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DOOR OPERATOR

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2 Sheets-Sheet 1

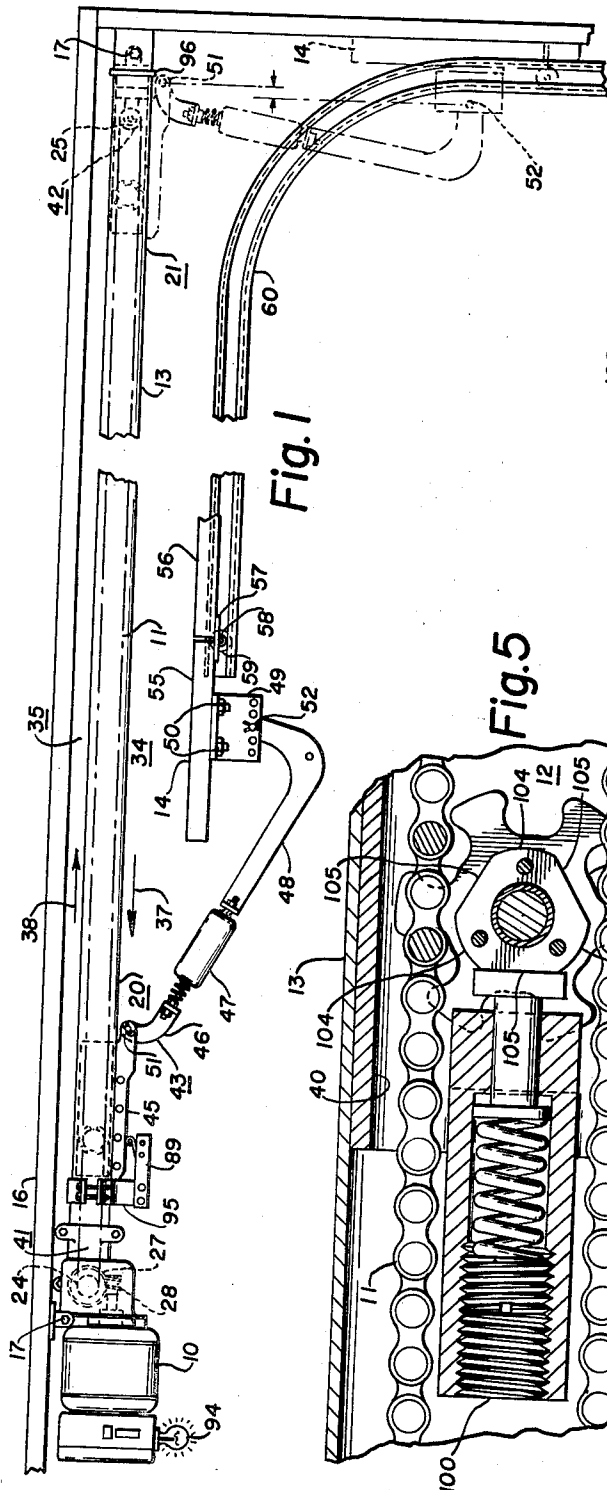


Fig. 1

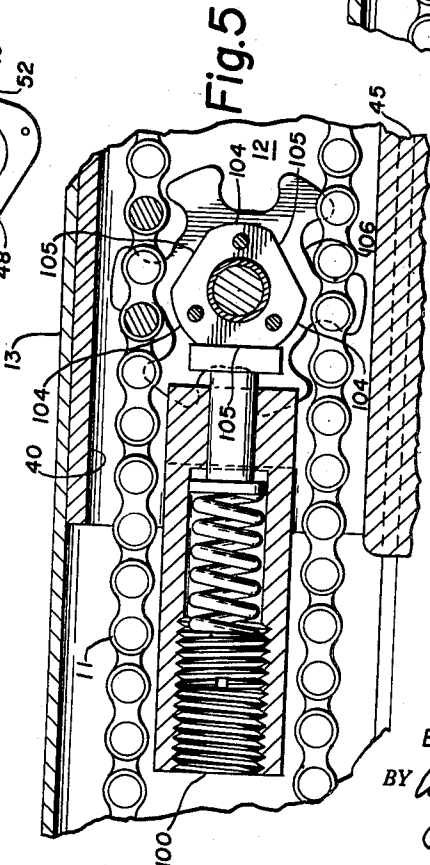


Fig. 5

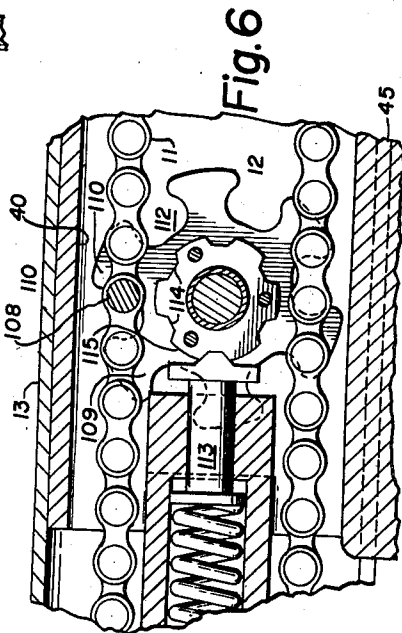


Fig. 6

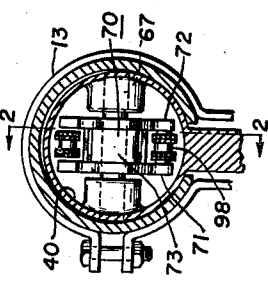


Fig. 4

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DOOR OPERATOR

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9 Claims. (Cl. 268—59)

