April 27, 1965 T. MADLAND 3,179,986

CONTROL DEVICE

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FIG. 1

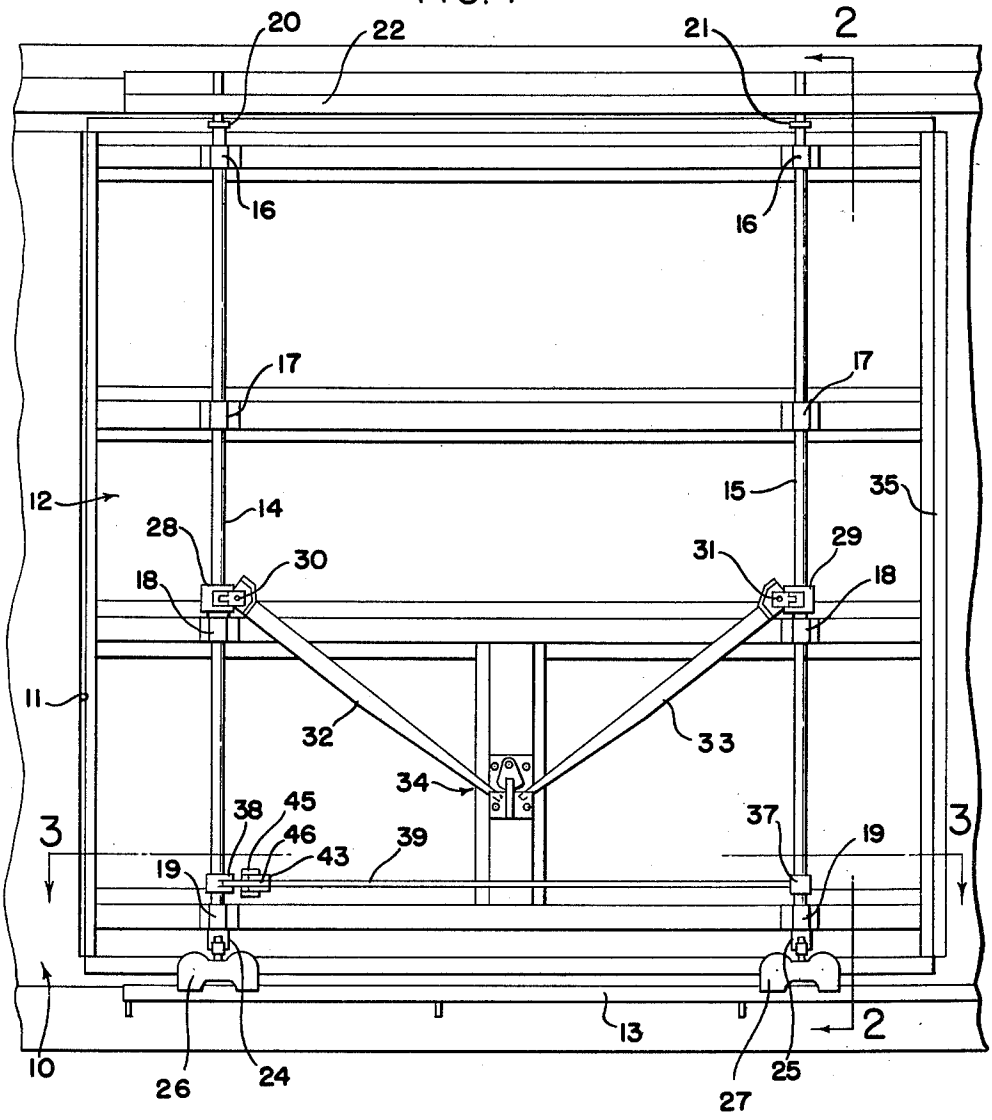

