April 21, 1953 H. P. BIRKEMEIER 2,635,718

FIRE DOOR HOLDER

Filed Dec. 8, 1948 2 SHEETS—SHEET 1

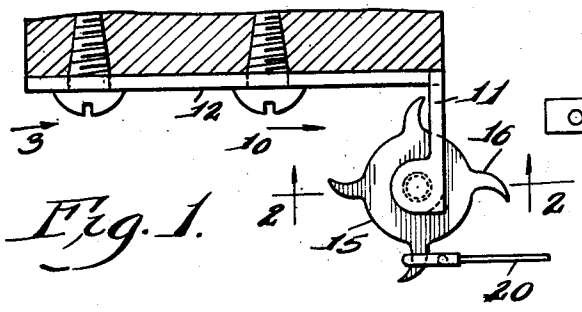



Fig. 1.

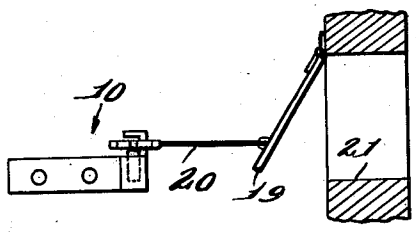



Fig. 4.

Fig. 2.

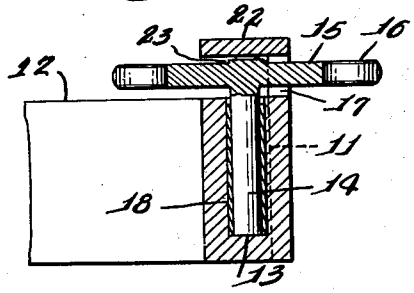



Fig. 3.

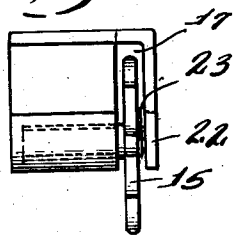
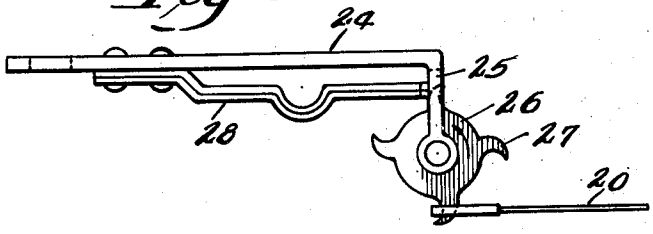



Fig. 5.




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Fig. 6.

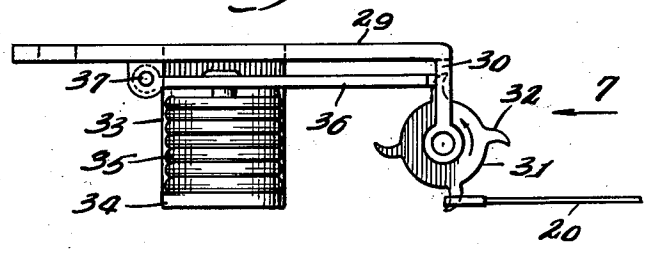



Fig. 7.

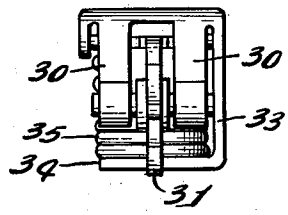



Fig. 9.

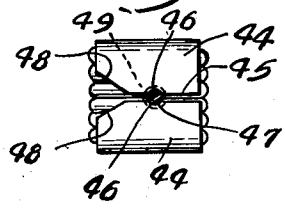



Fig. 8.