The invention relates in general to door operators and more particularly to latch means for connecting and disconnecting a garage door from a drive means. The invention also relates to connecting and disconnecting drive and driven members by means of a movable latch which has different resistances to movement in the latched and unlatched conditions which may be overcome by the application of suitable forces. The driven member has a resistance to movement which may be overcome by a force applied by the drive member. The numerical value of the normal resistance is smaller than the value of the latched resistance and larger than the value of the unlatched resistance.

It has long been desired to have a garage door opener which may be driven by a uni-directional power source without the use of a slipping clutch or other equivalent means to disconnect the driven member from the driving means in the event an obstruction might be encountered by the garage door in its travel between an open and a closed position. They have also been desirous of obtaining a door opener driven by a positively geared uni-directional power source, which will unlatch upon reaching an open position and which will automatically latch when it is desired that the door be closed. The reverse is also desirable, namely that the door opener will unlatch upon reaching a closed position and will latch when the door is to be opened.

The use of a single or uni-directional power source and a positively geared drive train are desirable because of the economics involved in their manufacture and the ease in their installation.

An object of the invention is to provide latching means in a garage door opener which will permit relative movement between a carriage which is attached to a garage door and a continuous chain.

Another object of the invention is to provide a garage door opener with a single carriage which carries a latch sprocket assembly and a continuous chain which has lug means whereby the chain engages and moves the carriage to one end of a guideway where the carriage abuts a stop and whereafter the chain disengages the carriage and rounds a member to which it is supported and thereafter re-engages the carriage and moves it in another direction to another end of the guideway.

Another object of the invention is to provide a door opening mechanism having a positive drive from a uni-directional power source, with latching means which provides for unlatching the door from the power source when the door is up and provides for latching the door to the power source when it is desired that the door be closed.

Another object of the invention is to provide a continuous chain which is driven from a positive uni-directional source and which travels in two substantially linear paths and two substantially one hundred eighty degree paths, with lug means for connecting the chain through latch means to a carriage which is in turn connected to a door to be opened and closed whereby the chain and the carriage will become disconnected after the carriage

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and chain travels through one of the two substantially linear paths and when the door reaches the open position and the lug means will thereafter traverse one of the one hundred eighty degree paths and become re-connected to the carriage and the carriage will then be transported in the other substantially linear path until the door is in the closed position or until the door engages an obstruction.

Another object of the invention is to provide safety means in a door latching mechanism whereby a carriage connected to a door is prevented from escaping from lug means on a chain which is moving the carriage and the door, while the door is traveling between open and closed positions.

Another object of the invention is to provide latching means whereby movement of a driven member is transmitted to another member until a predetermined resistance to movement is developed by the other member whereby relative movement may be effected between the driven member and the other member.

Another object of the invention is to provide latching means which will disconnect a chain which is moving a door between open and closed positions when the door or a part thereof meets a predetermined resistance to movement.

Other objects and a fuller understanding of this invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is an elevational view showing a garage door opener connected to a garage door and showing in full lines the position of the door when open and showing in dotted lines the position of the door when closed;

Figure 2 is an enlarged sectional view of the latch means taken along the lines 2—2 of Figure 4, which connect a chain drive to a garage door and is shown just as the door reaches the open position;

Figure 3 is an enlarged sectional view of the latch means of Figure 2 shown subsequent to the door reaching the open position;

Figure 4 is a view taken generally along the lines 4—4 of Figure 2;

Figure 5 is an enlarged view partially in section showing principally a different latch means which may be used in the invention;

Figure 6 is another view showing a further modification of the latch means utilized in this invention; and

Figure 7 is a view showing a still further modification of the latch means as taught by the invention.

Figures 1 and 2 show generally a motive power source 10 driving a continuous chain 11 and latch means indicated generally at 12. The latch means 12 is mounted for travel in a guideway 13 and connects and disconnects garage door 14 to the chain 11. The guideway 13 and the power source 10 are connected to a ceiling 16 of a building in which they are to function, by suitable means such as bolts 17. The power source 10 is a single or uni-directional power source as taught by this invention, but it will be apparent that a bi-directional power source might be used if one so desired. The motive power source 10 is designed to deliver by way of the chain 11, a predetermined force of at least a first numerical value.

