March 10, 1970 T. MADLAND 3,499,247

GEAR RETARDER MECHANISM FOR RAILWAY CAR DOORS

Filed April 4, 1967 2 Sheets-Sheet 1

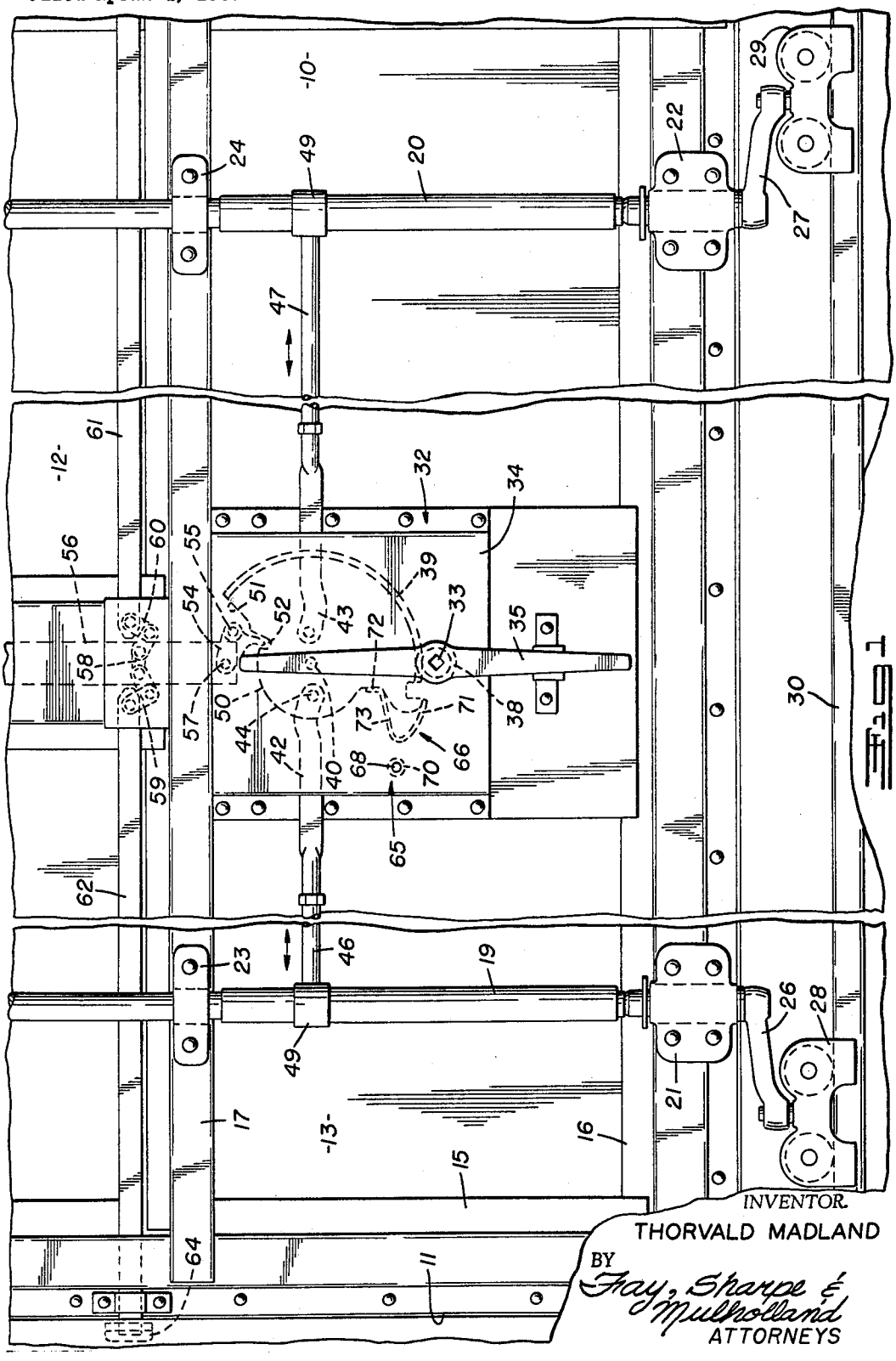


FIG. 1

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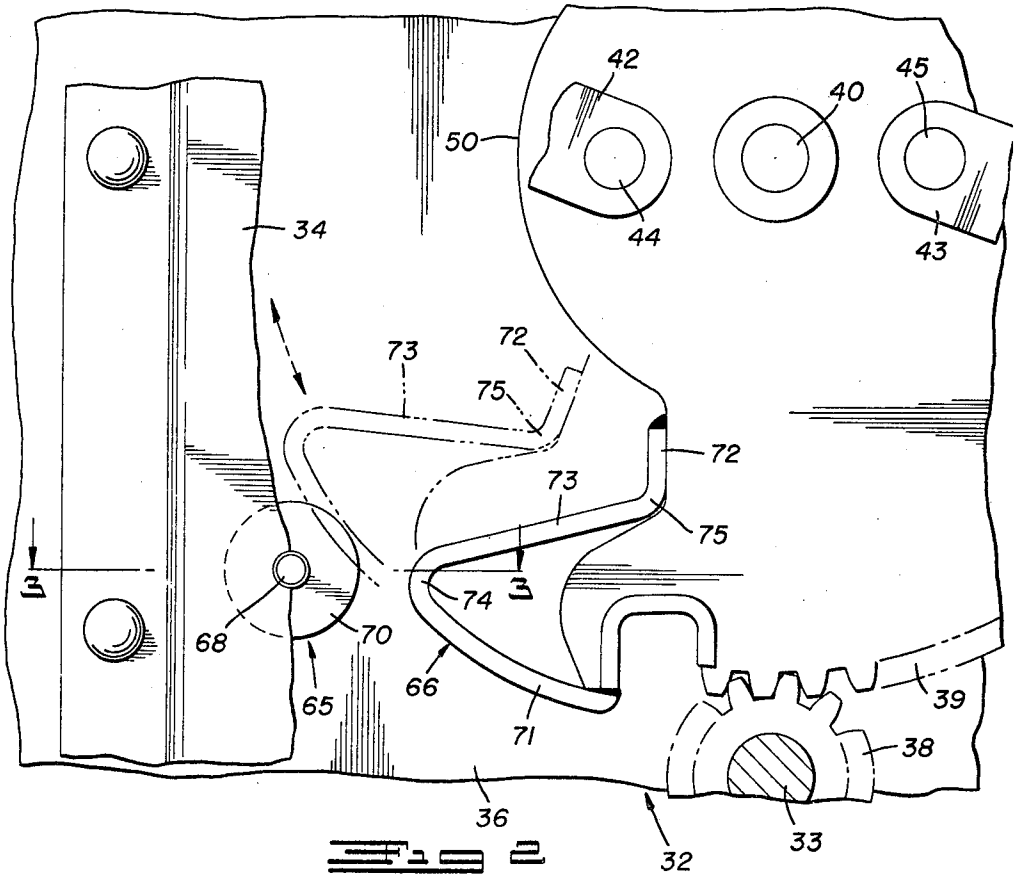


Fig 2

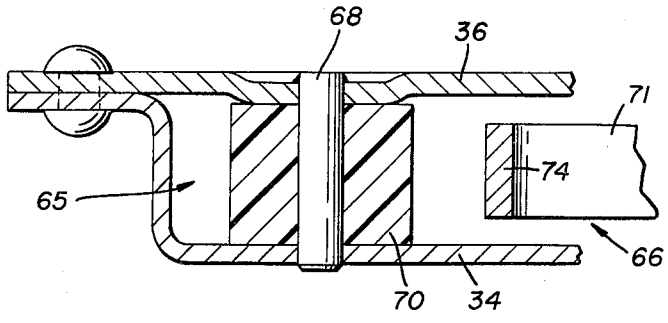


Fig 3

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# GEAR RETARDER MECHANISM FOR RAILWAY CAR DOORS

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U.S. Cl. 49—220 2 Claims

## ABSTRACT OF THE DISCLOSURE

A retarder device for the operating mechanism of a plug-type railway car door having a portion of a movable gear segment in the operative mechanism formed to frictionally engage a fixed elastomeric member effectively to retard the tendency of the operating lever to spin during a predetermined portion of the operating cycle.