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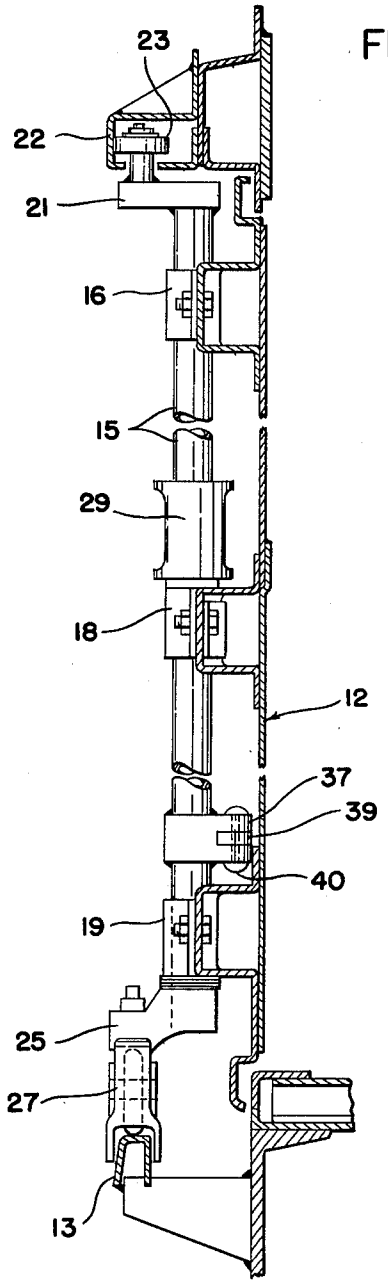
FIG. 2



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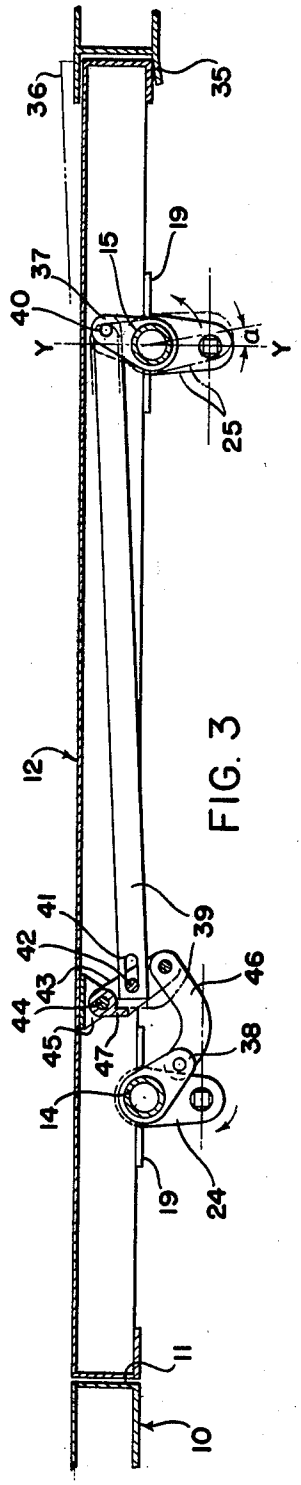