The guideway 13 has a first and a second end portion indicated by the reference numerals 20 and 21, respectively. A first sprocket wheel 24 is mounted at said first end portion 20 of the guideway 13 and a second sprocket wheel 25 is mounted at the second end portion 21 of the guideway. The chain 11 or driving member is carried by the sprocket wheels 24 and 25 and is driven in its movement about these sprocket wheels by means of a gear wheel 27 intermeshing with a worm gear 28 which is in turn connected to the motive power source 10. The motive power source may be, as is illustrated in Figure 1,

an electric motor. A switch arm 30 which leads to a switch 31, shown in Figure 2, connects the power source 10 to a source of electric current, not shown. The chain or first member 11 has a first and a second substantially straight run portion indicated generally by the reference numerals 34 and 35 respectively across which the chain 11 is adapted to travel in a first and a second substantially linear direction respectively. The first and second linear directions are indicated by the arrows 37 and 38 respectively. The chain 11 also travels through two substantially one hundred eighty degree paths as it rounds the first and second sprocket wheels 24 and 25 respectively. These paths are indicated generally by the numerals 41 and 42 respectively. The guideway 13 as shown in the accompanying drawings may be of any suitable form and has been shown merely by way of example as a circular pipe which is slotted along its underside for a distance which is the greater part of the length of the pipe. A carriage or second member 40 is mounted within the guideway 13 and is adapted for movement within the guideway in the above-mentioned first and second linear directions 37 and 38 respectively. Connection means 43 are provided for connecting the carriage or driven member 40 to the garage door 14 whereby movement of the carriage 40 imparts movement to the door 14. The door 14 is shown only partially in Figure 1. The connection means 43 include generally a downwardly extending flange 45 which extends from the carriage or driven member 40, an off-center locking arm 46 pivotally connected to the flange at 51, a shock absorber type snubber 47 connected to the off-center locking arm and a door arm 48. The door arm 48 is attached at one end to the snubber 47 and at the other end at 52 to an adjustable door bracket 49 which in turn is fixedly attached to an upper portion of the garage door 14 by suitable means such as by the bolts 50. The garage door 14 is made up of sections 55 and 56 which are hinged together by a hinge 57. A shaft 58 extends through the hinge 57 and thus completely connects the door sections 55 and 56 together and a roller 59 is attached to the end of the shaft 58. As will be noted in Figure 1, in the dotted line position indicating the position of the door when closed, the points of connection, 51 and 52, are off center or not in the same perpendicular plane. This feature is to prevent strangers from pushing the door open from the outside, when the door is in this closed position.

A track 60 is adapted to receive the roller 59 whereby the garage door is supported and guided in its movement between the open and closed positions. The latch means 12 resides within the carriage 40 and is carried therewith. The principal function of the latch means is to maintain either a latched or an unlatched condition between the chain 11 and the carriage 40 and hence the door 14. The latch means 12 includes a latch sprocket assembly indicated generally at 65 and holding means indicated generally at 66. The latch sprocket assembly 65 is mounted for rotation upon a shaft 67 which is in turn journaled on the carriage 40.

The latch sprocket assembly 65 comprises a rotatable or arcuately movable member 70 which has a first and a second oppositely disposed side portion 71 and 72 respectively and an intermediate annular portion 73 disposed between the first and second oppositely disposed side portions, as best seen in Figure 4. The first and second oppositely disposed side portions have outer peripheries which are defined by teeth or projections thereon and these teeth on the first and second side portions are disposed substantially opposite to each other thus making up pairs of oppositely disposed teeth. These teeth or projections are identified by the numerals 77 through 82 for more ease in referring to them hereafter.

The annular portion 73 comprises alternately spaced first surface areas or locking surface areas 85 and second surface areas or arcuate surface areas 86. The locking surface area 85 includes an angular surface area 87 and

a flattened surface area 88. The holding means 66 includes generally a holding member or plunger 90 and spring means 91. The holding member 90 has surface means comprising a first surface 92 adapted to engage the first surface or flattened surface 85 and a second surface 93 adapted to engage said angular surface 87 when the latch means 12 is in the latched position. The latched position is illustrated most clearly in Figure 2. The spring means 91 is adapted to urge the plunger toward the intermediate annular portion 73 of the latch sprocket assembly 65. The above-described elements in the latched position comprise means for establishing the first resistance to rotation of the latch sprocket assembly. A force of a first value is required to overcome this first resistance to rotation of the latch sprocket assembly and thereby rotate the latch sprocket assembly. When the latch means 12 is in the unlatched condition, as best shown in Figure 3, the first surface 92 of the plunger 90 engages the arcuate surface 86 whereby a third resistance to rotation of the latch sprocket assembly 65 is effected. The above-described elements in the unlatched position comprise means for establishing the third resistance to rotation of the latch sprocket assembly. A force of a third value is required to overcome this third resistance to rotation of the latch sprocket assembly and thereby rotate the latch sprocket assembly.

