United States Patent

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[54] **FIRE DOOR DROPOUT**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **160/1,** 160/7, 49/1
[51] **Int. Cl.** **E05f 15/20**
[50] **Field of Search** 160/1, 5–9; 49/1–8

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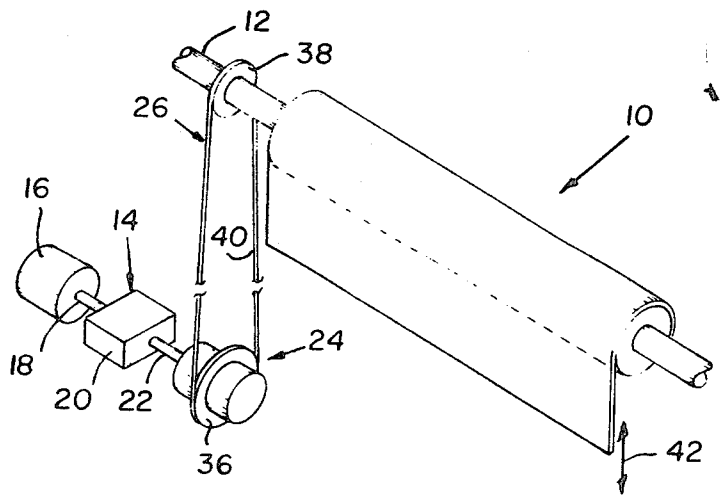
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ABSTRACT: A fusible link dropout or disconnect device for a motor-operated fire door which is advantageously located on the motor shaft and is an integral part of the chain drive by which the motor operator powers the fire door support shaft through rotation to correspondingly urge the fire door through opening and closing movements. The chain drive, consisting of the usual endless loop of chain entrained about spaced-apart sprockets, functions effectively while permitting a degree of lateral shifting movement of the dropout which is utilized as the disconnecting movement thereof in the event of a fire.



