June 20, 1961 H. B. CLARK 2,989,302

FIRE DOOR OPERATING APPARATUS

Filed July 18, 1960 2 Sheets-Sheet 1

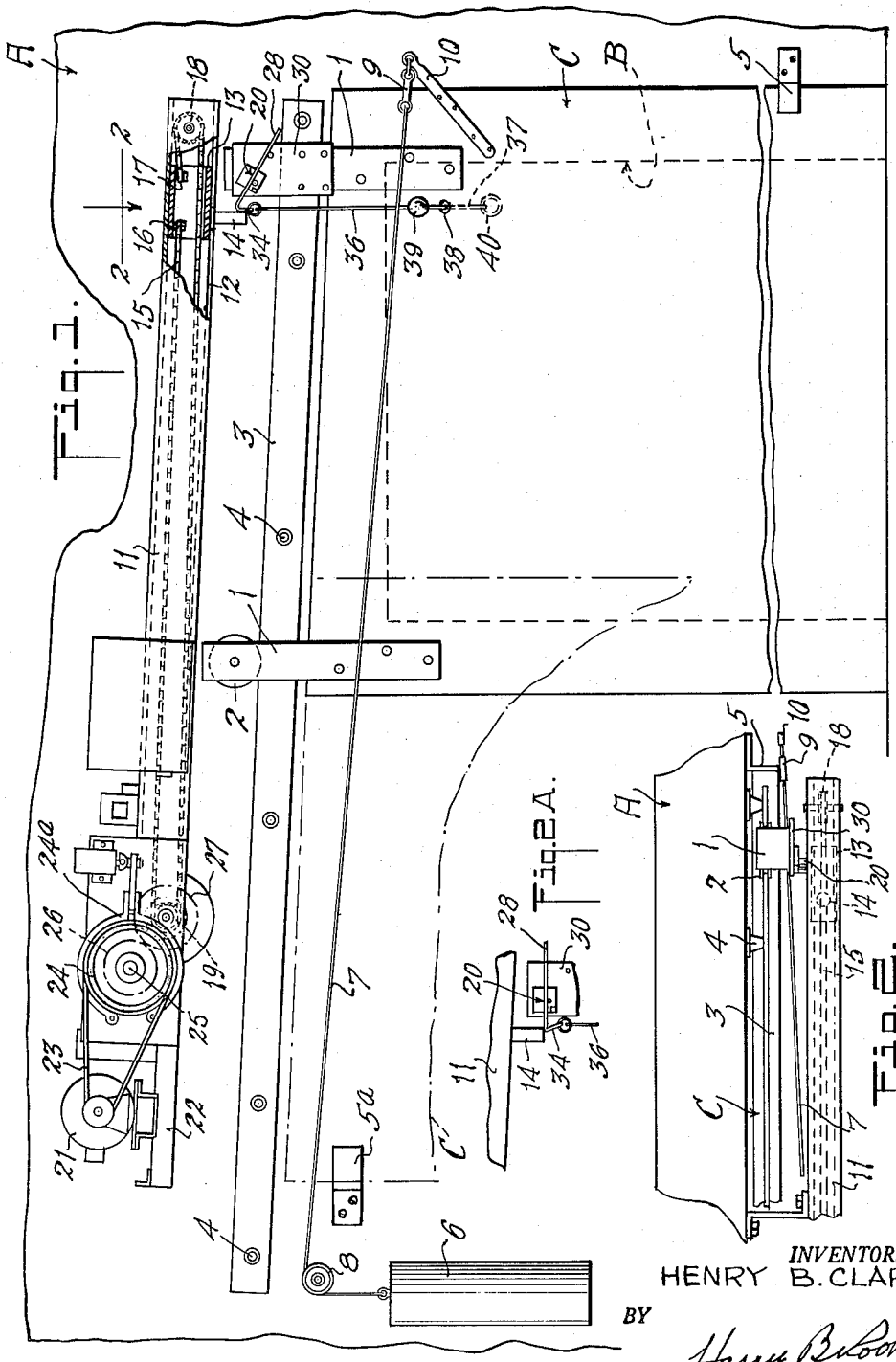


Fig. 1.

Fig. 2.

Fig. 2A.

INVENTOR.
HENRY B. CLARK

BY

Harry B. Cook,
ATTORNEY

June 20, 1961 H. B. CLARK 2,989,302

FIRE DOOR OPERATING APPARATUS

Filed July 18, 1960 2 Sheets-Sheet 2

Fig. 3.

