April 17, 1945. H. H. PANCAKE 2,374,155

DOOR CLOSING DEVICE

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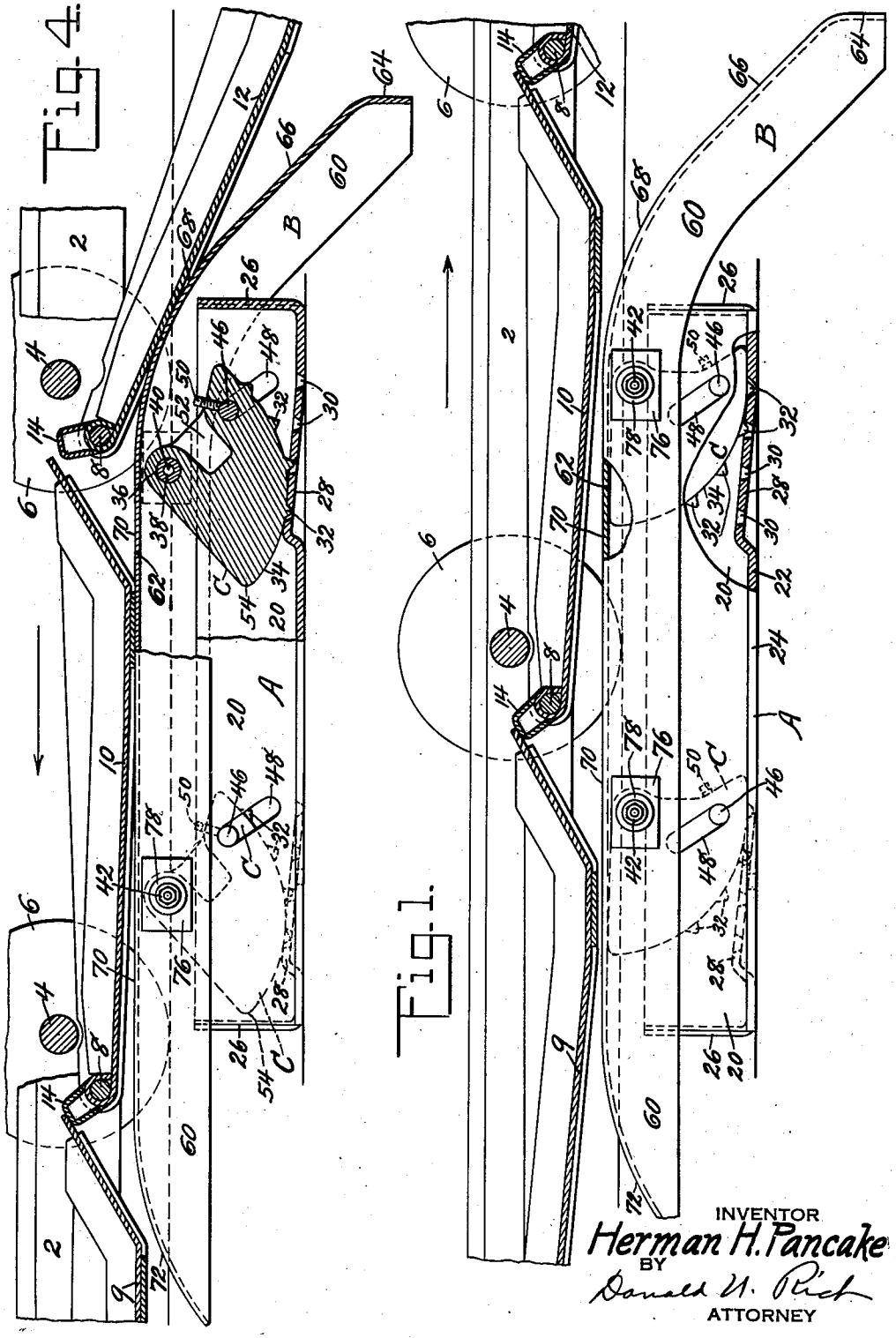


Fig. 1.

Fig. 4

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Fig. 2.