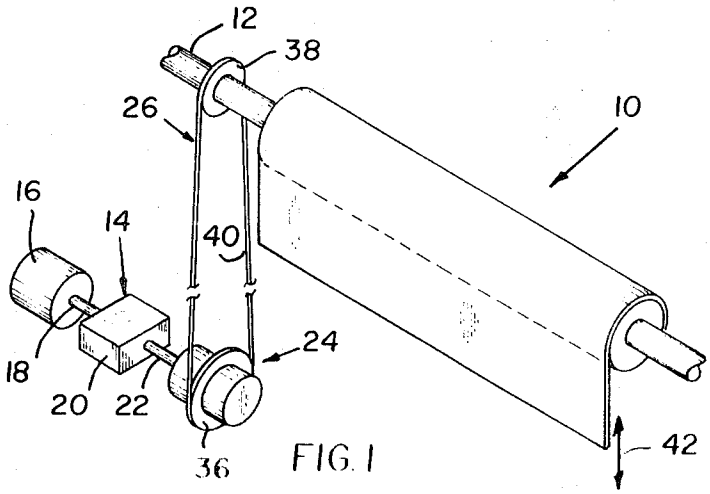


FIG. 1

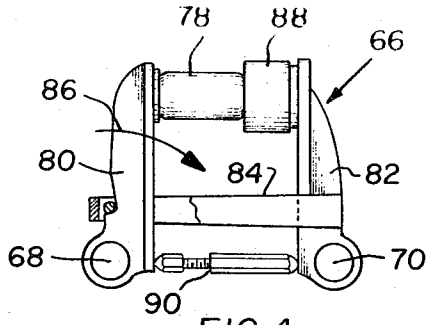


FIG. 4

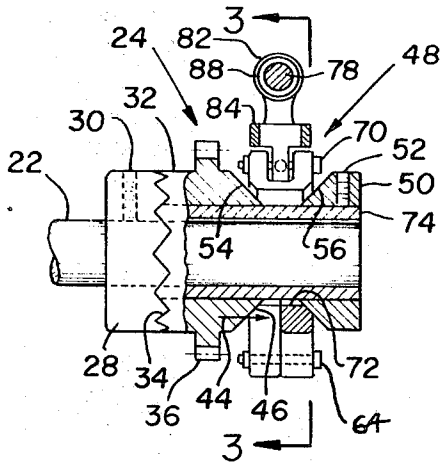


FIG. 2

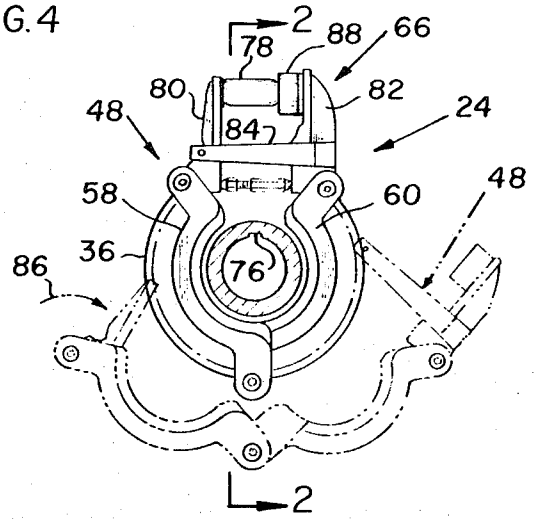


FIG. 3

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FIRE DOOR DROPOUT

The present invention relates generally to fire doors, and more particularly to a disconnect or so-called dropout for a fire door which, in the event of fire, automatically causes the descent thereof to thereby minimize spreading of the fire.

As generally understood, the metal construction of a typical fire door renders the same sufficiently heavy that a motor operator is often required to urge the door through opening and closing movements. Such fire door, due to its weight and under the urging of a starter spring mechanism, would readily descend into its closed position in the event of a fire, provided, however, there is no interference with this closing movement. Thus, a motor-operated fire door requires a disconnect or dropout mechanism to free the fire door of the restraint which results from the positive drive connection between the motor operator and the fire door. While there are numerous types and models of available fire door dropouts, each is considered to be unduly complicated and consequently vulnerable to malfunction.

Broadly, it is an object to provide an improved fire door dropout overcoming the foregoing and other shortcomings of the prior art. Specifically, it is an object to utilize the flexibility inherent in the chain or pulley drive connected between the motor operator and fire door which allows shifting or sliding movement laterally thereof, and to employ this sliding movement to effectuate a disconnect in the drive, all to the end of significantly simplifying the construction and mode of operation of the dropout.

An improved fire door dropout demonstrating objects and advantages of the present invention includes a normally restrained sprocket on the motor shaft, said sprocket having supportingly entrained thereabout one end of the endless loop of chain of the drive connection between the motor operator and the fire door support shaft. In the event of fire, the sprocket is released for sliding movement along the motor shaft, a movement which is not impeded by the chain and which, as is more fully disclosed subsequently herein, effectively renders the sprocket freewheeling on the support shaft. As a consequence, the fire door is free to descend, under its weight, into its closed position.

The above brief description, as well as further objects, features and advantages of the present invention, will be more fully appreciated by reference to the following detailed description of a presently preferred, but nonetheless illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a simplified perspective view illustrating the operative relationship of the fire door dropout hereof and a fire door;

FIG. 2 is an isolated side elevational view of the fire door dropout, in section taken on line 2—2 of FIG. 3, illustrating structural details thereof;

FIG. 3 is an end elevational view, as seen in the direction of the arrows 3—3 of FIG. 2, illustrating further structural details of the fire door dropout; and

FIG. 4 is an isolated view, on an enlarged scale, of the fusible link of the fire door dropout.