## BACKGROUND OF THE INVENTION

This invention is directed to retarding means for the operating mechanism of railway car doors. More particularly, this invention relates to retarding means having a fixed portion and a movable portion which coact effectively to retard the motion of the handle of the door operating mechanism during a predetermined portion of the operating cycle.

Two general types of railway car doors are known to the prior art; namely, longitudinally slidable doors and plug-type doors. This invention is concerned with the plug-type door which is received in a door opening with the door being movable, in sequence, both laterally and longitudinally of the car. Gaskets are ordinarily provided about the periphery of the door and are adapted to be compressed against the frame of the door opening thereby to seal the opening. These gaskets are of a relatively rigid material which requires a substantial force to compress the gasket.

The operating mechanism for such doors has included an operating lever secured to rotatable pipes mounting the doors on the railway car, with the lever providing means by which sufficient mechanical advantages may be obtained to effect the compression of the gaskets as the door is closed into the opening. Various types of operating mechanisms have been developed with a view toward the convenient transmission of force to close the door during the closure cycle, and conveniently to initiate and effect the opening of the door during the opening cycle.

One of the difficulties confronted by such lever-operated mechanisms is that, during the opening cycle, where the operation of a lever begins to free the door from its compressive seal, both the seal and the contents, especially bulk contents such as grain, may exert a substantial force against the door tending to accelerate the movement of the lever out of the control of the operator, often resulting in serious injuries. Such an effect is commonly known as a "spin-away," or a "breakaway" or a "flying lever." Moreover, sudden stoppage of a rapidly-moving portion of the operating mechanism may prove injurious to the mechanism.

In order to overcome the difficulties of a "breakaway" or "flying lever," various braking mechanisms have been developed to minimize or attempt to eliminate the tendency of the movement of the mechanism and lever to accelerate in accordance with the movement of the door laterally away from its opening.



## SUMMARY OF THE INVENTION

In order to overcome the aforementioned, as well as other difficulties in braking and retarding mechanisms in the prior art, means according to the invention comprise a fixed portion and a movable portion which coact in a braking or retarding manner only through a portion of the opening and closing cycle. The fixed portion of the invention includes a cylinder of elastomeric material, such as urethane, disposed about a fixed pin in the operating mechanism of the railway car door. The elastomeric member is preferably of a relatively rigid construction, but yet is sufficiently resilient to coact with the movable portion of the retarding mechanism as a mechanism retarding plug.

The movable portion of the invention comprises segmented means, for example an arcuate segment, included within a portion of the operating mechanism of the railway car door. The movable portion of the retarding device is concurrently operative with the handle in such a manner that no coaction exists between the arcuate segment of the movable portion and the fixed portion of the device during the initiation of the opening cycle. However, at a particular point in the opening cycle, partially determined by the spatial relationship of the door, the door operating mechanism, and opening, as well as by the anticipated force exerted by the expansion of the compressed gasket and the material against the inside of the railway car door, the movable portion comes into frictional interference with the fixed portion of the invention. Accordingly, the frictional contact between the fixed and movable portion of the invention retards rotation of the movable portion of the door operating mechanism, and the handle during the main door gasket decompression cycle, as well as during the application of forces due to the contents of the car.

Accordingly, it is an object of this invention to provide a novel and unobvious retarding device for the operating mechanism of railway car doors.

It is another object of this invention to provide retarding means including a fixed portion and a movable portion wherein the said portions are in a frictionally interfering relationship only during a predetermined portion of the operating cycle effectively to retard the movement of the movable portion of the door operating mechanism and lever.

It is another object of this invention to provide an operating mechanism for the railway car door in which a retarding mechanism is not operative during the initial portion of the door opening cycle.

It is still another object of this invention to provide a retarding device for the operating mechanism of a railway car door which coacts to retard the motion of the operating mechanism only during a particular portion of the operating cycle.

It is a still further object of this invention to provide a convenient braking device for a railway car plug door which employs a retarding mechanism to prevent inadvertent rotation of the operating lever and possible injury to the mechanism or operator.