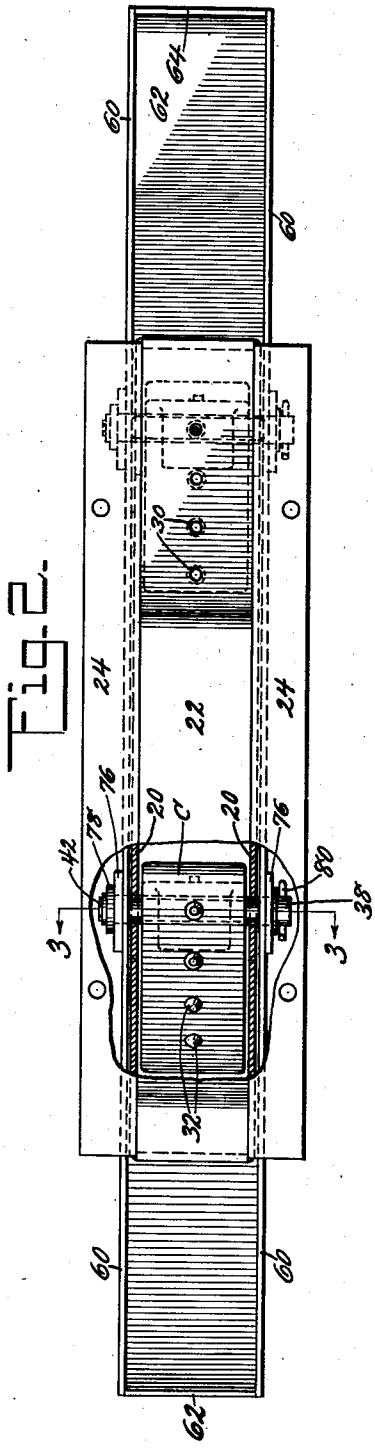
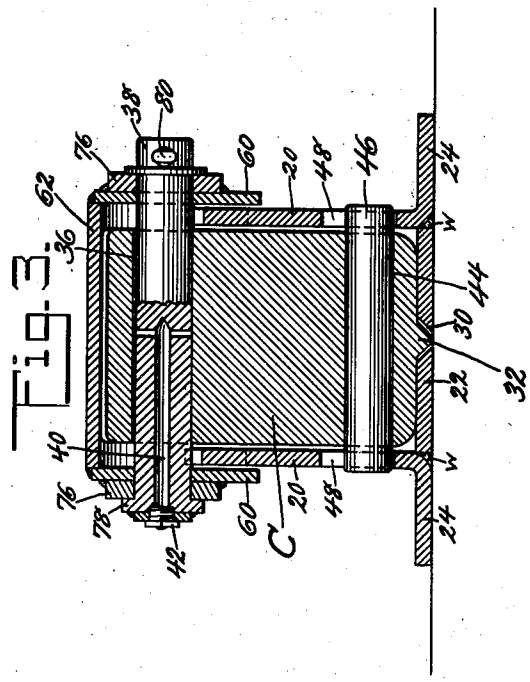


Fig. 3.



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DOOR CLOSING DEVICE

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10 Claims. (Cl. 214—63)

This invention relates to door closing devices in general and in particular to such devices intended to close the doors on drop bottom mine cars having doors which open and close in sequence.

Most of the installations using drop bottom mine cars utilize a permanent ramp for closing the car doors but since the doors must be lifted slightly above their final position, it is impossible to transfort the cars past the ramp without the doors striking the ramp even though closed. Furthermore, in a lot of installations the locomotive pulling the cars will have parts, such as the gear case located so low that it is impossible to drive the locomotive over the door closing ramp. In cases where the fixed ramps are used it is impossible to move the cars across the ramp at any considerable speed since to do so would subject the doors to tremendous strains and eventually ruin the doors and cars. It is an object, therefore, of the present invention to provide a door closing device having a shifting or movable ramp capable of absorbing some of the shock incident to closing of the doors.

A further object of the invention is the provision of a door closing device which is normally in a lowered position permitting the cars with closed doors to pass the ramp without touching the same.

A still further object of the invention is the provision of a door closing device having a ramp member mounted on special form rockers which cause a gradual rise in the position of the ramp as it moves in the direction of car movement under impact of the open doors.

Yet another object of the invention is the provision of a door closing device so mounted on rockers as to offer slight resistance to movement when in a lowered position but in which the resistance increases as the ramp is raised.

A yet further object of the invention is the provision of a door closing device mounted on rockers with the whole so constructed and balanced that the door closing ramp may move toward each door to absorb a portion of the shock due to impact of the door on the ramp.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawings, in which:

Figure 1 is a longitudinal sectional view taken through a car and showing the doors in closed position and passing over the door closing device which is in normal or lowered position;

Fig. 2 is an inverted plan view with parts broken away to better disclose the construction of the door closing device;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 2, and

Fig. 4 is a view similar to Fig. 1 but showing the device in door closing position.

Referring now to the drawings in detail it will be seen that the car illustrated in conjunction with the door closing device is of the automatic drop bottom type having side sills 2, axles 4 and supporting wheels 6. Hinge rods 8 extend across the car from sill to sill and pivotally carry doors 9, 10 and 12 arranged respectively from the front to the rear of the car. The doors, of course, may be of any suitable form but as illustrated are of the type having a projecting portion 14 adapted to support the next adjacent door when in the closed position.

