

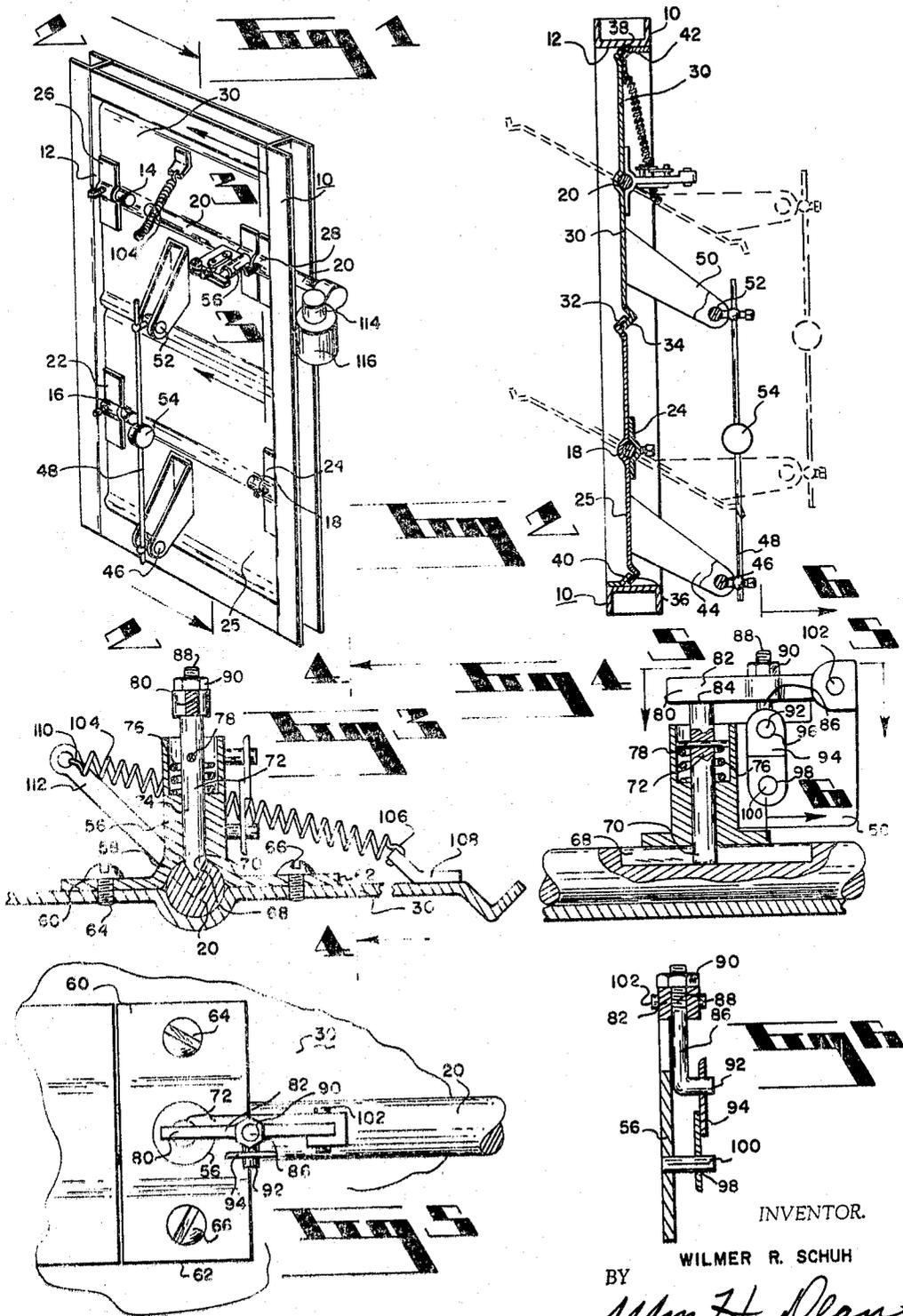
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DOOR CLOSING MECHANISM

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DOOR CLOSING MECHANISM

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This invention relates to a door closing mechanism, and, more particularly, to a door closing mechanism operable in response to a rise in temperature for closing air registers or other doors which may be installed to provide an opening through a fire stop or fire resistant wall.