A first adjustable stop means 95 is mounted at the first end portion 20 of the guideway 13 and a second stop means 96 is mounted at the second end portion 21 of the guideway 13. The stop means 95 may be adjusted within limits for variations in different garage door lengths. The stop means 95 and 96 limit the movement of the carriage 40, in the above-mentioned first and second linear directions 37 and 38, respectively, within the guideway 13. The continuous chain 11 is made up of a series of interconnecting links 94 which are adapted to travel between the oppositely disposed teeth on the first and second side portions 71 and 72 of the latch sprocket assembly 65 and adjacent the intermediate annular portion 73. Lug means comprising a first and a second chain lug indicated by the reference numerals 97 and 98 respectively are mounted upon the continuous chain 11 and as best seen in Figure 4, are of a greater length than the distance between the first and second side portions 71 and 72 of the latch sprocket assembly 65 and thereby engage the oppositely disposed teeth on the latch sprocket assembly.

A switch actuating member 99 is carried by the chain 11 and is spaced a predetermined distance from the chain lugs and is adapted to engage the switch arm 30 which in turn actuates the switch 31 and thus energizes and de-energizes the power source 10. The carriage 40 has a second and a fourth resistance to movement within the guideway 13. The second resistance to movement stems from the weight, inertia, and friction involved in the carriage 40, connection means 43 and the door 14, even though these elements are partially balanced by counterweights or tension springs of some type. This might be referred to as the normal free-running resistance to movement of the carriage and the door. This second resistance requires a force of a second value to overcome it and thus start the carriage moving or to keep it moving when once started. The fourth resistance to movement of the carriage 40 stems from the carriage, door or some part thereof striking an object in the path of its travel either accidentally placed there or placed there purposely as a permanent stop.

The numerical value of the above-mentioned force of a second value which is required to overcome the second resistance to movement of the carriage is less than the numerical value of the force of the first value which is required to overcome the first resistance to rotation of the latch sprocket assembly and is greater than the numerical value of the force of the third value which is required to overcome the third resistance to rotation of the latch sprocket assembly. The fourth resistance to

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movement of the carriage 40 is of a greater value than the force of the first value. The second resistance to movement of the carriage 40 is greater than the third resistance to movement of the latch sprocket assembly and less than the first resistance to movement of the latch sprocket assembly. The fourth resistance to movement of the carriage 40 is greater than the force of the first value. In other words, the fourth resistance prevents movement of the carriage 40 sufficiently so that the force from the motive power source acting through the chain and the lug means to the latch sprocket assembly contributes an effective force of the first value to rotate the latch sprocket assembly rather than contributing the entire force to the moving of the carriage. As shown best in Figure 2, the first chain lug 97 and the second chain lug 98 surround the tooth indicated by the numeral 77 when the latch means is in the latched position and since the resistance to movement of the carriage 40 and the door 14, otherwise referred to as the second resistance or free-running condition of the carriage and the door, is less than the above-mentioned first resistance to rotation of said latch sprocket assembly, the movement of the chain 11 carries the carriage 40 and hence the garage door 14 across the first straight run portion 34 in the first linear direction 37 to the first end portion of the guideway 13.

Figure 2 shows the downwardly extending flange 45 just as it makes contact with the first stop means 95 at the first end portion of the guideway. It will be noted that as the flange reaches this position it actuates a switch 89 which controls an electric light 94. The surrounding of the tooth 77 by the lugs 97 and 98 acts also as a safety latch whereby the carriage and hence the door is prevented from escaping from the movement of the chain and possibly striking someone or something while slamming shut to the closed position. It will thus be seen that there is no relative movement between the chain and the carriage while the carriage is traversing the first and second straight run portions 34 and 35, respectively. As the carriage reaches the limit of its movement in the first linear direction as shown in Figure 2, the above referred to fourth resistance to movement of the carriage 40 is effected and the second chain lug 98 provides the force of the first numerical value which overcomes the first resistance to rotation of the latch sprocket assembly and the assembly rotates into the position as illustrated in Figure 3, thus permitting relative movement between the chain 11 and the carriage 40. The switch actuating member 99 engages the switch arm 30 at approximately the same time that the second chain lug 98 causes the rotation of the latch sprocket assembly 65, and thereby de-energizes the motive power source 10. The inertia of the moving parts carries the chain and hence the chain lugs into the unlatched position, as indicated in Figure 3 wherein movement of the chain ceases. As noted in Figure 3, the first surface 92 of the holding member 90 is in engagement with the second or arcuate surface 86. While in this unlatched condition, there is a third resistance to rotation of the latch sprocket assembly. When it is desired that the garage door be closed, suitable means for re-energizing the motive power source, not shown here, may be provided whereby the first and second chain lugs 97 and 98, respectively, are carried around the first sprocket wheel 24 located at the first end portion 20 of the guideway 13 and into position to traverse the second straight run portion 35 in the second linear direction 38. The normal free running or second resistance to movement of the door 14 and the carriage 40 is greater than said third resistance to rotation of the latch sprocket assembly 65. The first chain lug 97 engages the tooth 79 thereby rotating the latch sprocket assembly into the latched position thus locating the tooth 78 between the first and second chain lugs 97 and 98, respectively; and once in this latched condition, the carriage 40 will be transported within the guideway 13 to the second end portion 21 of the guideway 13 and the door 14 will be

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closed as indicated by the dotted line position in Figure 1. It will be noted that the safety latch feature as mentioned above is also in effect when the door is being carried to the closed position. When the carriage reaches the second stop means 96 at the second end portion 21 of the guideway 13, the same process occurs as described above when the carriage reached the first stop means 95 at the first end portion of the guideway.