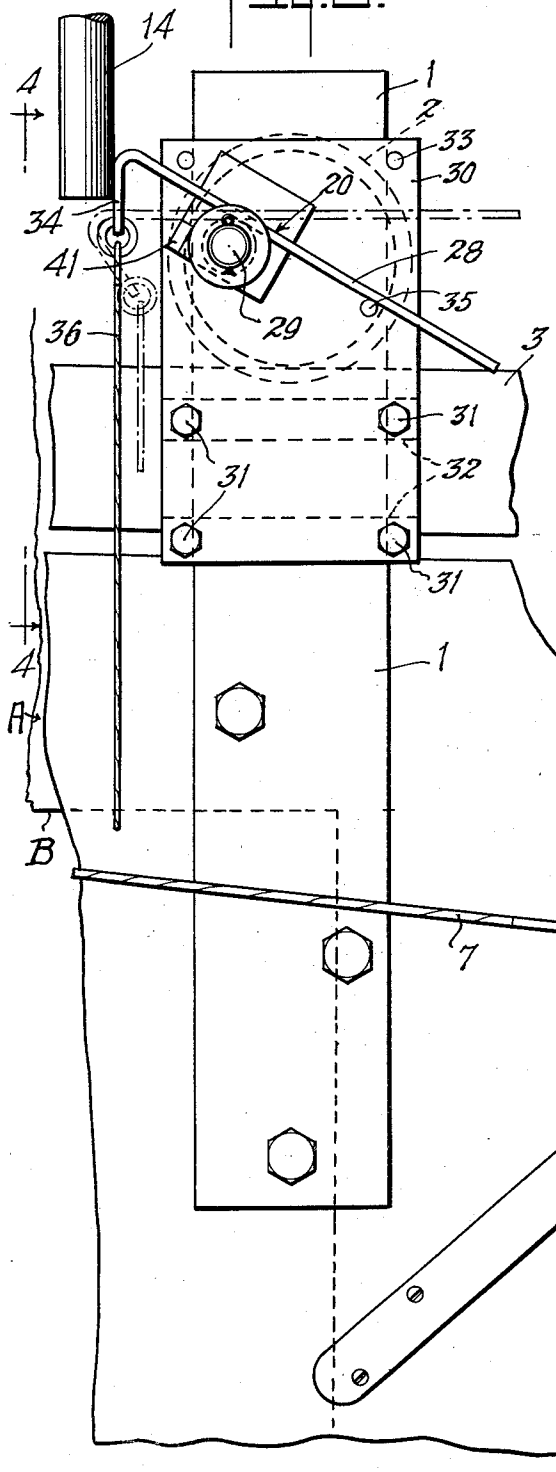
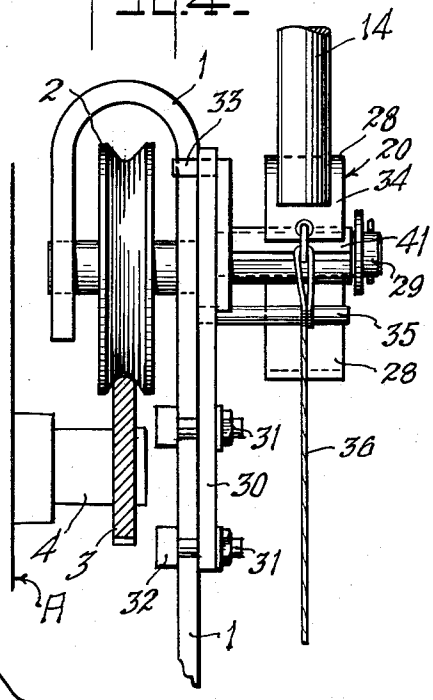


Fig. 4.



INVENTOR.
HENRY B. CLARK

BY Harry B. Clark

ATTORNEY

United States Patent Office 2,989,302 Patented June 20, 1961

2,989,302

FIRE DOOR OPERATING APPARATUS

Henry B. Clark, 1247 Clinton Place, Elizabeth, N.J.

Filed July 18, 1960, Ser. No. 43,527
11 Claims. (Cl. 268—30)

This invention relates in general to fire doors of the type wherein the door is mounted to slide or roll on a track and is held in open position by a counterweight and a connection between the counterweight and the door including a fusible link so that the heat from any fire in the vicinity of the door will fuse the link and release the door to its closed position. However, in the operation of known doors of this type, the operator, during normal operation of the door, is required to manually pull the door into closed position against the influence of the counterweight, which requires the expenditure of considerable physical energy.

