July 6, 1965 R. C. ORTNER 3,192,876

SPRING LOADED DOOR CONSTRUCTION FOR RAILROAD HOPPER CAR

Filed June 20, 1963

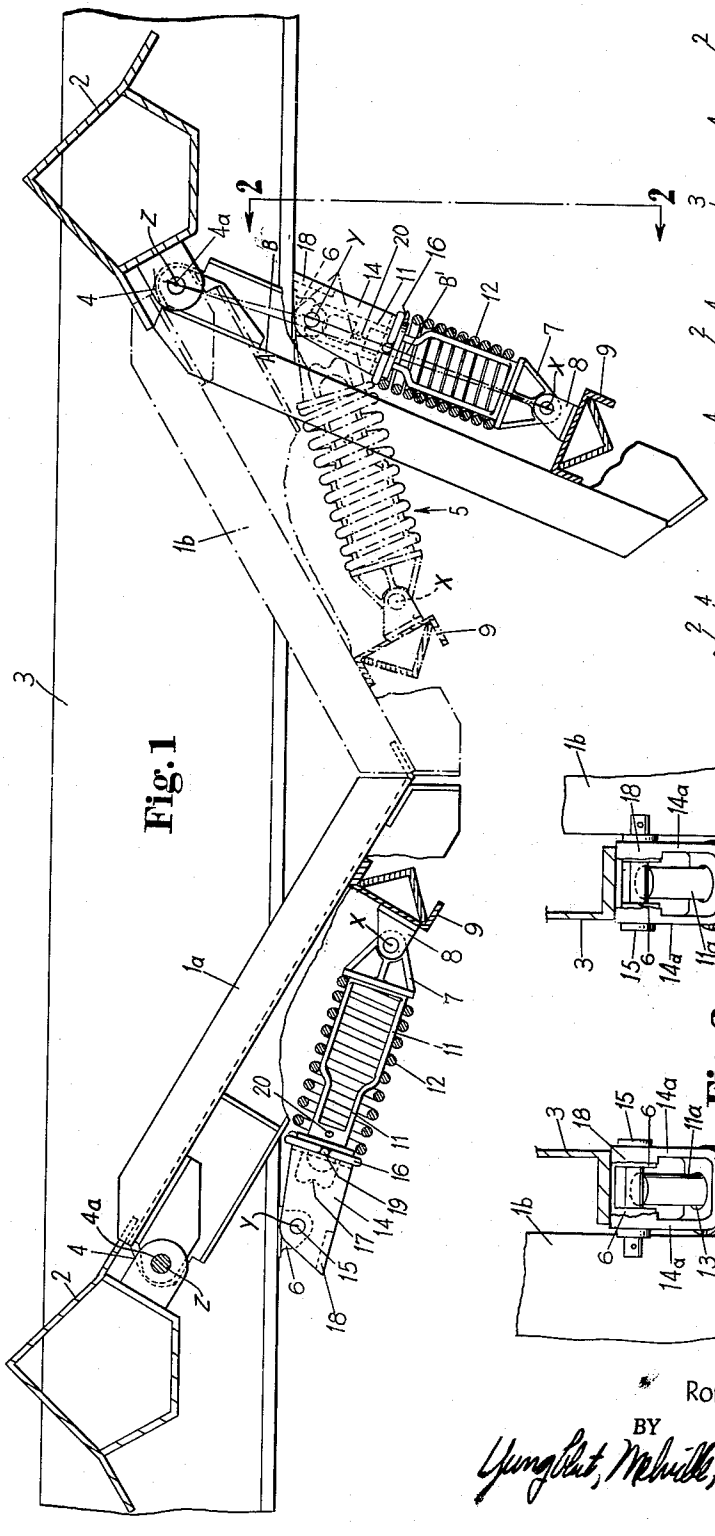


Fig. 1

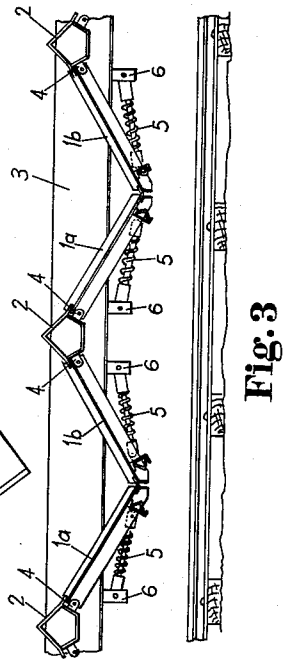


Fig. 3

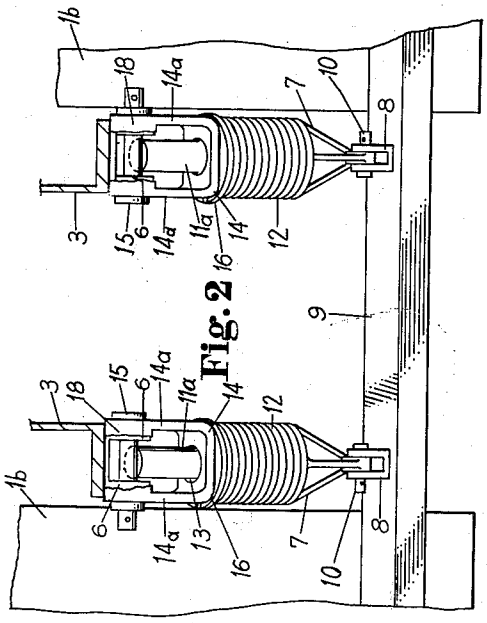


Fig. 2

INVENTOR.
ROBERT C. ORTNER,
BY
Yungblut, Melville, Strasser & Foster
ATTORNEYS.

United States Patent Office 3,192,876 Patented July 6, 1965

1

3,192,876

SPRING LOADED DOOR CONSTRUCTION FOR RAILROAD HOPPER CAR

Robert C. Ortner, Cincinnati, Ohio, assignor to Ortner Freight Car Company, Cincinnati, Ohio, a corporation of Kentucky

Filed June 20, 1963, Ser. No. 289,347
4 Claims. (Cl. 105—284)

This invention relates to railroad cars, and has to do more particularly with hopper cars of the type wherein the load is discharged through doors in the under side of the car body.

In my copending application Serial No. 93,529, filed March 6, 1961, and entitled Rapid Discharge Hopper Car, I have taught a hopper car construction wherein the entire car body comprises essentially a single hopper closed across its bottom by coacting pairs of hopper doors arranged crosswise of the car throughout essentially the full length of the car. Thus, the sets of doors, when opened, define in effect a single discharge orifice interrupted only by bracing members of minimal size which are configured to assist in discharging the load as it drops downwardly upon the opening of the doors. While such sets of doors may be opened and closed automatically, as by means of the door actuating mechanism disclosed in my said copending application, there are circumstances which make it desirable to provide for the manual opening and closing of the doors in essentially the same manner as conventional hopper car doors are opened and closed. Normally, the conventional hopper door is hingedly connected along its upper edge to the car body and has an open position in which it hangs vertically downwardly, the door being moved manually to an inclined position in which it closes the opening in the hopper car. Latch means are provided, usually at the opposite ends of the hopper door, to secure it in the closed position; and when the latches are released the door will swing downwardly to its open position under its own weight and under the weight of the car's contents pressing against the door.

