of the car-mounted dog **32** and a chain-mounted pawl **30'** is shown in FIG. **6.** (In FIGS. **5** and **6,** the same numerals are used to designate parts which are identical to parts previously described, and primed numerals are used to designate parts which are modified to permit their use on a decline rather than an incline.) In this embodiment of the present invention, the pawls **30,** are mounted in the opposite direction and are slightly longer so that they will force the finger **34** against the stop **40** rather than the stop **38.** However, everything else remains the same.

CAVEAT

While the present invention has been illustrated by a detailed description of a preferred embodiment thereof, it will be obvious to those skilled in the art that various changes in form and detail can be made therein without departing from the true scope of the invention. For that reason, the invention must be measured by the claims appended hereto and not by the foregoing preferred embodiment.

What is claimed is:

1. In a unit carrier system in which a plurality of cars are driven over a trackway, apparatus for accelerating and decelerating the cars, said apparatus comprising:

a. a dog mounted on the exterior of at least some of the cars, each of said dogs comprising

i. a housing;

ii. a forward stop mounted on said housing at a first distance from a first endless chain recited hereinafter,

iii. a rear stop mounted on said housing at a second distance from a second endless chain recited hereinafter, said second distance being different than said first distance, and

iv. a finger pivotably mounted in said housing and movable between a first position in which it is positioned against said forward stop and a second position in which is is positioned against said rear stop;

b. a first plurality of pawls;

c. a first endless chain carrying said first plurality of pawls, said first endless chain being mounted adjacent to the trackway in a position such that said first plurality of pawls engages said fingers when they are in their first position;

d. first means for driving said first endless chain in the direction of motion of the cars on the trackway, thereby pushing said fingers against said first stops;

e. a second plurality of pawls of a different length than said first plurality of pawls;

f. a second endless chain carrying said second plurality of pawls, said second endless chain being mounted adjacent to the trackway at a place remote from said first endless chain in a position such that said second plurality of pawls engages said fingers when they are in their second position; and

g. second means for driving said second endless chain in the direction of motion of the cars on the trackway, thereby pushing said fingers against said second stops,

whereby the cars may be accelerated by said first means, acting through said first endless chain, said first plurality of pawls, said fingers, and said first stops, and decelerated by said second means, acting through said second endless chain, said second plurality of pawls, said fingers, and said second stops.

2. Apparatus as claimed in claim **1** wherein said first means is adapted to drive said first endless chain at a speed slightly less than that of the cars on the portion of the trackway immediately preceding the portion of the trackway where said first endless chain is located.

3. Apparatus as claimed in claim **1** wherein said first means comprises:

a. a motor;

b. a coupling;

c. a gear box for reducing the rotational speed of the output of the motor; and

d. means for transmitting the output of said gear box to said endless chain.

4. Apparatus as claimed in claim **1** wherein, when said fingers are positioned against said forward stops, the points on said fingers which come in contact with said first plurality of pawls are located behind the points about which said fingers pivot when considered with reference to the direction in which said first endless chain moves.

5. Apparatus as claimed in claim **1** wherein said forward and rear stops and said first endless chain are positioned such that, when the speed of one of said cars exceeds the speed of said first endless chain, the finger on said car will be pivoted away from said forward stop by contact with said first plurality of pawls without, however, coming into contact with said rear stop.

6. Apparatus as claimed in claim **1** wherein said first endless chain is located at an incline in the trackway.

7. Apparatus as claimed in claim **1** wherein said second endless chain is located at a decline in the trackway.

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