A primary object of the present invention is to provide a novel and improved apparatus including a motor for closing the door, and means to permit the door to close by action of gravity independently of the motor and for disconnecting the door from the motor whenever it is desired, for example, in case a person should be trapped in a room closed by the door and manual opening of the door should become necessary.

Another object is to provide apparatus of this character wherein the door shall be opened by a counterweight connected to the door through a fusible link and which shall include a motor-driven part movable in a pre-determined straight path engageable with a coacting part on the door for motor-closing of the door, and the part on the door shall be manually disengageable from the motor-driven part at the will of the operator and shall be automatically actuated into non-cooperative relation to said motor-driven element in case said element should be stopped intermediate the limits of its travel in said path and the door should be released by fusing of the fusible link under the influence of heat from a fire in the vicinity of the door.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

FIGURE 1 is a front elevation of a fire door operating apparatus embodying the invention, showing the door in closed position in solid lines and in open position in dot and dash lines, and illustrating the motor-driven part and the cooperative door-carried part in cooperative relation to each other;

FIGURE 2 is a fragmentary plan view of the apparatus taken from the plane of the line 2—2 of FIGURE 1;

FIGURE 2A is a fragmentary elevation of the motor-driven part and the cooperative part carried by the door, illustrating the parts in non-cooperative relation;

FIGURE 3 is a greatly enlarged fragmentary front elevation of a portion of the door, one of the door hangers and a portion of the track, the motor-driven part for closing the door and the cooperative door-carried part illustrated in cooperative relation by solid lines and in non-cooperative relation in dot and dash lines; and

FIGURE 4 is a side elevation from approximately the plane of the line 4—4 of FIGURE 3.

Specifically describing the illustrated embodiment of the invention, the reference character A designates the wall of a building in which is a door opening B which is closed and opened by a door C. The door is shown as having hanger brackets 1 rigidly secured thereto and projecting upwardly therefrom, which have rollers 2 journaled therein and rollable along a mounting track 3 which is rigidly secured on the wall A by bracket bolts 4 in inclined relation to the door opening B so that the door will normally roll along the track by action of

gravity into closed position. Movement of the door into closed and open positions is limited by the usual stops 5 and 5a respectively, that are mounted on the wall and abutted by the edges of the door. The door is actuated into open position by a counterweight 6 which is connected to one end of a cable 7 that passes over an idler-support pulley 8 and has its other end connected to one end of a fusible link 9, the other end of which is connected to an arm 10 secured to the door. The counterweight is sufficiently heavy to normally roll the door along the track 3 into open position, and in case of fire in the vicinity of the door, with the door open, the fusible link will be disintegrated to disconnect the door from the counterweight whereupon the door will automatically roll by action of gravity into closed position. It will be noted, however, that normally when the door is in open position and it is desired to close the door, in the absence of power-operated apparatus, it would be necessary for the operator to manually pull the door into closed position, and while another counterweight to substantially balance the counterweight 6 might be provided, it would still be necessary for the operator to expend considerable physical energy in simply overcoming the weight of the door for moving the door from open to closed position.

It is the purpose of the invention to provide power-operated apparatus for relieving the operator of work incident to closing the door, in combination with means for permitting the door to be automatically gravity-closed in case of fire and also to permit the door to be manually opened by a person when desired. While the construction of such apparatus may be widely varied, for the purpose of illustrating the invention, it has been shown as comprising a guide track 11 supported on the wall A in line with the mounting track rail 3, and preferably formed of a tube of rectangular cross section having a longitudinal slot 12 in its bottom wall. Slidable within the guide track and movable from one end to the other thereof is a hollow metal guide block 13. The outside dimensions of the block are smaller than the inside dimensions of the track so that the block has a free sliding contact with the inner walls of the track so as to smoothly guide the block in its movements in the track. Secured to and depending from the bottom wall of the block and projecting through the slot 12 is a motor-driven part that is shown in the form of a pin or stud 14. The block 13 is moved through a predetermined path along the guide track by a flexible chain 15 that has one end secured to one end of the block 13 as indicated at 16 and its other end secured to the other end of the block as indicated at 17. At one end of the guide track, the chain passes over a sprocket wheel 18 and at its other end the chain passes over a sprocket wheel 19 which is driven so as to move the chain longitudinally upon rotation of the sprocket, it being understood that the two sprockets are journaled in the track 11. The sprocket wheel 19 is operatively connected to a reversible electric motor 21 mounted on a frame 22 secured to the wall A. The exact construction of the driving mechanism is not material to the invention; it may be of the same general nature as that shown in my Patent No. 2,412,871. For a schematic illustration, the motor 21 is shown as having a belt connection 23 with a pulley 24 on a shaft 25, the pulley being associated with a friction clutch. On the shaft 25 is a pinion 26 that meshes with a gear 27 on the shaft of the sprocket 19. The motor may be controlled by a single simple switch (not shown) that may be either manually or automatically operated; and connected in circuit with the motor and the switch may be a magnetic controller for the motor, a selector switch to reverse the motor, and suitable limit switches to stop the operation of the motor