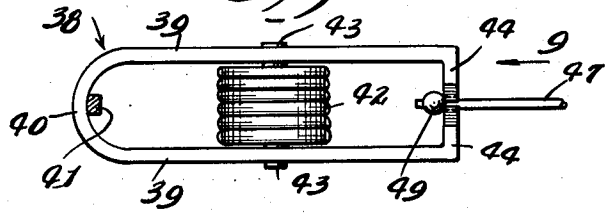
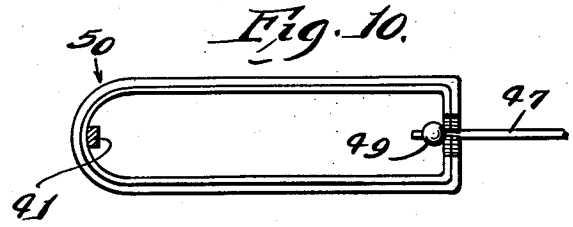



Fig. 10.




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# UNITED STATES PATENT OFFICE

2,635,718

## FIRE DOOR HOLDER

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Application December 8, 1948, Serial No. 64,221

3 Claims. (Cl. 189—45)

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My invention relates to fire door holders and more particularly to a device of this type which possesses a capacity for being reset after release by exposure to a predetermined temperature.

Fire doors, which are customarily placed in selected locations in a building, are sometimes held in an open position for ventilating or other purposes by means of a link partly composed of a low melting point metal so that when exposed to a predetermined temperature, the link ruptures and permits the door to close by gravity or a suitable spring mechanism. After rupture, such a link is a valueless and must be replaced by a new link.

It is therefore one object of my invention to provide a fire door holder which is capable of indefinite use by reason of its ability to be reset for normal operation after each release.

A further object is to devise a holder of the character indicated in which the resetting capacity may be embodied in a structure including fusible metal, a pressure responsive member, such as a bellows, or a thermally responsive member, such as a bimetal strip.

These and further objects of the invention will be set forth in the following specification, reference being had to the accompanying drawings, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

In the drawings:

Fig. 1 is a plan view of one form of my improved holder which utilizes a mass of low melting point metal as the arresting factor for the connected fire door.

Fig. 2 is a fragmentary, enlarged, side view of the holder, partly in section, as taken along the line 2—2 in Fig. 1.

Fig. 3 is an end view looking in the direction of the arrow 3 in Fig. 1.

Fig. 4 is a diagrammatic view showing the holder, positioned as in Fig. 2, connected to a gravity closed, fire door.

Figs. 5 and 6 are views similar to Fig. 1, but showing modified forms of the holder which, respectively, embody a bimetal and a bellows member as the holding factor.

Fig. 7 is an end view of the holder shown in Fig. 6, looking in the direction of the arrow 7.

Fig. 8 shows a holder shaped as a tongs and equipped with a bellows which acts as the thermally responsive member.

Fig. 9 is an end view of the holder shown in Fig. 8, looking in the direction of the arrow 9..

Fig. 10 is a variation of the tongs holder shown in Fig. 8 in which the tongs is composed of a bimetal strip.

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Referring to Figs. 1 to 4, inclusive, the numeral 10 designates one form of the fire door holder which comprises an arm 11, one end of which may be integrally or otherwise connected to a plate 12 fastened to a convenient portion of a building. The other end of the arm 11 stands free of the plate 12 and is enlarged and hollowed to form a chamber 13 whose lower end, as viewed in Fig. 2 is closed while the upper end is open.

A spindle 14 is loosely and axially rotatable in the chamber 13 and its upper end extends above the adjacent end of the chamber for attachment to or integral formation with a disk 15 having quadrant related fingers 16 projecting from the periphery thereof. The diameter of the disk 15 is somewhat larger than that of the enlarged end of the arm 11 and the former rotates within a slot 17 provided in the latter. Uniformly filling the annular space between the wall of the chamber 13 and the spindle 14 is a mass 18 of low melting point metal of the type commonly used in the heat ruptured parts of fire door links and automatic sprinkling systems. This metal fill is preferably slightly less than the full depth of the chamber 13 to prevent loss by overflow when the metal melts.

When the holder is installed, the disk 15 is positioned in a horizontal plane and the looped end of a wire 20 is engaged with one of the fingers 16 while the other end of the wire is secured to the fire door 19 which is pivoted to open or close a passage 21 in the building. At this time, of course, the mass 18 is in a solid state and establishes a firm bond between the wall of the chamber 13 and the spindle 14, thus preventing rotation of the disk 15 by the gravity pull of the door, it being understood that when the wire 20 is attached to a finger 16 as shown, the length of the wire is such as to hold the door in the open position shown in Fig. 4.