FIG. 3

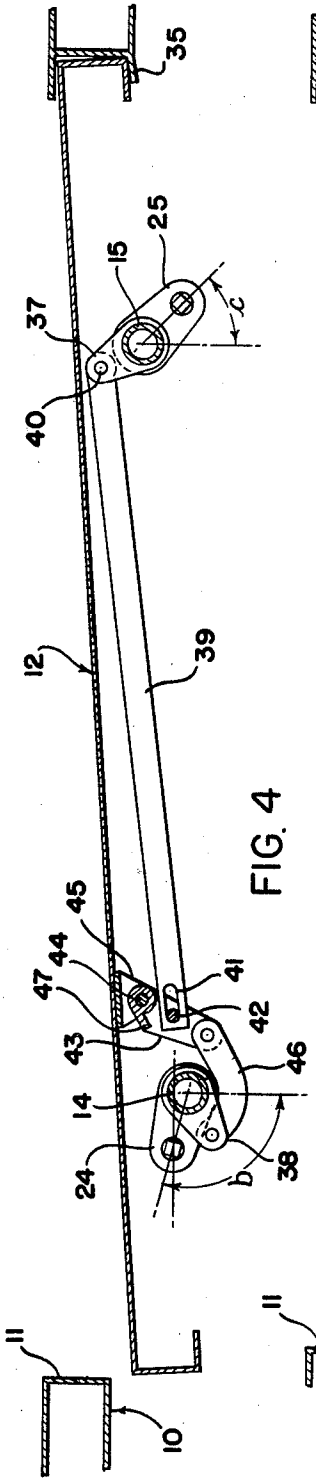

FIG. 4

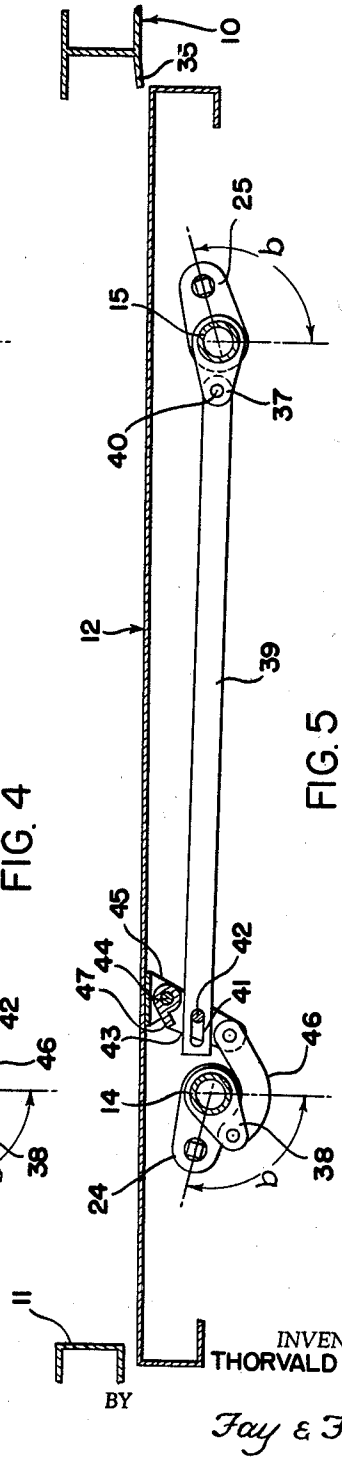

FIG. 5

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CONTROL DEVICE

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Filed June 28, 1963, Ser. No. 291,558
10 Claims. (Cl. 20—24)

This invention relates to a device whereby the operating sequence of two or more rotatable members may be controlled.

In its broadest aspect, the invention is directed to a mechanism whereby two separately operable rotatable members are interconnected so that the rotation of one of the members is dependent upon a prior rotation of the other of the members.

More specifically, the invention relates to a linkage system interconnecting two or more rotatable cranks. The linkage system is such that one of the cranks may be rotated only a predetermined amount independently of the rotation of the other of the cranks.

In its most specific aspect, the invention relates to a mechanism controlling the opening operation of railroad car doors.

In the field of railroad cars, a well known type of door is the so-called flush or plug door in which the door fits in a rabbeted frame so as to present a surface flush with the external surface of the railroad car. Such doors are designed to be moved outwardly from the side of the railroad car and then moved along a track parallel to the side of the car so as to expose the door opening.

In order to accomplish the lateral movement of the door toward and away from the door opening and to support the door for longitudinal movement along the track, the door is normally provided with a pair of parallel pipes having cranks at each end. To operate the door, the pipes are rotated thereby causing the cranks to displace the door laterally relative to the side of the car. With the door in the closed position, the cranks either may be disposed substantially parallel to the surface of the door or the system may be designed in such a manner that the cranks are normal to the plane of the door.

With either design, it usually is necessary to operate the two pipes and thereby the cranks somewhat simultaneously. Failure to operate the pipes together either will cause the mechanism to bind or the door to be wedged in the door opening. This is particularly true with the cranks normal to the plane of the door. In such case should one of the pipes be rotated to the exclusion of the other, the door would tend to pivot about the other of the cranks as a fulcrum, causing the mechanism effectively to be wedged in the door opening.

An additional problem is presented by the common expedient of a retaining plate places along one vertical edge of the door opening with the door adapted to be received behind the plate. With such an arrangement, it is necessary first to displace the side of the door opposite to the retaining plate and then slide the door to a position clear of the plate before the door can be fully opened. To accomplish this operation it is necessary that the rotatable pipes and cranks which mount the door be operated in proper sequence.

It is an object of this invention to provide a mechanism whereby two separately operable rotatable members are

interconnected so that the rotation of one of the members is dependent upon a prior rotation of the other of the members.

It is a further object of this invention to provide a control mechanism whereby the operation of one crank in a system having a plurality of cranks is dependent upon the operation of the other of the cranks.

It is a still further object of this invention to provide a control mechanism which includes a sequential control over a plurality of rotatable members.

It is another object of this invention to provide a mechanism which controls the sequential rotation of a plurality of rotatable members secured to a door on a railroad car.

It is a more specific object of this invention to provide a device to control the opening movements of a plug type door on a railroad car.

It is a still more specific object of this invention to provide a device secured to a plug door on a railroad car with said device interconnecting the usual crank operating mechanism, thereby to control the opening operation of the door.