Even in a conventional hopper car door, the door is of substantial size and is quite heavy, with the result that considerable physical force is required to swing the doors from the open to the closed position. This difficulty has been magnetified in recent years with the development of larger capacity hopper cars which, in many instances, have larger and heavier doors. This is particularly true of hopper cars constructed in accordance with the teachings of my aforesaid copending application, wherein the coacting sets of doors are extremely difficult to manually close and latch.

Accordingly, a principal object of the instant invention is the provision of spring mechanism for use in conjunction with hopper car doors which mechanism acts both as a spring loaded door stop as well as assisting in the operation of closing the hopper doors.

Still a further object of the instant invention is the provision of a rugged yet relatively simple and inexpensive door controlling mechanism which is self-loading in that its spring is caused to compress as the door moves to the open position, and yet the construction and arrangement of parts is such that the door will remain in the

2

open position until a positive force is applied to start its movement toward the closed position, whereupon the compressed spring is automatically released to apply a closing force to the door.

It is still a further object of the instant invention to provide a door actuating mechanism of the character described which, while particularly suited for use in conjunction with a hopper car having coacting pairs of hopper doors, is nonetheless equally useful with any type of hopper door or similar door construction wherein difficulty is experienced in moving the door to its closed position.

The foregoing together with other objects of the invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading this specification, I accomplish by that construction and arrangement of parts of which I shall now describe an exemplary embodiment.