Reference is now made to the drawings, and in particular to FIG. 1, wherein there is shown a fire door, generally designated **10**, appropriately supported on a support shaft **12** which is driven in rotation by a door motor operator **14**. As generally understood, the door motor operator **14** includes a motor **16** having a motor shaft **18** operatively connected to a gear reducer **20**. A shaft extension **22** of the motor shaft **18** transmits the rotational power of the motor **16** to the fire door dropout **24** which, according to the present invention, is part of the drive between the door motor operator **14** and the support shaft **12**, all as will be described in detail subsequently.

The foregoing is in contrast to presently known fire door dropouts which are located on, or otherwise are an integral part of the power connection to, the support shaft for the fire door. That is, the fire door dropout **24** hereof has the advantageous location of being part of the door motor operator **14**. This is in part due to the recognition that the pulley or chain drive, generally designated **26**, which exists between the door motor operator **14** and the support shaft **12** has sufficient flexibility to permit unimpeded sliding movement of one end of said drive which, in turn, can advantageously be used in the operation of the fire door dropout **24**. The foregoing will be better understood as the description proceeds.

Referring to FIGS. 2–4 in conjunction with FIG. 1, it will be noted that the dropout **24** consists essentially of two parts. Specifically, it includes a driving member **28** appropriately mounted, as at **30**, to be powered in rotation by the motor shaft extension **22**. Cooperating with the driving member **28** is a driven member **32** slidably disposed on the shaft **22** but normally driven in rotation by the driving member **28** because of meshing engagement therewith along facing intermeshing teeth **34**. Driven member **32** includes a sprocket **36** which is generally in alignment with a cooperating sprocket **38** (see FIG. 1) on the support shaft **12**. Entrained about the sprockets **36, 38** is an endless drive chain **40**.

Thus, when member **32** is in its position adjacent the member **28**, with the teeth **34** thereof in meshing engagement, the motor **16** is effective in powering, via the chain drive **26**, the fire door **10** through opening and closing movements **42**. However, if member **32** is released for sliding movement **44** along the shaft **22** to a clearance position removed from the driving member **28** and the teeth **34** are consequently no longer meshing, member **32** is then rendered freewheeling about the axis of the shaft **22**. In this freewheeling condition of the member **32**, a conventional starter spring and/or the weight of the fire door **10** is effective in causing the descent thereof from its open into its closed position. This, of course, is desired whenever there is a fire in the vicinity of the fire door **10**, since it prevents drafts which may contribute to the intensity and spreading of the fire. Thus, in accordance with the present invention, driven number **32** is released for the aforesaid sliding movement **44** to produce the closed condition of the fire door **10** whenever there is an increase in the ambient temperature sufficient to melt a fusible element and which thus indicates the existence of a fire.

Situated adjacent the driven member **32** and in holding engagement therewith, as at **46**, is a holding element **48** which is maintained at its position along the shaft **22** in holding engagement with the member **32** by a stop **50** rigidly affixed, as at **52**, to the shaft **22**. That is, element **48** normally straddles angularly oriented faces **54** and **56** which define therebetween a sufficient clearance for sliding movement **44** of the member **32** of an extent which disengages the teeth **34** and thereby renders the member **32** freewheeling about the shaft **22**.

As is perhaps best understood from FIG. 3, the holding element **48** includes two links **58** and **60** pivotally connected to each other as at **64**. The encirclement of shaft **32** by the holding element **48** is completed by a commercially available, so-called fusible link **66**. Although, as just indicated, link **66** is commercially available, it is not usually utilized as part of a holding element which prevents sliding movement along a shaft, but rather it is utilized as part of a chain in which it functions as one of the connecting links thereof. In any event, as best illustrated in FIG. 4, the fusible link **66** is appropriately connected, as at **68** and **70**, to the links **58** and **60** so as to provide an overall dimension to the three links **58, 60** and **66** which encircle the shaft **42** with a slight clearance between the inner diameter **72** thereof and an outer diameter of a sleeve **74** which is keyed, as at **76** (see FIG. 3), to the shaft extension **22**. Wedged beneath the encircling cylindrical surface **72** are the respective angular faces **54** and **56** of the members **32** and **50**. Thus, holding element **48** is under a constant urgency, by virtue of the inclined surfaces **54, 56**, to disengage from about the shaft **22**, all as indicated in full line and phantom line perspective in FIG. 3. This disengagement, however, cannot occur so long as the fusible link **66** is intact, and the fusible link remains in this condition so long as there is no melting of the fusible pellet **78** of this link.