The control mechanism of the instant invention comprises a pair of rotatable rods mounted on the usual plug door on a railroad car with operating means secured to each of the rods for rotating the same. Extending transversely to the rods but interconnected therewith are interconnecting means which serve to restrain the independent movement of each of the rods relative to the other of the rods. Appropriate stop means are secured to the rotatable rods and designed to cooperate with the interconnecting means so that upon rotation of one of the rods there is a proportional movement of the interconnecting means which causes the latter to engage stop means secured to the other of the rods, and thereby restrain the rotating movement of the one rod.

To the accomplishment of the foregoing and related ends, said invention then consists of the means hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail one approved means of carrying out the invention, such disclosed means, however, constituting but one of the various ways in which the principles of the invention may be used.

In the drawings:

FIG. 1 is a front elevation view showing the plug door in the closed position in the railroad car.

FIG. 2 is a side elevation, partly in section, showing the operating mechanism for the plug door taken on line 2—2 of FIG. 1.

FIG. 3 is a view taken along line 3—3 of FIG. 1, showing the invention mounted on the door with the door in the closed position.

FIG. 4 is a view similar to FIG. 3 with the door in a partially open position.

FIG. 5 is a view similar to FIG. 3 showing the door in the fully opened position.

Referring now to the drawings which illustrate one preferred embodiment of the invention, the numeral 10 designates one sidewall of a conventional railroad car. A door opening 11 is formed in the sidewall and is adapted to be closed by a laterally moveable door 12. In closed position, the door 12 is seated in the door opening and is flush with the external surface of the sidewall 10.

To move the door laterally out of the door opening 11 for longitudinal movement along the sidewall 10 upon a track 13, there are provided spaced apart parallel vertical pipes 14, 15. The pipes 14, 15 are rotatably secured upon the door 12 by means of brackets 16, 17, 18, 19.

Secured to the upper end of the pipes 14, 15 are cranks 20, 21 respectively. The cranks 20, 21 extend upwardly behind a retainer 22 and are provided with rollers 23 which guide the door in its longitudinal movement and retain the top of the door in the proper position relative to the car.

Secured to the lower end of each of the pipes 14, 15 are cranks 24, 25 respectively. The cranks 24, 25 are journalled in roller hangers 26, 27 mounted upon the track 13 thereby to facilitate sliding movement of the door.

Clevises 28, 29 are secured upon the pipes 14, 15 respectively and adjacent to the brackets 18. Secured by pins 30, 31 to the clevises 28, 29 are operating levers 32, 33. The operating levers 32, 33 are mounted for vertical swinging movement and, as shown in FIG. 1, are pivoted downwardly to a position where they are retained by a locking mechanism generally indicated by the reference numeral 34.

It is believed apparent that upon release of the levers 32, 33 from the locking mechanism 34 each lever may be pivoted to a position away from the locking mechanism. Thereupon, each lever 32, 33 may be rotated outwardly away from the door and through the pins 30, 31 and clevises 28, 29 cause rotation of the pipes 14, 15. As the pipes 14, 15 are rotated, the upper cranks 20, 21 and lower cranks 24, 25 are caused to be rotated. As it is apparent from an inspection of FIG. 1 and FIG. 2, all of the cranks 20, 21, 24, 25 are normal to the plane of the door when the door is in a closed position. Upon rotation of the pipes 14, 15 the cranks are pivoted to a position approximating a parallel relationship with the plane of the door thus causing the door to be displaced laterally outward from the plane of the car's siding. After this has been accomplished, the door is then free to be displaced longitudinally along the track 13 thereby exposing the door opening.

Turning to FIG. 3, there is illustrated the problem which arises with doors of this type. In FIG. 3, there is a schematic diagram of the plug door 12 received in the railroad car 10. A retaining plate 35 is provided at one end of the rabbeted frame. Assuming the door to be in the closed position as illustrated in FIG. 3 with the cranks normal to the plane of the door, should the operator then rotate pipe 14 without a corresponding rotation of pipe 15, the left end of the door in FIG. 3 would tend to assume the position shown in FIG. 4. The opposite end of the door, however, being restrained in the rabbeted frame, would tend to assume the position 36 shown in dotted lines in FIG. 3. Such a position is obviously impossible so the result is that the mechanism either binds or the door bends about a plane along the line *y—y* shown in FIG. 3. It is the purpose of this invention to provide a mechanism which prevents operation of one crank independently of the other thereby to avoid binding or bending of the door.