The first resistance to rotation of the latch sprocket assembly when in the latched condition is not so great that a person by grasping the door and pulling may not overcome this resistance. By predetermining, by means of an adjustable stop screw 100, the first resistance to rotation, when in the latched condition, a person may hand operate the door in the event the power source is unexpectedly destroyed when the door is only partially open or closed. It is, of course, obvious that the door may be hand operated when completely open or closed since the latch means is in the unlatched position. This is subject to one exception, however, in that the door may not be opened from the outside by hand when it is completely closed because of the off-center condition of the two points of connection 51 and 52.

Figures 5, 6 and 7 are basically illustrations of modifications of the latch means which may be utilized as taught by this invention. Figure 5 illustrates latch means wherein the basic change is in the locking surfaces which are utilized. In this case, alternately spaced arcuate surface areas 104 and flattened locking surfaces 105 are utilized upon a rotatable or arcuately movable member 106.

Figure 6 illustrates how a single chain lug instead of two chain lugs may be utilized in this invention. A single chain lug 108 is carried by the chain 11 and is surrounded by teeth 109 and 110 on a latch sprocket assembly 112. A holding member 113 and a series of locking surfaces 114 and arcuate surfaces 115 are similar to those shown in Figures 2 and 3 except that the locking surfaces 114 are spaced every sixty degrees instead of every one hundred and twenty degrees as in Figures 2 and 3. This is the case since a complete cycle from latched to unlatched and back to latched position requires a rotation of the assembly 112 through an angle of only sixty degrees rather than one hundred twenty degrees.

Figure 7 follows generally the same construction as that used in Figure 6, except that a different type chain lug 118, and a latch sprocket assembly having only three teeth 119, 120 and 121, instead of six teeth as illustrated hereinbefore, have been utilized.

As stated above, these modifications are illustrated to show variations in construction which may be utilized without departing from the basic teachings disclosed in this invention.

It will thus be seen from the foregoing description and operation of the invention herein disclosed that a new and novel latching means has been provided whereby movement of a driven member is transmitted to another member until a predetermined resistance to movement is developed by the other member whereby relative movement may be effected between the driven member and the other member. A few of the safety and convenience features attendant to the disclosed invention are of course apparent from the safety latch feature and the consideration that the door may be operated by hand in the event the motive power source is destroyed when moving the door between an open and a closed position. Among the many important features of this invention is the fact that a uni-directional motor or power source may be utilized thus saving money and complexity of wiring in the mechanism.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the

combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A door operating mechanism comprising, a guide-
way having a first and a second end portion, a first and a
second sprocket wheel located at said first and second end
portions of the guideway, a continuous chain carried by
said first and second sprocket wheels, a positive drive
uni-directional power source adapted to drive one of said
sprocket wheels and having an off and on switch, said
chain having a first and a second straight run portion
across which said chain is adapted to travel in a first and
a second substantially linear direction respectively, a car-
riage mounted within said guideway for movement in
said first and second substantially linear directions, con-
nection means for connecting a door to be operated to
the carriage whereby movement of the carriage is trans-
mitted to the door, latch means adapted to maintain
alternately a latched condition and an unlatched condition
between the carriage and the chain, said latch means in-
cluding a latch sprocket assembly adapted for rotation
about an axis, comprising a rotatable member having first
and second oppositely disposed side portions and an in-
termediate annular portion disposed between said first
and second side portions, said first and second oppositely
disposed side portions having outer peripheries defined by
teeth thereupon, said teeth on the outer peripheries of said
first and second side portions disposed substantially op-
posite each other therefore making up pairs of oppositely
disposed teeth, said annular portion comprising alternately
spaced arcuate surface areas and flattened surface areas,
said arcuate surface areas and said flattened surface areas
connected by angular surface areas, a plunger having a
first surface area adapted to engage said flattened surface
area and a second surface area adapted to engage said
angular surface area when said latch means is in the
latched position, spring means urging said plunger toward
said intermediate annular portion, said latched condition
creating a latched resistance to rotation of said latch
sprocket assembly about said axis, said first surface area
of said plunger adapted to engage said arcuate surface
area when said latch means is in the unlatched condition,
said unlatched condition creating an unlatched resistance
to rotation of said latch sprocket assembly, stop means
mounted at said first and second end portions of said
guideway whereby movement of said carriage in said first
and second linear directions within said guideway is
limited, said chain being made up of a series of intercon-
necting links which are adapted to travel between the
oppositely disposed teeth on said first and second side por-
tions of the latch sprocket assembly and adjacent said in-
termediate annular portion, lug means comprising a first
and a second chain lug mounted upon said chain, a switch
actuating member carried by said chain, resistance to
movement of said carriage and said door being less than
said latched resistance and greater than said unlatched
resistance, said first and second chain lug surrounding one
of said pairs of oppositely disposed teeth on said latch
sprocket assembly when said latch means is in said latched
condition whereby said carriage is transported in said first
linear direction within said guideway, said carriage there-
after engaging said stop means at said first end portion of
the guideway thus preventing further movement of said
carriage in said first linear direction whereby said second
chain lug overcomes the latched resistance to rotation of
said latch sprocket assembly and said sprocket assembly
rotates slightly thus moving said latch means to the
unlatched condition and thus permitting relative move-
ment of said chain and said carriage, said switch actuating
member actuating said off and on switch and thereby de-
energizing said uni-directional power source and move-
ment of said chain ceases, means for re-activating said
uni-directional power source whereby said first and second
chain lugs are carried around said first sprocket wheel and