at the limits of the opening and closing movements of the door. Also, desirably, an electromagnetic brake **24a** is associated with the pulley **24** to brake the movements of the parts as they approach their limits of movement. It will be understood by those skilled in the art that the ratio of the driving gears and sprockets will be determined in accordance with the motor speed and the desired speed of movement of the door. With this construction, it will be seen that upon longitudinal movement of the chain in opposite directions, the guide block **13** will be moved back and forth within the guide track **11**, and during its movement in one direction, the pin **14** will cooperatively engage a door-carried part **20**, that is shown in the form of a latch, for actuating the door into closed position.

The present invention is directed toward the broad combination of the motor-driven part or pin **14** and the cooperative door-carried part or latch **20** which permits normal closing of the door under the power of the motor and also allows the door to close by action of gravity, separate from the motor drive, in case of fire.

The door-carried part or latch **20** is shown as comprising a plate **28** pivotally mounted intermediate its ends on a stud **29** that is rigidly mounted on and projects from a mounting plate **30** which is conveniently secured on one of the door hanger brackets **1** by bolts **31** that project from bars **32** that are disposed on the side of the bracket **1** opposite the plate **30** so that the bracket is clamped between the plate **30** and the bars **32**. To steady the plate **30** on the hanger bracket, preferably studs **33** are rigidly secured to the plate and disposed at opposite edges of the hanger bracket **1**. The end of the latch plate **28** that extends toward the motor-driven pin **14** has a portion thereof turned downwardly as shown at **34** for abutment with the pin **14**. The latch plate is mounted intermediate its ends so that the action of gravity on the end portion of the plate opposite the downturned end **34** will tilt the plate so as to normally hold the engaging portion **34** in position to be abutted by the pin **14**, movement of the latch plate under the action of gravity being limited by abutment of the plate by a pin **35** on the mounting plate **30**.

With this construction, it will be observed that normally the motor-driven pin **14** will be in cooperative engaging relation with the door-carried latch **20**, and when the door is in open position as shown in FIGURE 1, starting of the motor in one direction will cause movement of the pin **14** in one direction so as to push the door into closed position, while when the door is in closed position as shown in FIGURE 1, reversal of the motor will cause the pin to move in the opposite direction and the door will be closed by gravitational action on the counterweight **6**.

To permit disengagement of the latch from the pin **14**, a pull cord **36** is connected to the downturned end portion **34** of the latch plate **28** and extends downwardly along one side of the door for a portion of its length and then through an opening **38** in the door and along the other side of the door as indicated at **37**. Desirably, hand grip elements **39** and **40** will be connected to the cord at opposite sides of the door, respectively. It will be understood that a simple pull on the cord will move the engaging portion **34** out of cooperative relation to the pin **14** so that the door will be released or disengaged from the motor-operated parts as shown by dot and dash lines in FIGURE 3, and can be opened by the counterweight when the fusible link **9** is intact, or can be manually pushed into open position in case the fusible link is disintegrated. A stop lug **41** on the mounting plate **30** limits swinging of the latch plate **28** under the influence of a pull on the cord **36**.

Another feature of the invention is that should the motor-driven pin **14** become stopped or stuck intermediate the limits of its movement with the door in its open position, and in the presence of a fire, the door upon release by the fusible link would be free to move into closed position by action of gravity, the engaging end portion **34** of the latch plate being tilted downwardly by engagement of the pin **14** as shown by dot and dash lines in FIGURE 3 so as to slide freely past the pin and permit the door to freely close. The invention thus ensures against any interference by the motor-operated apparatus with the safe operation of the door in case of fire or in case of entrapment of a person in a room at the side of the door opening opposite the door.