Reference is made to the accompanying drawings wherein:

FIGURE 1 is an enlarged fragmentary side elevational view of a set of hopper doors equipped with spring mechanism in accordance with the instant invention.

FIGURE 2 is an enlarged fragmentary elevational view taken along the line 2—2 in FIGURE 1 illustrating the condition of the spring mechanism when the door is in the open position.

FIGURE 3 is a somewhat diagrammatic side elevational view illustrating the spring mechanism of the instant invention applied to adjacent sets of hopper doors.

Referring first to FIGURE 3, I have therein diagrammatically illustrated several sets of hopper doors 1*a* and 1*b* which coact to close those portions of the hopper car bottom lying between the transversely disposed door supporting members 2 which, it will be understood, extend between the side sills of the car or between the side sills and a longitudinally extending center sill, which is indicated at 3. As shown, the sets of doors are in the closed position; and as will be understood by the skilled worker in the art, conventional latch means will be provided at the opposite ends of the doors for locking them in the closed position. When such latch means are released, the doors will drop downwardly, swinging about hinges 4 by means of which the doors are attached to the door supporting members 2.

Spring devices 5 in accordance with the instant invention extend between the outermost surfaces of the doors adjacent their free ends to mounting lugs 6 fixedly secured to the under structure of the hopper car, such as the opposite side edges of the center sill 3.

Referring now to FIGURES 1 and 2 of the drawings, each of the spring actuating devices 5 comprises a mounting member 7 adapted to be received between the ears of a lug 8 secured to a reinforcing bar 9 extending lengthwise along the outer surface of the hopper door toward the outermost side edge thereof. A pivot pin 10, which passes through sets of aligned openings in the mounting member 7 and lug 8, serves to pivotally connect the parts and defines a pivot line X, as seen in FIGURE 1. An elongated shaft-like member 11 projects outwardly from the base of mounting member 7 to which the shaft-like member is fixedly secured; and a helical spring 12 surrounds the shaft member with its lower-

most end seated against the base of the mounting member. At its opposite end the shaft member has a neck portion **11***a* which extends through an opening **13** in a yoke-shaped mounting member **14** having elongated legs **14***a* which are pivotally connected to the mounting lug **6** by means of pivot pin **15** which defines a pivot line Y, as also seen in FIGURE 1. As will be apparent from the drawing, the opposite end of the spring **12** seats against a collar **16** which surrounds the neck portion **11***a* and abuts against the base of mounting member **14**, and the length of the leg portions **14***a* are such that the neck portion **11***a* will be projected therebetween as the hopper door swings to the open position.

The open position of the door is illustrated in solid lines in the right hand portion of FIGURE 1; and as seen therein, opening movement of the door results in compression of the spring **12** between the mounting members **7** and **14**, with the neck portion **11***a* of the shaft member **11** projecting upwardly between the arms **14***a* of the mounting member **14** so that its free end, which has a groove **17** therein, seats against the pin **15**. At the same time, a stop **18** at the uppermost end of mounting member **14** seats against the under surface of the center sill **3**, or other member to which lug **6** is secured. Thus the shaft-like member **11** and the stop **18** coact to define a positive stop for the door when in the fully open position. Preferably, the spring **12** does not quite go solid when the door is fully open, although it will be compressed sufficiently so as to develop substantially maximum compression.

It will be noted that as the door swings to the open position, the longitudinal axis of the spring moves from a position in which it is angularly related with respect to the door to a position in which it is substantially parallel to the plane of the door. Thus, when the door is opened, substantially the full force of the spring is exerted along a line essentially parallel to the door, with the result that there is little or no moment of force exerted by the spring tending to move the door to the closed position, and the door thus remains open. In other words, when the door is fully open, the center lines of the pivot pins **10** and **15**, as represented by the pivot lines X and Y, respectively together with the center line of the pintle **4***a*, which serves as the hinge line Z for the hopper door, all lie in an essentially straight line. However, as illustrated by the lines A and B, B', it is preferred that the pivot line Y of pivot pin **15** be offset slightly with respect to a straight line extending between the pivot line X of pivot pin **10** and hinge line Z of pintle **4***a* so that there is a slight biasing of the spring mechanism toward the door closing position. The closing force of the spring when in this position is insufficient to overcome the weight of the door until closing movement of the door is begun, whereupon the compressed spring, due to the shifting position of the pivot pin **10**, will exert an increasing moment of force against the door tending to urge it toward its closed position. Consequently, once closing movement of the door has begun, the stored force of the compressed spring is released to assist in the closing movement of the door.