into position to traverse said second straight run portion
in said second substantially linear direction, said first chain
lug engaging another pair of oppositely disposed teeth
thereby rotating said latch sprocket assembly into a
latched condition and thereby surrounding another pair
of oppositely disposed teeth with said first and second
chain lug thus positively locking said carriage to said
chain, thereafter the movement of said chain lugs in said
second substantially linear direction transports said car-
riage in said second linear direction until engagement of
said carriage with said stop means at said second end por-
tion of the guideway is effected.

2. A door operating mechanism comprising, a guide-
way having a first and a second end portion, a first and
a second sprocket wheel located at said first and second
end portions of the guideway, a continuous chain carried
by said first and second sprocket wheels, a power source
adapted to drive one of said sprocket wheels, a carriage
mounted within said guideway for movement in a first
and a second substantially linear direction, connection
means for connecting a door to be operated to the carriage
whereby movement of the carriage is transmitted to the
door, latch means adapted to establish a latched condition
and an unlatched condition between the carriage and the
chain, said latch means including a rotatable member
having arcuate surface portions and locking surface por-
tions, teeth extending from said rotatable member, a
plunger having a first surface adapted to engage said lock-
ing surface portion when said latch means is in the latched
position, means urging said plunger toward said rotatable
member, said latched condition creating a latched resist-
ance to rotation of said rotatable member, said first sur-
face of said plunger adapted to engage said arcuate sur-
face portion when said latch means is in the unlatched
condition, said unlatched condition creating an unlatched
resistance to rotation of said rotatable member, stop
means mounted at said first and second end portions of
said guideway whereby movement of said carriage in
said first and second linear directions within said guide-
way is limited, a first and a second chain lug mounted
upon said chain, resistance to movement of said carriage
and said door being less than said latched resistance, said
first and second chain lug surrounding at least one tooth
on said rotatable member when said latch means is in said
latched condition whereby said carriage is transported in
said first linear direction, said carriage thereafter engag-
ing said stop means at said first end portion of the guide-
way thus preventing further movement of said carriage
in said first linear direction whereby said second chain
lug overcomes the latched resistance to rotation of said
rotatable member and said rotatable member rotates
slightly thus moving said latch means to the unlatched
condition and thus permitting relative movement between
said chain and said carriage, means acting in accordance
with the movement of said chain whereby said power
source becomes de-energized and movement of said chain
ceases, means for reactivating said power source whereby
said first and second chain lugs are carried around said
first sprocket wheel and into position to travel in said
second substantially linear direction, resistance to move-
ment of said carriage and said door being greater than
said unlatched resistance, said first chain lug engaging
another tooth thereby rotating said latch means into a
latched condition and thereby surrounding another tooth
with said first and second chain lug, thereafter the move-
ment of said chain lugs in said second substantially linear
direction transports said carriage in said second linear
direction until engagement of said carriage with said stop
means at said second end portion of the guideway is
effected.

3. A door operating mechanism comprising, a guide-
way having a first and a second end portion, a first and
a second sprocket wheel located at said first and second
end portions of the guideway, a continuous chain carried
by said first and second sprocket wheels, a uni-directional