Other objects and features of this invention will become more apparent upon a consideration of the detailed description and the study of the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a front elevational view of the retarder means according to the invention incorporated into a plug-type railway car door;

FIG. 2 is a detailed view of the fixed and movable portions of the retarding means shown in FIG. 1;

FIG. 3 is a view taken along line 3—3 of FIG. 2.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates the invention within the environment of a plug-type railway car door. The side wall of a conventional railway car is generally depicted by the numeral **10** and includes a door opening **11** formed in the side wall **10**. A laterally movable plug-type railway door, generally indicated by the reference numeral **12**, is adapted to be securedly received in the door opening **11**. The details of the overall door construction may, of course, vary, but the construction generally includes metal sheathing **13** constructionally associated in a suitable manner with a frame, representatively shown by an edge **15** and a bottom edge **16** and may be reinforced, for example, as shown by a horizontal reinforcing member **17**. Although only a limited fragmentary view of the railway door incorporating the invention is depicted, it can be understood that the details of framing and sheathing are within the choice of the designer subject to the demands of the anticipated use. Doors of the type disclosed further generally include sealing gaskets (not shown) which are adapted to be compressed against the edges of the door opening to provide a secure seal when the door is in its closed position.

Vertical pipes **19** and **20** are provided in a spaced, generally parallel, relationship and are rotatably secured to the exterior of the car door by appropriate brackets **21** and **22** respectively, in such a manner to permit the door to be laterally moved into and withdrawn from the door opening **11**. Where desired, additional brackets **23** and **24** may be provided to maintain the vertical pipes **19** and **20** in the proper relationship. At the upper end of the pipes **19** and **20** are cranks (not shown) which extend upwardly behind the top door retainer. These cranks are provided with rollers which guide the door in its longitudinal movement and retain the top of the door in the proper position relative to the car.

Vertical pipes **19** and **20** also include lower cranks **26** and **27** which are journalled in roller hangers **28** and **29** which are positioned upon a track **30** to facilitate the sliding movement of the door longitudinally of the car after the door has been withdrawn from the door opening.

Rotation of the pipes **19** and **20** will cause a corresponding rotation on the cranks **26** and **27**, as well as the upper cranks, thereby to withdraw the door laterally from the door opening. The door-operating mechanism, indicated generally by the reference numeral **32** is provided for controlling the rotation on the pipes and cranks and, hence, the withdrawal of the door from its opening in the car door.

Operating mechanism **32** includes a handle **35** fixedly mounted upon a shaft **33** which is rotatably supported between a base plate **36** on the door and the cover plate **34** of the operating mechanism **32**.

As can best be seen in FIG. 2, the mechanism also employs a gear train between plates **34** and **36** which includes a pinion **38** secured to the shaft **33** for rotation therewith in accordance with the rotation of the handle **35** by the operator. Pinion **38** meshes with gear segment **39** which is rotatably secured to a shaft **40** which, like shaft **33**, is fixed between the base plate **36** and cover plate **34** of the operating mechanism **32**. It is necessary that both pinion **38** and gear segment **39** have gear teeth only over a portion thereof, partially determined by the relative number of gear teeth, the desired mechanical advantage, and the like.

Links **42** and **43** are pivotally connected at **44** and **45** to the gear segment **39** in such a manner that when the door is closed, the pivots **44** and **45** have rotatably traveled "over center" to assist the locking of the door.



The links **42** and **43** are connected to the ends of connecting rods **46** and **47** respectively. Each of the connecting rods is pivotally connected to a clevis **49** secured to the pipes **19** and **20** in conventional manner so that rotation of handle **35** by the operator will impart a rotational movement to the pipes and cranks.

Gear segment **39** includes an arcuate surface **50** including a substantially radial terminal shoulder **51** and cam recess **52**. A generally L-shaped cam follower **54** is pivotally supported about pin **55** for pivotal movement toward and away from gear segment **39**. On one leg of the cam follower **54**, a vertical link **56** is pivotally interconnected with the cam follower at pin **57**. The vertical link **56** includes a cam slot **58** in which are received the nose portions of cam followers **59** and **60** respectively. Cam followers **59** and **60** are also pivotally connected to the ends of locking bolts **61** and **62**. The locking bolts are supported for longitudinal movement and are adapted to be engaged with keepers **64** (only one of which is depicted) on the side walls of the railway car thereby to secure the door in the door opening.