While a preference has been expressed for the arrangement of parts illustrated in FIGURE 1, wherein the pivot line Y of the pin **15** is offset slightly with respect to the straight line A, it will be evident that the parts could be arranged to go either to dead center or beyond dead center, if so desired; although where this is done, some of the effectiveness of the spring is lost, particularly if the device goes beyond dead center, in which event substantial additional force will be required to initiate the closing movement of the door.

In any event, it will be understood that the magnitude of the spring will be so chosen that it will effectively counter balance the weight of the door. It will be further understood that one or more of the spring devices may be utilized on any given door, depending in large measure upon its size and weight. For example, in the embodiment of the invention illustrated in FIGURE 2, a pair of the spring devices may be conveniently suspended beneath the opposite sides of the center sill **3** of the car body. Such arrangement is particularly useful in conjunction with the type of hopper door construction disclosed in my aforesaid copending application wherein each of the transversely disposed hopper doors is made up of two parts lying on opposite sides of the center sill and operatively connected together by means of a single reinforcing bar **9**.

It is also contemplated that adjustment means may be provided to adjust the compression of the spring **12** either initially or due to the possibility that the spring may take a set during the life of the device. As already pointed out, a collar **16** is provided between the uppermost end of spring **12** and the base of mounting member **14**. This collar has a transverse bore **19** therein which will become aligned with a transverse bore **20** in the neck portion **11***a* when the door is moved to a partially opened position. When the two bores are in alignment a gagging pin (not shown) may be inserted therein, whereupon the door may be manually lifted toward the closed position sufficiently to permit a shim to be inserted between the base of mounting member **14** and the upper surface of collar **16** which, due to its attachment to the neck portion **11***a*, will move away from mounting member **14** as the neck portion retracts from the mounting member as the door is lifted toward the closed position. Upon the insertion of one or more shims, which are preferably of U-shaped configuration, the gagging pin is removed, whereupon the collar is released and the spring freed to act in its normal manner.

As should now be apparent, the instant invention provides a spring loaded door construction which greatly facilitates the manual handling of the door, particularly at such times as it is desired to return the doors to their closed position. Yet the construction is such that even when the doors are open and the spring means loaded, the doors will nonetheless remain fully open until such time as positive force is applied to initiate closing movement.

Having thus described the invention in an exemplary embodiment and with the understanding that modifications may be made therein without departing from its spirit and purpose, what I desire to secure and protect by Letters Patent is:

1. A spring loaded door closing device for railroad hopper cars and the like wherein the hopper door is hingedly connected to the hopper car along a hinge line Z and is movable downwardly from a closed to an open position, said device comprising a first mounting member pivotally connected to the outer side of the hopper door at a pivot line X remote from the hinge line Z of said hopper door, a shaft secured at one end to said first mounting member and projecting outwardly therefrom, a second mounting member configured to slidably receive the opposite end of said shaft, said second mounting member being pivotally connected at a pivot line Y to a fixed support lying beneath and in spaced relation to the hinge line Z of said hopper door, a helical spring surrounding said shaft and extending between said first and second mounting members, the location of said pivot line Y being so chosen that:

(a) when said hopper door is in the closed position the longitudinal axis of the closing device, as defined by a straight line XY extending between the pivot lines X and Y, is angularly related to a plane ZX passing through the hinge line Z and the pivot line X, and

(b) when said door is moved to the open position the pivot line X is moved toward pivot line Y and the helical spring is compressed to slightly less than fully solid condition, and the longitudinal axis of the clos-

ing device, as defined by the straight line XY, lies in near parallelism to the plane ZX,

and stop means operative to establish the open position of said hopper door and prevent the door from swinging beyond the said open position, whereby the opening movement of the door is cushioned by the helical spring as it is compressed and yet the door is positively stopped before the closing device reaches the dead-center position in which its longitudinal axis parallels the plane ZX.

2. The door closing device claimed in claim 1 wherein said stop means comprises an abutment adapted to be contacted by the end of the said shaft which is slidably received in said second mounting member.

3. The door closing device claimed in claim 2 wherein

said abutment comprises a pivot pin which pivotally connects said second mounting member to said fixed support.

4. The door closing device claimed in claim 1 including adjustment means for varying the compression of said helical spring.

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LEO QUACKENBUSH, *Primary Examiner.*