power source adapted to drive one of said sprocket wheels, said chain having a first and a second straight run portion across which said chain is adapted to travel in a first and a second substantially linear direction respectively, a carriage mounted within said guideway for movement in said first and second substantially linear directions, connection means for connecting a door to be operated to the carriage whereby movement of the carriage is transmitted to the door, latch means adapted to establish a latched condition and an unlatched condition between the carriage and the chain, said latch means including a rotatable member having first and second surface portions, projections extending from said member, a holding member adapted to engage said first and second surface portions, said holding member engaging said first surface portion when the latch means is in the latched condition and said holding member engaging said second surface portion when the latch means is in the unlatched condition, means urging said holding member and said first and second surface portions together, said latched condition creating a latched resistance to rotation of said rotatable member and said unlatched condition creating unlatched resistance to rotation of said rotatable member, stop means mounted at said first and second end portions of said guideway whereby movement of said carriage in said first and second linear directions within said guideway is limited, a first and a second chain lug carried by said chain, resistance to movement of said carriage and said door being less than said latched resistance, said first and second chain lug surrounding at least one of said projections on said rotatable member when said latch means is in said latched condition whereby said carriage is transported in said first linear direction within said guideway, said carriage thereafter engaging said stop means at said first end portion of the guideway thus preventing further movement of said carriage in said first linear direction whereby said second chain lug overcomes the latched resistance to rotation of said rotatable member and said rotatable member rotates slightly thus moving said latch means to the unlatched condition and thus permitting relative movement between said chain and said carriage, means for de-energizing said uni-directional power source whereby movement of said chain ceases, means for re-energizing said uni-directional power source whereby said first and second chain lugs are carried around said first sprocket wheel and into position to traverse said second straight run portion in said second substantially linear direction, resistance to movement of said carriage and said door being greater than said unlatched resistance, said first chain lug engaging at least one of said projections thereby rotating said rotatable member into a latched condition and thereby surrounding another of said projections with said first and second chain lug, thereafter the movement of said chain lugs in said second substantially linear direction transports said carriage in said second linear direction until engagement of said carriage with said stop means at said second end portion of the guideway is effected.

4. A door operating mechanism comprising, a guideway having a first and a second end portion, a first and a second sprocket wheel located at said first and second end portions of the guideway, a continuous chain carried by said first and second sprocket wheels, a uni-directional power source adapted to drive said chain, said chain having a first and a second straight run portion across which said chain is adapted to travel in a first and a second substantially linear direction respectively, a carriage mounted with said guideway for movement in said first and second substantially linear directions, connection means for connecting a door to be operated to the carriage whereby movement of the carriage is transmitted to the door, latch means adapted to maintain a latched condition and an unlatched condition between the carriage and the chain, said latch means including a rotatable member having alternately spaced first and second surface portions, pro-

jections extending from said member, a holding member adapted to engage said first and second surface portions, said holding member engaging said first surface portion when the latch means is in the latched condition and said holding member engaging said second surface portion when the latch means is in the unlatched condition, means urging said holding member and said first and second surface portions together, said latched condition creating a latched resistance to rotation of said rotatable member and said unlatched condition creating an unlatched resistance to rotation of said rotatable member, stop means mounted at said first and second end portions of said guideway whereby movement of said carriage in said first and second linear directions within said guideway is limited, only a single drive lug carried by said chain, resistance to movement of said carriage and said door being less than said latched resistance, said single drive lug surrounded by two of said projections on said rotatable member when said latch means is in said latched condition whereby said carriage is transported in said first linear direction within said guideway, said carriage thereafter engaging said stop means at said first end portion of the guideway thus preventing further movement of said carriage in said first linear direction whereby said single drive lug overcomes the latched resistance to rotation of said rotatable member and said rotatable member rotates slightly thus moving said latch means to the unlatched condition and thus permitting relative movement between said chain and said carriage, means for de-energizing said uni-directional power source whereby movement of said chain ceases, means for re-energizing said uni-directional power source whereby said single drive lug is carried around said first sprocket wheel and into position to traverse said second straight run portion in said second substantially linear direction, resistance to movement of said carriage and said door being greater than said unlatched resistance, said single drive lug engaging at least one of said projections thereby rotating said rotatable member into a latched condition and thereby surrounding said single drive lug with at least two of said projections, thereafter the movement of said single drive lug in said second substantially linear direction transports said carriage in said second linear direction until engagement of said carriage with said stop means at said second end portion of the guideway is effected.

5. A door operating mechanism comprising, a guideway having a first and a second end portion, a continuous chain mounted for movement along said guideway, a power source adapted to drive said chain, said chain having a first and a second straight run portion across which said chain is adapted to travel in a first and a second substantially linear direction respectively, a carriage mounted with said guideway for movement in said first and second substantially linear directions, connection means for connecting a door to be operated to the carriage whereby movement of the carriage is transmitted to the door, latch means adapted to maintain a latched condition and an unlatched condition between the carriage and the chain, said latch means including an arcuately movable member having first and second surface portions, projections extending from said member, a holding member adapted to engage said first and second surface portions, said holding member engaging said first surface portion when the latch means is in the latched condition and said holding member engaging said second surface portion when the latch means is in the unlatched condition, means urging said holding member and said first and second surface portions together, said latched condition creating a latched resistance to movement of said arcuately movable member and said unlatched condition creating an unlatched resistance to movement of said arcuately movable member, first and second means for stopping said carriage from movement whereby movement of said carriage in said first and second linear directions within said guideway is limited,

chain lug means carried by said chain, resistance to movement of said carriage and said door being less than said latched resistance, said chain lug means engaging at least one of said projections on said rotatable member when said latch means is in said latched condition whereby said carriage is transported in said first linear direction within said guideway, said first means for stopping said carriage thereafter preventing further movement of said carriage in said first linear direction whereby said chain lug means overcome the latched resistance to movement of said arcuately movable member and said movable member moves slightly thus moving said latch means to the unlatched condition and thus permitting relative movement between said chain and said carriage, means for de-energizing said power source whereby movement of said chain ceases, means for re-energizing said power source whereby said chain lug means is carried into position to traverse said second straight run portion in said second substantially linear direction, resistance to movement of said carriage and said door being greater than said unlatched resistance, said chain lug means engaging at least one of said projections thereby rotating said rotatable member into a latched condition, and thereafter the movement of said chain lug means in said second substantially linear direction transports said carriage in said second linear direction until said second means for stopping the carriage prevents further movement of said carriage in said second linear direction.