Due to the presence of the retaining plate 35, it is also believed apparent that pipe 15 may not be rotated independently of pipe 14 until the door has been removed from behind the plate. Accordingly, it is another purpose of this invention to provide a mechanism which assures the proper sequential operation of the crank's operating mechanism thereby to obtain a single and effortless method of opening a plug door.

The embodiment of the invention shown in FIGS. 1–5 comprises a lever 37 secured for rotation to the pipe 15. A similar lever 38 is secured to the pipe 14. A tie bar 39 is secured by a pin 40 to the lever 37. The opposite end of the tie bar 39 is provided with a slot 41 which receives a pin 42. The pin 42 is carried on a link 43 which in turn is pivotally mounted at 44 to a bracket 45 secured to the door. An intermediate link 46 interconnects the lever 38 and the link 43. Formed on the link 43 is a flange 47 which functions as an abutment or stop member for the tie bar 39.

For the purposes of this disclosure, the links 43, 46 comprise a toggle with the flange 47 being a stop member secured to one of the links of the toggle. The position of the links 43, 46, as illustrated in FIG. 3, describes the toggle in an uncollapsed position whereas the condition of the links 43, 46 in FIG. 4 illustrate the toggle when it is collapsed.

Turning to the operation of the embodiment shown in FIG. 3, the door is initially in a closed position with the upper cranks 20, 21 and the lower cranks 24, 25 being normal to the plane of the door. To open the door, the operator would release the operating levers 32, 33 from the locking mechanism 34. With the levers released, the lever 33 may be rotated through an angle "*a*." The angle "*a*" generally is in the order of 11° and is dependent upon the amount of rotation possible before the door interferes with the retaining plate 35. Rotation of the pipe 15 beyond the angle "*a*" is prevented by the tie bar 39 abutting the stop member 47 on the link 43. The tie bar 39 might be made longer to prevent any initial rotation of the pipe 15 if so desired.

Operating lever 32 may be rotated through the full angle needed to laterally displace one end of the door, the angle being designated by the letter "*b*." During this operation, the lever 38 is rotated through a corresponding angle and, through linkage 46 and 43, the pin 42 abuts the end of the slot 41 causing the tie bar 39 to be displaced with the link 43. Since the link 43 is pivoted about the point 44, the stop member 47 is rotated to a position where the tie bar is free from restraint. Inasmuch as the tie bar is pinned to the lever 37 which in turn is secured to the pipe 15, the movement of the tie bar 39 wil cause a corresponding rotation of the pipe 15 through an angle "*c*."

The amount of rotation imparted to the pipe 15 is determined by the link 43 and pin 42 which serve as a proportioning lever. Thus, for a given amount of rotation of the pipe 14, a proportional angular displacement will be imparted to the link 43. Since the link 43 is pivoted about the point 44, it is believed apparent that the position of the pin 42 along the length of the link 43 relative to the pivot 44 will determine the corresponding amount of rotation imparted to the pipe 15. Thus, the greater the distance between the pin 42 and the pivot point 44, the greater will be the amount of rotation imparted to the pipe 15. In order for the door to move as a straight line, it is necessary that the proper position of the pin 42 on the link 43 be ascertained so that the correct ratio of rotation is imparted to pipe 15. With an incorrect ratio, the door would tend to bind or bend in the same manner as if the levers 32, 33 were being independently actuated.

With the door in the position shown in FIG. 5, the door is then free to be moved to the left so as to clear the retaining plate 35 and the operating lever 33 may then be rotated to the full open position to complete the lateral movement of the door. The lever 33 is now capable of moving the pipe 15 independently of the mechanism associated with the pipe 14 by virtue of the elongated slot 41. With the door laterally displaced to the position shown in FIG. 5, the door then may be longitudinally displaced along the track 13 thereby exposing the door opening.

The embodiment illustrated is directly applicable to all types of plug doors where the operating cranks on the doors, in the closed position, are normal or nearly normal to the door and where one edge of the door is retained behind a plate. It should be noted, however, that this invention is not limited to railroad car doors, but may be used wherever a sequence of operation is necessary and proportional movement between rotation elements is required. Further, although the invention has been illustrated as being secured to the lower ends of the

pipes 14, 15 the precise location of the mechanism is not critical and it might be at any position along the length of the parallel pipes.

It will be apparent that numerous changes and modifications in the invention may be made by those having ordinary skill in the art and therefore the embodiments illustrated are not meant to be restrictive with all modifications and changes apparent to those having skill in the art comprehended within this invention which is to be limited only by the scope of the claims.