The door closing device, as clearly shown in the drawings, is formed by a base member A, a door closing ramp member B and rockers C. The base member is of general channel cross-section having side walls or flanges 20 and a connecting web or bottom 22. In the instance shown and for ease of construction and attachment to the supporting structure, the sides or flanges of the channel like base member are formed of angles with the upright legs or flanges 20 forming the flanges of the channel, while the horizontal legs 24 are in substantial alignment with the web portion 22 of the channel like member. The web portion 22 is securely welded to the angle members as at W and is formed of a plate having its ends turned upwardly as at 26 to close the ends of the channel member and complete an upwardly open box like base. Portions of the web are pressed upwardly as at 28 (Figs. 1 and 4) to form an inclined trackway with the trackway pierced by conical openings 30 adapted to receive conical projections 32 formed on the rocking surface 34 of the rockers C. It is, of course, obvious that the inclination of the track portion may vary from the plane of the web to any desired degree.

Each of the rockers is formed roughly as a quarter segment of a cylinder although the rocking surface 34 is preferably not a true cylindrical surface throughout but is formed as a part of an irregular curve. Each of the rockers is pierced as at 36 at one side of the center of curvature of the rocker surface and receives a pivot pin 38 extending through the rocker and through the sides of the ramp member later to be described. Thus the rocker surface is eccentrically curved with reference to the pivot pin.

Each pin is preferably formed with a passageway 40 closed by an oil fitting 42 permitting introduction of lubricant axially and radially of the pin onto the bearing surfaces between the pin and rocker. In order to limit the total rocking movement of the rockers each is pierced as at 44 to receive a rod or bar 46 extending completely through the rocker and into inclined slots 48 formed in the flanges 20 of the channel like base member. The pins or rods 46 are locked in the rockers by means of set screws or other devices 50 (Fig. 4). As clearly shown in Fig. 4, the rockers have the portion between limiting pin 46 and pivot pin 38 lightened by removal of metal as at 52. In other words, the nose 54 is weighted so as to constantly urge the rocker toward a position such as is occupied by it in Fig. 4.

The door closing ramp is preferably formed as an inverted channel and may be made from a single pressing but, in the present instance, is made of curved side pieces 60 constituting flanges of the inverted channel and joined together by the flat web plate 62. The side pieces and web are curved so as to present a substantially vertical end wall 64 merging to an inclined surface 66 which in turn curves as at 68 into a substantially flat upper surface 70. This flat upper surface at the rear end of the ramp merges into a downwardly curved portion 72, all of which is clearly shown in Figs. 1 and 4. The side flanges 60 of the inverted channel form ramp member have reinforcing plates 76 attached thereto and pierced to receive the pivot pins 38 which, as clearly shown in Fig. 3, are formed with a shoulder 78 and pierced to receive a cotter pin or other retaining means 80.

Thus it will be seen that in assembling the device it is only necessary to take the fabricated parts and drop the rockers into proper position in the base members and insert pin 46, thus holding the rockers in position in the base member. The inverted channel form ramp may then be lowered into position and pivot pins 38 inserted through the flanges of the ramp and through the rockers, thus holding the ramp in position on the rockers and on the base. With the ramp in position it will be seen that it fully caps and prevents entrance of coal or other foreign matter into the upwardly open base member A.

With the door closing device assembled it will be seen that although the weighted nose 54 of the rockers tends to rock them in a counterclockwise direction as viewed in Figs. 1 and 4, the weight of the ramp will, due to the relative position of pivot pin 38, tend to cause the rockers to rotate in a clockwise direction. By proper choice of the weight in the nose 54 of the rockers and of the curved surface 34 and pivot pin location, it is possible to balance the door closing ramp on the rockers so that a comparatively light blow imparted to surface 64 will cause the ramp to shift, thereby moving the rockers and lifting the ramp. As the ramp moves the weighted nose 54 lowers and the point of contact between the rocker and the track approaches the nose with the net result that the resistance to continued movement and lifting of the ramp progressively increases. It will be obvious that as the doors, for instance door 10 of Fig. 4 rides up over the curved portion 68 of the ramp, the friction between the door and ramp will decrease. By proper choice of the track 28, rocker surface 34 and weight disposed in the nose 54, it is possible to cause the ramp to move toward the right as viewed in Fig. 4 after the friction between door 10 and the ramp has reached a predetermined minimum, thus it is possible to cause the ramp to automatically move toward the door 12 so as to be in position to absorb part of the shock when the door 12 strikes the vertical part 64 of the ramp. Any excessive movement of the ramp is prevented by the pin 46 riding in slot 48 of the base, while displacement of the rocker on the track is prevented by engagement of projections 32 in recesses 30. As soon as the doors of the car are closed the ramp drops back to its normal position as shown in Fig. 1 and the car with closed doors may move freely in either direction without contacting the ramp, thus relieving the car of any shock and preventing any unnecessary wear on the ramp or door closing device. It will be obvious that certain cars and door arrangements will require different movements of the ramp but these special movements may be easily accomplished by slight redesign of the ramp supporting rockers.