6. A door operating mechanism comprising, a guideway having a first and a second end portion, a first and a second sprocket wheel located at said first and second end portions of the guideway, a continuous chain carried by said first and second sprocket wheels, a power source adapted to drive said chain, said chain having a first and a second straight run portion across which said chain is adapted to travel in a first and a second substantially linear direction respectively, a carriage mounted for movement in said first and second substantially linear directions, connection means for connecting a door to be operated to the carriage whereby movement of the carriage is transmitted to the door, latch means adapted to maintain a latched condition and an unlatched condition between the carriage and the chain, said latch means including an arcuately movable member having first and second surface portions, projections extending from said member, a holding member adapted to alternately engage said first and second surface portions, said holding member engaging said first surface portion when the latch means is in the latched condition and said holding member engaging said second surface portion when the latch means is in the unlatched condition, means alternately urging said holding member and said first and second surface portions together, said latched condition creating a latched resistance to movement of said arcuately movable member and said unlatched condition creating an unlatched resistance to movement of said arcuately movable member, stop means limiting the movement of said carriage in said first and second linear directions within said guideway, lug means carried by said chain, resistance to movement of said carriage and said door being less than said latched resistance, said lug means engaging at least one of said projections on said arcuately movable member when said latch means is in said latched condition whereby said carriage is transported in said first linear direction along said guideway, said stop means thereafter preventing further movement of said carriage in said first linear direction whereby said lug means overcomes the latched resistance to movement of said arcuately movable member and said arcuately movable member rotates slightly thus moving said latch means to the unlatched condition and thus permitting relative movement between said chain and said carriage, means for de-energizing said power source whereby movement of said chain ceases, means for

re-energizing said power source whereby said lug means is carried around said first sprocket wheel and into position and to traverse said second straight run portion in said second substantially linear directions, resistance to movement of said carriage and said door being greater than said unlatched resistance, said lug means engaging at least one projection thereby moving said arcuately movable member into a latched condition and thereby engaging another projection with said lug means, thereafter the movement of said lug means in said second substantially linear direction transports said carriage in said second linear direction until said stop means limits further movement of said carriage in said guideway.

7. A latching mechanism to connect and disconnect a carriage from a continuous chain comprising, a rotatable member having a first surface and mounted for rotation about an axis, teeth extending from said rotatable member, said first surface having arcuate portions and locking portions, a lug carried by the chain, a holding member having a first surface, means urging said holding member toward said arcuate and said locking portions, said first surface of said holding member engaging said locking portion when the latching mechanism is in the connected position, said lug engaging at least one of said teeth in the connected position thereby moving said carriage, a stop coacting with said carriage whereby said carriage is prohibited from movement and thereafter a force exerted by the lug to said tooth rotates said rotatable member thereby putting the latching mechanism in the disconnected position whereby the first surface of said holding member engages said arcuate portion.

8. A latching mechanism for effecting relative movement between a first and a second member comprising, a latch assembly carried by said second member and including a rotatable member having first and second alternately spaced surface portions, tooth means extending from said rotatable member, a holding member having surface means adapted to engage said first and second alternately spaced surface portions, means urging said plunger toward said rotatable member, engagement of said surface means of said holding member and said first and second surface portions creating a latched and an unlatched resistance to rotation of said rotatable member, a first and a second lug carried by said first member and adapted to surround said tooth means whereby movement of said first member is transmitted to said second member while the resistance to movement of said second member is less than said latched resistance, when the resistance to movement of said second member becomes greater than said latched resistance said rotatable member rotates thereby allowing relative movement between said first and second members.

9. A latching mechanism to connect and disconnect a carriage from a continuous chain comprising, a first member having a first surface and mounted for rotation about an axis, teeth extending from said member, said first surface having alternately spaced arcuate portions and locking portions, a first and a second lug carried by the chain, a plunger having a first surface, spring means urging said holding member toward said rotatable member, said first surface of said holding member engaging said locking portion when the latching mechanism is in the connected position, said first and second lugs surrounding one of said teeth and thereby moving said carriage when said latching mechanism is in the connected position, stop means forcing said carriage to stop whereby a force exerted by the chain through at least one of said lugs to the said tooth rotates said rotatable member thereby putting the latching mechanism in the disconnected position whereby the first surface of said plunger engages said arcuate portion.

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