In many buildings fire resistant walls have air conditioning ducts or other openings therein, and these openings are provided with closures which must be automatically closed in case of fire.

Accordingly, it is an object of the present invention to provide a novel door closing mechanism which is adapted automatically to close a door in a wall or partition between an area in which a fire starts and an adjacent area.

Another object of the invention is to provide a novel door closing mechanism employing a fusible link which resists movement of a latch pin out of engagement with a V-shaped notch in a shaft; said shaft carrying a damper or door pivotally mounted thereon, and said damper carrying a casing in which said latch pin is slidably mounted, whereby fusion of said link permits said V-shaped notch in said shaft to cam said latch out of said notch and thereby permit pivotal movement of the damper or door on the shaft.

Another object of the invention is to provide a novel door closing mechanism having a chisel-shaped or V-shaped latch member engaged in a substantially V-shaped notch extending longitudinally on the shaft and communicating with the periphery thereof, and whereby a fusible link is connected to a pivoted lever which is pivotally mounted on a damper rotatable around said shaft, and whereby the lever normally holds the latch member in the V-shaped notch in the shaft, but is adapted to pivotally release said latch member when said link is fused whereby the door or damper may be pivoted on said shaft by a weight or a spring tending to close the door or damper relative to an opening.

Another object of the invention is to provide a novel door closing mechanism having an aperture type frame in which a damper or a door is pivotally mounted, and wherein a latch member carried on the damper or door is engageable with a V-shaped notch in a control shaft disposed to actuate the damper, and wherein a fusible link normally tends to hold a chisel-shaped latch member in said V-shaped notch and when fused releases said chisel-shaped latch member so that the damper or door may be pivotal relative to the actuator shaft carried by the frame so that a spring interconnecting the damper and the shaft may readily force the damper closed relative to the opening in the frame.

Another object of the invention is to provide a novel door closing mechanism wherein either a spring or a gravity operated weight will close a door or a damper when a fusible link is heated to release a latch member engaging an actuating shaft for a damper of the invention.

Another object of the invention is to provide a novel combination of a damper, an actuating shaft, a fusible link and a latch means wherein the latch means and the shaft are provided with complementary V-shaped latch portions, and wherein an ejecting spring is provided to eject the latch from the shaft when the fusible link is fused so that the damper and latch may be pivoted relative to the shaft after the fusible link has released the latch.

Further objects and advantages of the invention may

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be apparent from the following specification, appended claims and accompanying drawings in which:

FIGURE 1 is a perspective view of a door closing mechanism in accordance with the present invention;

FIGURE 2 is a sectional view taken from the line 2-2 of FIGURE 1 showing by broken lines varying positions of the mechanism of the invention;

FIGURE 3 is an enlarged fragmentary sectional view taken from the line 3-3 of FIGURE 1;

FIGURE 4 is a fragmentary sectional view taken from the line 4-4 of FIGURE 3;

FIGURE 5 is a fragmentary view taken from the line 5-5 of FIGURE 4; and

FIGURE 6 is a fragmentary sectional view taken from the line 6-6 of FIGURE 4.

As shown in FIGURE 1 of the drawings, the door closing mechanism of the invention comprises a substantially rectangular outline frame 10 which may be made up of channel shaped in cross section members. This outline frame 10 is provided with a rectangular opening 12 therein.

Extending into the opening 12 are trunnion shafts 14, 16 and 18, and an actuating shaft 20. The trunnion shafts 16 and 18 are engaged by clamps 22 and 24 and are on a common axis affording pivoting mechanism for a damper plate 25. The trunnion 14 and shaft 20 are on a common axis and are engaged respectively by clips 26 and 28 to hold them in axial alignment and to connect them with a damper 30. The trunnion 14 is fixed in the clip 26, as will be hereinafter described.