While the door closing device has been described more or less in detail, it will be obvious to persons skilled in the art that various modifications and rearrangements of parts may be made without departing from the scope of the invention as defined by the following claims.

What is claimed is:

1. In a door closing device, a base member, trackways formed on said base member, substantially cylindrically curved rockers mounted on said trackways and rockable thereon, and a door engaging ramp member pivotally connected to said rockers and movable therewith, said pivotal connection being located to one side of the center of curvature of the rockers whereby said ramp member is raised during movement of said rockers on said trackways.

2. In a door closing device, a door engaging ramp member, and rockers supporting said ramp member for a combined horizontal and vertical movement, said rockers having an eccentrically curved surface and having a greater mass adjacent one end of the curved surface whereby the movements of said ramp member are cushioned and controlled.

3. In a car door closing device, a door closing ramp member frictionally engaging the open car doors during movement of the car over the ramp in door closing direction, and eccentrically curved rockers supporting said ramp member in equilibrium and out of contact with car doors which are closed, said eccentrically curved rockers and ramp moving in unison in the direction of car travel to absorb shock and lift the doors when frictionally engaged thereby.

4. In a door closing device for cars having doors closing in sequence, a door closing ramp member frictionally engaging the open car doors and movable by the doors during movement of the car over the ramp in a door closing direction, rockers having eccentrically curved supporting surfaces, said rockers pivotally supporting said ramp member and rockable thereby to raise the ramp member to a door closing position, said rockers having a weighted portion adjacent one end of the eccentrically curved surface to counterbalance and support said ramp member in stable equilibrium on the rockers when in a lowered position out of contact with car doors which are closed, said weighted portion lowering during rocking to progressively decrease the counterbalancing effect thereof during movement of the ramp to a raised position by the doors whereby

said raised ramp will have a relatively strong tendency to lower and move toward an open door to cushion the shock of contact therewith after the friction between the ramp and a substantially closed door has reached a predetermined minimum.

5. In a door closing device for cars, a door support member, a door closing ramp member engaging the open car doors and movable relative to the support member in a substantially horizontal forward direction by the doors during movement of the car over the ramp in a door closing direction, means movably positioned between said members and normally supporting said ramp member in a lowered position and offering but slight resistance to the initial substantially horizontal movement of the ramp by the open doors, said means being so constructed and arranged as to progressively increase the distance between the point of support of said ramp member on said means and the point of support of said means on said support member to thereby offer progressively increasing resistance to the ramp movement.

6. In a door closing device, a base member of upwardly open channel cross-section, rockers mounted on the web portion of the channel form base member and rockable thereon, a door engaging ramp member of downwardly open channel cross-section having the flanges thereof overlapping the base member flanges to prevent entrance of foreign matter, and pivot means extending through the flanges of the ramp member and supporting the latter on said rockers.

7. In a door closing device, a base member of upwardly open channel cross-section, rockers mounted on the web portion of the channel form base member and rockable thereon, a door engaging ramp member of downwardly open channel cross-section having the flanges thereof overlapping the base member flanges to prevent entrance of foreign matter, pivot means extending through the flanges of the ramp member and supporting the latter on said rockers, and stop means carried by said rockers and riding in slots formed in said base member to limit movement of the rockers.

8. In a door closing device, an upwardly open channel form base member, track portions formed on the webs of said base member, rockers located in the channel form base member and rockably mounted on said track portions, a door engaging ramp member of inverted channel form overlapping said base member and rockers, means pivotally connecting said ramp member and rockers, and means retaining said rockers in position on said track portions.

9. In a door closing device, a base member of upwardly open channel cross-section, a door engaging ramp member of downwardly open channel cross-section having the flanges thereof overlapping the base member flanges to prevent entrance of foreign matter, means housed by said members and supporting said ramp member for combined longitudinal and vertical movement relative to said base member, and additional means movably connecting said members and first named means to permit said combined movement while preventing separation of said members.

10. In a door closing device, a base member of upwardly open channel cross-section, a door engaging ramp member of downwardly open channel cross-section having the flanges thereof overlapping the base member flanges to prevent entrance of foreign matter, means housed by said members and supporting said ramp member for combined longitudinal and vertical movement relative to said base member, and additional means movably connecting said members and first named means to permit said combined movement while preventing separation of said members, said first named means being so constructed and arranged as to limit the movement between said ramp member and base member in at least one direction.

HERMAN H. PANCAKE.