CLAIMS

[Claim 1] A door closing device comprising:

a drive source configured to open and close a door body; and

a restrictor configured to restrict movement of the door body in an opening direction of the door body by driving of the drive source; wherein

the restrictor includes:

a pin member configured to restrict the movement of the door body in the opening direction by engaging with a door body fixed portion fixed to the door body, the pin member being configured to be urged toward a position of engagement with the door body fixed portion;

a pin holding member configured to hold the pin member, the pin holding member being configured to move integrally with the pin member;

a shaft drive including a shaft, the shaft drive being configured to move the pin holding member in a direction away from the position of the engagement by linearly moving the shaft and pressing the pin holding member, the shaft drive being configured to move the pin member held by the pin holding member in the direction away from the position of the engagement; and

a shock absorber configured to cushion an impact

caused by collision between components of the restrictor when the engagement between the pin member and the door body fixed portion is released as the pin member is moved in the direction away from the position of the engagement such that a locked state in which the movement of the door body is restricted is released, and

wherein the shock absorber includes a plurality of shock absorbing members provided between the pin holding member and each of the plurality of parts included in the restrictor.

[Claim 2] The door closing device according to claim 1, wherein the shock absorber includes an elastic member.

[Claim 3] The door closing device according to claim 1 or 2, wherein the shock absorber includes a first shock absorbing member provided at a tip end of the shaft on the pin holding member side.

[Claim 4] The door closing device according to claim 3, wherein the first shock absorbing member includes a first portion fixed to the tip end of the shaft, and a second portion held by the first portion and provided between the pin holding member and the first portion.

[Claim 5] The door closing device according to claim 4, wherein the first portion includes a holding surface configured to hold the second portion and an annular side surface portion arranged so as to surround the holding surface and provided so as to extend from the holding surface side to the pin holding member side.

[Claim 6] The door closing device according to claim 4 or 5, wherein

a first recess is provided on a surface of the pin holding member on the first shock absorbing member side; and

the shock absorber includes a second shock absorbing member arranged in the first recess of the pin holding member, the second shock absorbing member being configured to contact the second portion of the first shock absorbing member.

[Claim 7] The door closing device according to claim 6, wherein a portion of the second portion that contacts the second shock absorbing member has a substantially flat surface shape.

[Claim 8] The door closing device according to any one of claims 1 to 7, wherein

the shaft drive includes:

a solenoid including the shaft and a solenoid main body into which the shaft is inserted, the solenoid being configured to move the shaft in an axial direction of the shaft by a force of a magnetic field; and

a stopper provided on the shaft on a side opposite to a tip end of the shaft on the pin holding member side with respect to the solenoid main body, the stopper being configured to stop movement of the shaft toward the pin holding member at a predetermined position by being restricted movement of the stopper toward the pin holding member by the solenoid main body; and

the shock absorber includes a third shock absorbing member provided between the stopper and the solenoid main body.

[Claim 9] The door closing device according to any one of claims 1 to 8, wherein

an engaging member configured to engage with the pin holding member is provided at an end of the pin member on a side opposite to the door body fixed portion;

the pin holding member includes a support surface configured to support the engaging member from the door body side; and

the shock absorber includes a sheet-shaped fourth

shock absorbing member provided between the support surface and the engaging member.

[Claim 10] The door closing device according to claim 9, wherein

the pin holding member includes a through-hole into which the end of the pin member is inserted and in which the engaging member provided at the end of the pin member is housed;

a clearance is provided between the engaging member and an inner wall surface of the through-hole in the through-hole; and

the shock absorber includes a gel-like fifth shock absorbing member filled in the clearance of the through-hole and provided such that the engaging member is interposed between the gel-like fifth shock absorbing member and the fourth shock absorbing member.

[Claim 11] The door closing device according to any one of claims 1 to 10, wherein the shock absorber is configured to cushion the impact caused by the collision between the components of the restrictor when the locked state of the door body provided on a railroad vehicle is released.