In a characteristic installation, as exemplified in Fig. 1, the weight of the door 19 tends to rotate the disk 15 in a counterclockwise direction, with the looped end of the wire 20 fastened to that finger 16 which lies outwardly of the arm 11. Hence, if a fire occurs in the building, the melting of the fusible mass 18 will free the disk 15 for rotation and the door 19 will swing to a closed position. Preferably, each finger is curved or otherwise shaped in a trailing direction with respect to the rotation direction of the disk so that the looped end of the wire 20 will maintain pulling engagement therewith until

the finger has been rotated through an arc of about 90°, thus bringing the next finger 16 in the direction of rotation into position for reengaging the wire. Therefore, when the mass 18 has resolidified, the holder is ready for use again, since no part of the mass has been lost. Any tendency toward upward movement of the spindle 14 during rotation is prevented by a stop 22 which forms part of the arm 11 and overlies a boss 23 projecting upwardly from the disk 15.

The essential concept involved in the holder 10 is the use of a confined, fusible metal mass as the arresting factor for the fire door. Hence, the holder may be located in positions other than that shown in Fig. 2. Where the chamber 13 is placed in non-vertical positions, the open end thereof would be closed by a suitable cap to prevent loss of the mass 18, the spindle 14 extending through the cap.

Further, it will be understood that the quadrant relation of the fingers 16 is by way of example only, since they may obviously be so spaced with reference to the linear displacement of the wire 20 necessary to move the fire door from an open to a closed position that a new finger 16 is correctly positioned for reengagement with the wire when the door is closed. Accordingly, the finger spacing may be adjusted for different installations, but the quadrant spacing does provide a good, general design suitable for a variety of situations.

In Fig. 5 is illustrated a variant form of the resettable holder which employs a bimetal member as the factor which is responsive to heat. It includes a bracket 24 for fastening to a convenient part of the building and projecting laterally therefrom is a bifurcated arm 25 between whose limbs is rotatably mounted a disk 26 having spaced fingers 27 extending from the periphery thereof, all as indicated in Fig. 1. A bimetal member 28 has one end secured to the bracket 24 and the opposite end is positioned in easy abutting relation to one of the fingers 27, with the intermediate portion, including the latter end, offset from the bracket. As viewed in Fig. 5, the lower strip of the member 28 is characterized by a higher thermal coefficient than the other strip. Hence, when the member 28 is heated, it will bow upwardly and free the engaged finger 27 so that the disk 26 will rotate counterclockwise under the pull of the fire door wire 20 which is detachably engaged with another finger 27. This modification may be located in any position and may be reset for further use after disengagement from the wire.

The modification shown in Figs. 6 and 7 is a variation of that illustrated in Fig. 5 in that it includes a latch-like arrangement, but substitutes a thermally responsive bellows for the bimetal member. The numeral 29 designates a bracket for attachment to the building and from one end of which laterally projects a pair of spaced arms 30—30 between which is rotatably mounted a disk 31 having spaced fingers 32 extending from the periphery thereof. A second arm 33 projects from an intermediate part of the bracket 29 and carries a platform 34 on which is rested as an abutment one end of a bellows 35 which is filled with any of the liquids customarily used in a thermally responsive member of this type. The opposite end of the bellows 35 is secured to an intermediate portion of a lever 36, one end of which is pivoted at 37 in offset relation to the bracket 29 and the other end normally engages one of the fingers 32 to prevent rotation thereof under the pull of the fire door wire 20, the latter position of the lever 36 corresponding to a fully retracted condition of the bellows. If a fire occurs, it will be obvious that the heat engendered extension of the bellows 35 will move the lever 36 to a release position and will thus free the disk 31 for rotation and permit the fire door to close. When the heat is removed, the bellows retracts to the position shown in Fig. 6 and the lever 36 is reengaged with one of the fingers 32.