As shown in FIGURE 2 of the drawings, the dampers 25 and 30 are rotatably mounted around the axes of the trunnions 16 and shafts 20, and these damper plates 25 and 30 are provided with overlapping edges 32 and 34, respectively, adapted to provide a suitable fire stop. Opposite edges 36 and 38 of these damper plates 25 and 30 are normally engageable when in closed position with stop strips 40 and 42, respectively, of the frame 10 to thereby form a suitable seal against fire.

Connected to the damper plate 25 is an extending clevis 44 having a trunnion bearing 46 to which a shaft 48 is connected. A similar clevis 50 is connected to the damper plate 30 and a trunnion bearing 52 connects the clevis 50 with the shaft 48 which is provided with a weight 54 serving as a gravity actuated member tending to urge the damper plates 25 and 30 from a broken line position, as shown in FIGURE 2, to a closed solid line position, shown therein, as will be hereinafter described in detail.

Disposed adjacent the clip 28 is a bracket frame 56 which is provided with a clip portion 58 straddling the shaft 20 and provided with a pair of clip portions 60 and 62 through which screws 64 and 66 project into the damper plate 30 to hold the bracket frame 56 securely on the damper plate 30.

The shaft 20 is provided with a V-shaped notch portion 68 extending longitudinally thereof and diverging outwardly toward the periphery of the shaft. This notch portion 68 is engaged by a V-shaped chisel portion 70 of a latch plunger 72 reciprocally mounted in a bore 74 of the bracket frame 56. Disposed in an enlarged portion of the bore 74 is a compression spring 76 engaging a pin 78 in the latch member 72 tending to permit the spring 76 to exert force on the pin 78 and eject the chisel point 70 of the latch member 72 from the V-shaped notch 68, as will be hereinafter described.

An end 80 of a lever 82 engages an end 84 of the latch member 72 tending to hold the chisel point 70 thereof in the V-shaped notch 68, as will be hereinafter described.

An L-shaped link 86 is provided with a shank 88 extending through the lever 82 and adjustably held in connection therewith by a nut 90 which is screw threaded on the shank 88 of the link 86.

A lower end 92 of the link 86 provides a hook on which a fusible link 94 is engaged. This link 94 is provided with an opening 96 at its normally upper end fitted over the hook 92 and an opening 98 in the lower end of the link 94 is fitted over a stationary prong 100 carried by the bracket frame 56, all as shown in FIGURE 6 of the drawings.

The lever 82 is pivotally mounted on the bracket frame 56 by a pin 102.

As shown in FIGURES 1, 2 and 3 of the drawings, a damper closing spring 104 is secured at its one end 106 to a clip 108 fixed to the damper plate 30. The opposite end 110 of the spring 104 is secured to an arm 112 which is fixed to the shaft 20, and disposed at an angle whereby release of the chisel point 70 from the V-shaped notch 68 will permit contraction of the spring 104 to effect at least 90 degree pivotal actuation of the plate 30 about the axis of the shaft 20 which is normally held stationary by a gear actuator 114 of a motor 116 fixed to the frame 10. Thus, when the damper plate 30 and its connected damper plate 25 are held in a partially open position and when the chisel point 70 of the latch member 72 is released from the V-shaped notch 68, the spring 104 quickly rotates both damper plates 25 and 30 connected together by the bar 48 to a closed position. Thus the weight 54 and the spring 104 both operate to close the damper plates 25 and 30, or the spring 104 or weight 54 may operate individually to do this, so long as the damper plate 30 is released from the shaft 20 and free to pivot thereon.