I claim:

1. A control for operating elements comprising;
a pair of rotatable rods mounted on a common support;
operating means secured to said rods for rotating the same;
said operating means including lever means secured to one of said rods for rotation therewith;
linkage means connected to the other of said rods and the common support;
a bar secured at one of its ends to said lever means and at the other of its ends to said linkage means, whereby rotation of one of the rods causes a proportional rotation of the other of the rods.

2. An operating mechanism for a railrod car plug door comprising;
a pair of rotatable rods mounted on the door;
operating means secured to each of said rods for rotating the same;
lever means secured to one of said rods;
linkage means connected to the other of said rods and the door;
a bar secured at one of its ends to said lever means and at the other of its ends to said linkage means whereby rotation of one of the rods causes a proportional rotation of the other of the rods.

3. A control mechanism comprising;
a pair of rotatable elements;
a support mounting the rotatable elements;
an operator secured to each of said elements for rotating the same;
one of said elements having a lever secured thereto for rotation therewith;
a toggle having one link connected to the other of the elements with the other link pivotally secured to the support;
a pin projecting from said other link of said toggle;
a tie bar secured at one end to said lever and receiving said projecting pin in a slot in the other end;
a stop member on said toggle operatively associated with said other end of said tie bar whereby rotation of said one element causes said tie bar to abut said stop member and restrain the rotation of said one element.

4. In combination;
a railroad car plug door;
first and second rotatable rods mounted on said door;
operating means secured to each of said rods for manually rotating the same;
a lever secured to the first of said rods for rotation therewith;
a toggle mechanism;
one link of said toggle being secured to the second rod with the other link of said toggle being secured to said door;
a pin projecting from one of said links;
a tie bar secured at one end of said lever and receiving said pin in a slot at the other end;
a stop member on said toggle;
said stop member being operatively associated with said other end of said tie bar when said toggle is uncollapsed thereby restraining rotation of said first rod independent of said second rod, said stop member being disassociated from said other end of said tie bar when said toggle is collapsed by rotation of said second rod thereby allowing independent rotation of said first rod.

5. A control mechanism comprising;
a pair of rotatable members mounted on a common support;
operating means secured to each of said members for rotating the same;
lever means secured to one of said members for rotation therewith;
a linkage connected to the other of said members and the support;
said linkage comprising a toggle with one link pivotally secured to the support and the other of the links secured to the other of said members;
a bar secured at one of its ends to said lever means, and at the other of its ends to said link secured to the support whereby rotation of one of the members causes a proportional rotation of the other of the members.

6. A control mechanism comprising;
a pair of rotatable members mounted on a common support;
manual operating means secured to each of said members for rotating each member individually;
proportioning means secured to one of said members;
a bar secured at one of its ends to the other of said members;
the other end of said bar being associated with said proportioning means thereby upon rotation of said one of said members through actuation of its operating means a proportional rotation is imparted to said other of said members and its operating means.

7. A control mechanism comprising;
a pair of rotatable elements;
a support mounting the rotatable elements;
a bar;
means securing said bar to one of said elements;
a stop member;
means connecting said stop member to the other of said elements;
said stop member being movable with said other element to a plurality of positions;
said stop member in one of said positions being operatively associated with said bar and thereby restraining movement of said bar and said element associated therewith;
said stop member in another of said positions being removed from said bar and thereby allowing free movement of said bar.

8. In combination;
a railroad car having a door opening;
a door adapted to close the door opening;
a retaining plate along one vertical edge of the door opening and adapted to receive an edge of the door therebehind;
a pair of rotatable rods mounted on said door;
each of said rods having operating means for rotating the same;
lever means secured to one of said rods;
linkage means connected to the other of said rods and said door;
a bar secured at one of its ends to said lever means and at the other of its ends to said linkage means whereby rotation of one of the rods causes a proportional rotation of the other of the rods.

9. The combination of claim 8 wherein said linkage means comprises a toggle;
a stop member on said toggle;
said stop member being operatively associated with said bar when said toggle is uncollapsed thereby restraining movement of said bar.

10. In combination,
a railroad car door adapted to close an opening in the side wall of a railroad car,
a pair of spaced apart rotatable means mounting said

door on the car for transverse movement into and out of the door opening,

actuating means operatively connected to said rotatable means for effecting rotation thereof,

said actuating means including means whereby rotation imparted to a first one of said rotatable means causes a corresponding but different degree of rotation to be imparted to the other of said rotatable means.

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