In addition to and coacting with the above-described combination of elements for a predetermined portion of the operating cycle, the retarding device is best illustrated in FIGS. 2 and 3 as comprising a fixed portion shown generally at **65**, and a movable portion, shown generally at **66**. Fixed portion **65** includes pin **68** fixedly secured as by welding between the base plate **36** and the cover plate **34**. A generally cylindrical elastomeric member **70** having an annular cross-section is circumferentially disposed about pin **68**. Elastomeric member **70** is preferably manufactured from a compressible material which is resilient, yet relatively rigid, and capable of rotation about pin **68** when frictionally engaged. An example of a material found suitable for utilization in the fixed portion of the retarder mechanism is identified as "80 durometer urethane." Member **70** may also be molded to a sleeve (not shown) so that both the member and the sleeve rotate about the pin.

The movable portion **66** of the retarding device includes an irregularly-shaped segment comprising a generally arcuate portion **71** for frictional engagement during a portion of the operative cycle with elastomeric member **70**, a leg **72** for attaching the movable portion of the retarding device to the gear segment **39** of the operating mechanism **32**, for example, by spot welding, extension means **73** connecting the leg **72** and the arcuate portion **71** by formed radii **74** and **75**.

It can be seen that for the retarding device to be operative, the radial length from the center of pin **40** to the center of fixed pin **68** must be slightly less than the sum of the radial length from the center of pin **68** to furthermost radial point of elastomeric member **70** plus the maximum radial length from the center of pin **40** to the outermost radii of surface **71**. In this manner, a degree of overlap between surface **71** of movable portion **66** and surface **70** of fixed portion **65** exists during a portion of the operating cycle. When engaged, the interaction of the surfaces coact to produce the desired degree of frictional interference therebetween to retard the motion of the gear segment, and hence the handle.

Moreover, when arcuate segment **71** contacts the elastomeric member, surface **70** tends to expand or flow axially due to the compression of the member. The expanding surface **70** thus also contacts both plates **34** and **36** thereby to retard rotation of member **70** to aid the breaking action.

The elastomeric member **70** is positionally related to arcuate segment **71** to effect contact therewith at about the time that the pivots **43** and **44** are at "dead center" during the opening cycle and when the decompression of the sealing gaskets tends to take effect.

The following is illustrative of the operation of the above-described mechanisms: With the railroad car spotted, the plug door is removed from door opening **11**

by rotating handle **35** in a counter-clockwise direction. The rotation of the handle transmits the rotation about shaft **33** through pinion **38** and gear segment **39**, links **42** and **43**, and connecting rods **46** and **47** to the vertical pipes **19** and **20** and the cranks associated therewith. Rotation of the vertical pipes **19** and **20** causes a lateral withdrawal of the door from the door opening.

Simultaneously, rotation of the gear segment **39** causes cam follower **54** to be displaced from the recess **52** which imparts a counter-clockwise movement of follower **54** about pin **55**. As follower **54** is pivoted, the vertical link **56** is displaced vertically which, through coaction of the cam followers **59** and **60** and the cam slot **58** imparts a horizontal movement to locking bolts **61** and **62**. As the followers are pivoted, the locking bolts **61** and **62** are retracted from the locking engagement with their keepers **65**, thereby releasing the door.

It can be seen that some types of lading, such as grain, will exert pressure against the door both while the door is in its closed position, and during the withdrawal of the door from its opening. During the withdrawal cycle, the forces due to the lading pressure will be transmitted through the foregoing linkage, tending to make the handle **35** spin out of control of the operator. To prevent such inadvertent spinning, as a result of the decompression of the sealing gasket and any pressure exerted on the inner door by the contents of the railway car, the retarding device as previously described is provided. As the gear segment **39** tends to rotate clockwise as a result of the counter-clockwise movement of the handle **35** through pinion **38**, the generally arcuate portion **71** of the movable portion of the gear retarding mechanism coacts with the elastomeric member **70** of the fixed portion of the braking device to impose a drag which dissipates the effect of the lading and prevents spinning of the handle **35**. The gear retarding mechanism is also effective to minimize or to prevent backspin of handle **35** which may tend to occur as the compressed gaskets expand from their compressed state as the door is opened.