Although the operation of fusible links, as exemplified by link **66**, are well known, for completeness' sake this operation will now be briefly described. Link **66** includes two arms **80** and **82** which, as previously indicated, are pivotally connected at **68** and **70** to the links **58** and **60**. Holding the arms **80** and **82** against opening movement, however, is a rectangular lug **84** which is an integral part of the arm **82** and is extended over the arm **80** and thereby effectively prevents pivotal movement of arm **80** in a counterclockwise direction away from the arm **82**. Preventing clockwise or closing movement **86** of the arm **80** relative to the arm **82** is the previously noted fusible pellet **78** and a suitable spacing element **88** appropriately wedged between the ends of the arms **80** and **82**. In practice, a threadable element **90** is threadably adjusted to exert wedging pressure against the fusible pellet **78** and spacing element **88**. When pellet **78** melts, however, in response to an increase in the ambient temperature, arm **80** is accordingly no longer restrained from partaking of pivotal movement **86** which, as a consequence, will project it through the lug **84** and thus clear of the restraining hold of this lug. When this occurs, as illustrated in phantom perspective in FIG. **3**, holding element **48** will disengage from about the shaft **22** and drop from its position therealong in which it normally restrains the driven member **32** from sliding movement **44**. Thus, the driven member **32** is released for sliding movement and is disengaged from the shaft **22**, thereby rendering the member **32** freewheeling about the shaft **22**. Naturally, in the freewheeling condition of the member **32**, the heavy fire door **10** will descend from its open into its closed position and thereby provide its intended fire protection function.

A latitude of modification, change and substitution is intended in the foregoing disclosure, and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. A fire door dropout including a fire door operatively arranged on a rotatable support shaft, and an improved means drivingly connected to urge said support shaft through rotation and cause corresponding opening and closing movements of said fire door, said improved means comprising a powering motor having a motor shaft, a cooperating pair of driving and driven members arranged on said motor shaft so as to provide said driving connection between said motor shaft and said support shaft, said driven member being selectively slidably disposed on said motor shaft for sliding movement between a first operative position drivingly engaged to said driving member and a second operative clearance position removed therefrom providing a freewheeling operation of said driven member relative to said driving member and said motor shaft, and holding means including a fusible element operatively arranged to normally hold said driven member in said first operative position thereof and to release the same for sliding movement into said second operative position thereof in response to an elevated ambient temperature which melts said fusible element, whereby said fire door descends into its closed position during said freewheeling operation of said driving member.

2. A fire door dropout as defined in claim **1** wherein said holding means comprises links connected on opposite sides of said fusible element and circumferentially arranged about said motor shaft at a selected location therealong so as to prevent sliding movement of said driven member along said motor shaft past said selected location while said fusible element is intact.

3. A fire door dropout as defined in claim **2** wherein said driven member includes an angularly inclined surface adapted to have a position wedged between said circumferentially arranged holding means and said motor shaft so as to minimize inadvertent sliding movement of said driven means from said first operative position thereof and also to contribute to forcing said holding means from about said motor shaft upon the melting of said fusible element.

4. A fire door dropout as defined in claim **3** wherein said driving and driven members have cooperating teeth in facing relation to each other and said members are in meshing engagement with each other in said first operative position of said driven member.

5. A fire door dropout as defined in claim **4** wherein said driving connection between said motor shaft and said support shaft includes an endless chain which is entrained about said driven member without inhibiting sliding movement thereof.