The fusible link 94 is disposed to come apart at a very low temperature, for example, 120 to 160 degrees, or whatever temperature for which it is designed to operate. When this happens, the lever 82 is free to pivot upwardly about the axis of the pin 102. The spring 76 tends to force the latch member 72 upward and to cause the pivotal movement of the lever 82 about its axis 102. Furthermore, the V-shaped in cross section chisel point 70 in the V-shaped outwardly diverging notch 68 causes outward camming movement of the latch member 72 due to force of the spring 104 tending to rotate the shaft 20 relative to the axis of the bore 74 in which the latch member 72 is reciprocally mounted. Thus, the spring 76 and the camming action of the V-shaped notch 68 insure release of the latch member 72 so that the spring 104 and/or the weight 54 may readily cause closing of the damper plates 25 and 30 whenever sufficient heat on the one side of the frame 10 is capable of fusing the link 94.

It will be obvious to those skilled in the art that various modifications of the invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said shaft, said link when intact holding said latch member to connect said closure member to said shaft and whereby rupture of said link releases said latch member and permits cam action of said V-shaped portion of said latch member in said V-shaped notch portion of said actuator shaft to eject said latch member therefrom under

influence of said first means tending to pivot said closure member relative to said shaft and, thus, permitting pivotal movement of said closure member relative to said shaft.

2. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; first means tending to close said closure member with respect to said opening in said frame; and spring means tending to eject said latch member to release said portion thereof from said notch in said shaft, said closure member pivoted about the axis of said shaft, said link when intact holding said latch member to connect said closure member to said shaft and whereby rupture of said link releases said latch member and permits cam action of said V-shaped portion of said latch member in said V-shaped notch portion of said actuator shaft to eject said latch member therefrom under influence of said first means tending to pivot said closure member relative to said shaft and, thus, permitting pivotal movement of said closure member relative to said shaft.

3. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said actuator shaft; a lever having a pivoted end pivotally mounted on said closure member; means supporting said fusible link on said closure member; means pivotally connecting said link to said lever between its pivotal mounting and the engagement of said lever with said latch member, said link when intact holding said latch member to connect said closure member to said shaft and whereby rupture of said link releases said latch member and permits cam action of said V-shaped portion of said latch in said V-shaped notch to eject said latch member therefrom under influence of said first means tending to pivot said closure member relative to said shaft; and thus permitting pivotal movement of said closure member relative to said shaft.

4. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said actuator shaft; spring means interconnecting said closure member and said shaft tending to create torsional force on said closure member around the axis of said shaft, said link when intact holding said latch member to connect said closure member to said shaft and whereby rupture of said link releases said latch member and permits cam action of said V-shaped portion of said latch in said V-shaped notch of said actuator shaft to eject said latch member therefrom under influence of said first means tending to pivot said closure member relative to said shaft; and

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thus permitting pivotal movement of said closure member relative to said shaft.

5. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said actuator shaft; said first means comprising; a lever secured to said closure member and a weight coupled to said lever and responsive to gravity.

6. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said actuator shaft; said first means comprising; a lever extending from said shaft and a spring interconnecting said closure member and said lever thereby tending to create pivotal movement of said closure member relative to said shaft.

7. In a door closing mechanism the combination of: an outline frame having an opening therein; a closure member pivotally mounted therein; an actuator shaft

pivotal relative to said closure member; holding means tending to hold said shaft against rotation relative to said frame; a latch member mounted on said closure member; an outwardly diverging V-shaped notch in said shaft; said latch member having an inwardly directed complementary V-shaped portion engageable with said V-shaped notch; a fusible link tending to hold said latch member in said notch; and first means tending to close said closure member with respect to said opening in said frame, said closure member pivoted about the axis of said actuator shaft; said last mentioned means comprising a spring interconnecting said closure member and said shaft tending to create pivotal movement of said closure member relative to said shaft; spring means tending to force said latch member out of engagement with said notch in said shaft when said fusible link releases said latch member, said link when intact holding said latch member to connect said closure member to said shaft and whereby rupture of said link releases said latch member and permits cam action of said V-shaped portion of said latch in said V-shaped notch of said actuator shaft to eject said latch member therefrom under influence of said first means tending to pivot said closure member relative to said shaft and thus permitting pivotal movement of said closure member relative to said shaft.

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