It should be noted, however, that the drag imposed by the frictional interference of the fixed and movable portions of the retarding mechanism does not impose any difficulty in rotating handle **35** to open the door since the interaction is inoperative during the initial portion of the opening cycle. Moreover, the relative resiliency of the elastomeric member in conjunction with the quantum of interference, the nature of the material of the arcuate segment **71**, the desired rotation of the elastomeric member during frictional engagement, and the degree of resiliency, if any, of the movable portion of the retarding mechanism may all be related in a predetermined manner to prevent any substantial inconvenience in closing the door.

It has been found particularly advantageous to correlate both the time of initial contact of the fixed and movable portions of the gear retarding mechanism and the time of the retarding coaction therebetween with the instance and duration of increasing and maximum forces due to the gasket decompression and lading on the inside of the door. Thus, the point at which the forces may otherwise become controlling in tending to spin the mechanism and handle out of control may be determined and the retarding device designed in accordance therewith to become effective at the time in the opening cycle when most needed.

In the embodiment illustrated in FIG. 2, the movable portion of the gear retarding mechanism is described to illustrate the particular configuration suitably secured to gear segment **39** by suitable means, such as spot welding of the surface **72** to a convenient portion of the gear segment. This configuration has been found particularly suitable because of the desirabilities of presenting a surface to the elastomeric member having a width greater than that necessary for the gear segment **39**. It may be noted, however, that in certain instances, the movable portion of the braking mechanism may be integral with the gear segment.

In the preferred embodiment, the radius of curvature of the arcuate segment is desirably less than a radius of the gear segment **39** so that contact between surface **71** and the elastomeric member, and accordingly, a degree of depression of the elastomeric member as a result of such contact, gradually increases from a minimum to a maximum over the period of contact therebetween.

In FIG. 3, the cross-sectional view of the elastomeric member **70** about fixed pin **68** between cover plate **34** and base plate **36** is depicted in its normal non-contact position. The resiliency of elastomeric member **70** has also been found to be advantageous in preventing the mechanical shock of contact between the fixed and movable portions of the retarding device from being transmitted through the operating mechanism **32** to the hand of the operator on handle **35**.

For ease of description, the principles of the invention have been set forth in connection with but a single illustrated embodiment. It is not our intention that the illustrated embodiment nor the terminology employed in describing it be limiting inasmuch as variations in these may be made without departing from the spirit of the invention. Rather we desire to be restricted only by the scope of the appended claims.

I claim:

**1.** In a railway car door of the type including a pair of rotatable pipes secured to the door, an operating mechanism for rotating said pipes including a shaft rotatably supported on the door, actuating means secured near one end of the shaft and transmission means supported on said door inter-connecting said operating mechanism with said pipes whereby rotation of said shaft in response to operation of said actuating means imparts corresponding rotation to said pipes, the improvement comprising:

means for retarding the motion of said operating mechanism and said actuating means in response to forces exerted upon the door during the opening cycle, said retarding means including a fixed portion and a movable portion which are free from frictional engagement therebetween during the initial portion of the opening cycle and in frictional engagement during a latter portion of the opening cycle;

said movable portion traversing a predetermined path in response to movement of the operating mechanism and said actuating means, said path intersecting the position of said fixed portion during the latter portion of said opening cycle;

said operating mechanism including a cover plate and a base plate and said fixed portion comprising a pin fixedly secured between said cover plate and said base plate;

a cylindrical elastomeric member disposed about said pin and in such a manner that upon frictional engagement of said elastomeric member by said movable portion of said retarding means, the elastomeric member axially expands between said base plate and said cover plate to aid the retarding action;

whereby the motion of said operating mechanism and said actuating means is effectively retarded by the frictional engagement of the respective portions of said operating mechanism.

**2.** The combination as defined in claim **1** wherein said operating mechanism includes a gear segment connected to said transmission means;

a pinion secured to said shaft for rotation therewith, said pinion further being in meshing engagement with said gear segment;

said movable portion of said retarding means includes segmental means forming a part of said gear segment and movable therewith;

said segmental means further being disposed between said base plate and said cover plate so that upon operation of said actuating means, movement of said gear segment and said segmental means causes said segmental means to frictionally engage said fixed cylindrical elastomeric member during a predetermined portion of said opening cycle to retard the motion of said operating mechanism and said actuating means.



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