In Figs. 8 and 9 is illustrated a further modification comprising a tongs 38 composed of spring metal and having a pair of arms 39—39 which are joined at one end of the member by a connector 40 that is intermediately secured to a fixed part 41 constituting a part of the building. The arms 39 may therefore be moved away from and towards each other and the separating movement is effected by a liquid filled bellows 42 whose opposite ends, respectively, abut the inner sides of the arms 39 and have guiding relation therewith by means of pins 43 which extend through the arms. The free ends of the arms 39 are bent inwardly to provide oppositely disposed jaws 44—44 whose inner ends are slightly spaced to define an elongated opening 45 and the opposing faces of the jaws are centrally notched at 46—46 to fit and prevent sidewise movements of a fire door wire 47. The wire is inserted in the notches by slightly opening the jaws 44 and to facilitate this insertion, the entrance at one end of the opening 45 may be enlarged by beveling each jaw at 48. Disengagement of the wire 47 from the jaws under the pull of the fire door is prevented by a knob 49 secured to the wire and which contacts the inner faces of the jaws.

With the parts in the positions shown in Fig. 8, the fire door is held open, but when a fire occurs, the length extension of the bellows 42 spreads the arms 39 and hence the jaws 44 and frees the wire 47 so that the fire door may close. When the heat is removed, the spring action of the arms 39 retracts the bellows, and the wire 47 is reengaged with the jaws 44 to recondition the holder for reuse.

A variation of the tongs type of construction is illustrated in Fig. 10 in which the tongs 50 is shaped like the tongs 38 and the parts with which the tongs 50 is associated are identified by the same numerals as in Fig. 8. The separating force for the arms and jaws of the tongs 50 is provided by making the tongs of bimetal and locating that component strip thereof which has the higher thermal coefficient inwardly of the tongs. Hence, when subjected to heat, the tongs' arms will separate and free the wire 47 and when the heat is removed, the tongs 50 will automatically recondition itself for attachment to the wire as above described.

I claim:

1. A resettable fire door holder comprising a pocket, a spindle loosely mounted in and extending beyond the pocket, a disk carried by the exposed end of the spindle and having spaced fingers extending therefrom for engagement of a selected finger with a tensioned connector attached to a fire door, the pull of the connector when the door is open tending to rotate the disk, and a fusible mass surrounding the spindle within the pocket and normally providing a bond therebetween to prevent rotation of the disk and closure of the door, the fusing of the mass at a determined temperature freeing the disk to rotate and release the connector and the spacing and shapes of the fingers being arranged to cor-

rectly position a succeeding finger after a movement of the disk whereby the holder is conditioned for reengagement with the connector when the mass solidifies.

2. A resettable fire door holder comprising a pocket, a spindle loosely mounted in and extending beyond the pocket, a disk carried by the exposed end of the spindle and having quadrant spaced fingers extending from the periphery thereof for engagement of a selected finger with a tensioned connector attached to a fire door, the pull of the connector when the door is open tending to rotate the disk, each finger being curved in a trailing direction with respect to the potential direction of rotation of the disk, and a fusible mass surrounding the spindle within the pocket and normally providing a bond therebetween to prevent rotation of the disk and closure of the door, the fusing of the mass at a determined temperature freeing the disk to rotate and release the connector and the spacing of the fingers being arranged to correctly position a succeeding finger after a movement of the disk whereby the holder is conditioned for reengagement with the connector when the mass solidifies.



3. A resettable fire door holder comprising a rotatable member having spaced fingers projecting therefrom for selective engagement of one finger with a tensioned connector attached to a fire door, the pull of the connector tending to rotate the member, and a confined fusible mass in contact with a part of the member and normally providing a bond therewith to prevent rotation of the member, the fusing of the mass at a determined temperature freeing the member to rotate and release the connector and the spacing and shapes of the fingers being arranged to correctly position a succeeding finger after a movement of the member whereby the holder is conditioned for reengagement with the connector when the mass solidifies.

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