While the invention has been shown as embodied in certain structural details, it will be understood that the construction of the door may be widely modified and changed within the spirit and scope of the invention.

I claim:

1. The combination with a building wall having a door opening therein, of a horizontally disposed inclined track mounted on the wall above said door opening, a door movable on the track by gravitational action into closed position, a motor and a connection between it and said door including a pin movable by said motor alternately in opposite directions between limits in a pre-determined path parallel with said track, and a latch mounted on said door in separable abutting relation with said pin upon movement of the pin in one direction to close the door, and means including a weight connected through a fusible link to said door and suspended on said wall for actuating the door into open position and providing for gravitational closing of the door upon fusing of said link.

2. The combination as defined in claim 1 wherein said latch is movable on the door out of abutting relation to the pin providing for movement of the door from closed position into open position unhindered by said connection between the motor and the door.

3. The combination as defined in claim 1 wherein said latch is movable on the door out of abutting relation to the pin and the latch is yieldingly influenced into a position to abut the pin and to be automatically moved out of said position by engagement of the latch with said pin upon movement of the door from open position into closed position relatively to said pin if and when the pin is stopped between its limits of movement.

4. The combination as defined in claim 1 wherein said latch is pivotally mounted on the door and gravitationally influence into a position to engage the pin and to be automatically moved out of said position by engagement of the latch with said pin upon movement of the door from open position into closed position relatively to said pin if and when the pin is stopped between its limits of movement.

5. The combination as defined in claim 1 wherein said latch is movable on the door out of abutting relation to the pin providing for movement of the door from closed position into open position unhindered by said connection between the motor and the door, said latch comprising a plate pivotally mounted intermediate its ends on the door and normally yieldingly biased into a position with one end to abut said pin, and with the addition of means to actuate said plate about its pivot and move said end out of abutting relation to said pin to release the door for opening movement unhindered by said connection between the motor and the door.

6. The combination as defined in claim 1 wherein said latch is movable on the door out of abutting relation to the pin providing for movement of the door from closed position into open position unhindered by said connection between the motor and the door, said latch comprising a plate pivotally mounted intermediate its ends on the door and normally yieldingly biased into a position with one end to abut said pin and the other end portion inclined downwardly away from the end of the pin, and to be automatically pivotally actuated and moved out of said position by engagement with said pin of the inclined portion of the plate between the first-mentioned end and the pivotal mounting of the plate upon movement of the door from open position to closed position relatively to

the pin if and when the pin is stopped between the limits of movement.

7. The combination of a track to be mounted in inclined position on a wall above a door opening in the wall, a door movable on the track by gravitational action into closed position, a motor and a connection between it and said door including a pin movable by said motor alternately in opposite directions between limits in a predetermined path parallel with said track, and a latch mounted on said door in separable abutting relation with said pin upon movement of the pin in one direction to close the door, and means including a weight connected through a fusible link to said door and suspended on said wall for actuating the door into open position and providing for gravitational closing of the door upon fusing of said link.

8. The combination as defined in claim 7 wherein said latch is movable on the door out of abutting relation to the pin providing for movement of the door from closed position into open position unhindered by said connection between the motor and the door.

9. The combination as defined in claim 7 wherein said latch is movable on the door out of abutting relation to the pin and the latch is yieldingly influenced into a position to abut the pin and to be automatically moved out of said position by engagement of the latch with said pin upon movement of the door from open position into closed position relatively to said pin if and when the pin is stopped between its limits of movement.

10. The combination of a track to be mounted in inclined position on a wall above a door opening in the wall, a door movable on the track by gravitational action into closed position, a motor and a connection between it and said door including a first part movable by said motor alternately in opposite directions in a pre-determined path parallel with said track, and a second part mounted on said door, said parts being drivingly engageable upon movement of the first part in one direction to close the door, and means for actuating the door into open position including a fusible link and providing for gravitational closing of the door upon fusing of said link, and said first and second parts being automatically separable upon release of the door by the fused link for gravitational closing.

11. The combination as defined in claim 10 with the addition of means for moving said second part out of engagement with said first part to provide for manual opening of the door unhindered by said connection between the door and the motor.

References Cited in the file of this patent

UNITED STATES PATENTS

782,224	Edmonds	Feb. 14, 1905
920,477	Keating	May 4, 1909
2,425,312	Gower	Aug. 12, 1947