Aug. 28, 1962 W. M. HUFF, JR 3,051,281

FIRE DOOR

Filed March 31, 1958 2 Sheets-Sheet 1

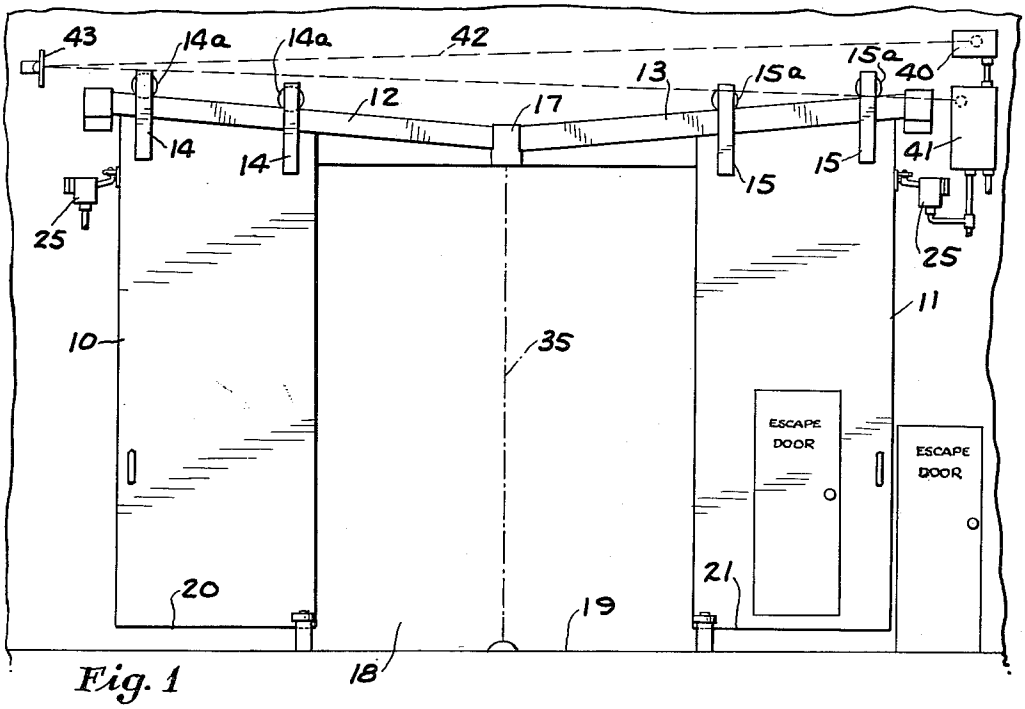


Fig. 1

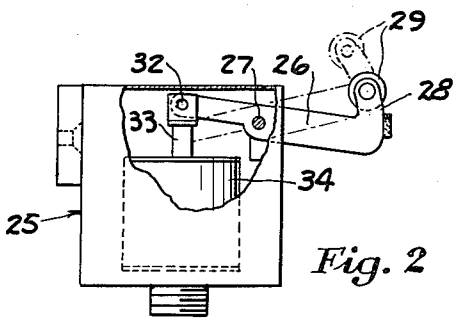


Fig. 2

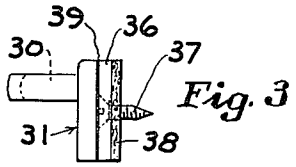


Fig. 3

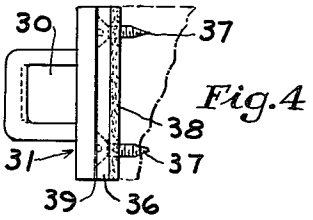


Fig. 4

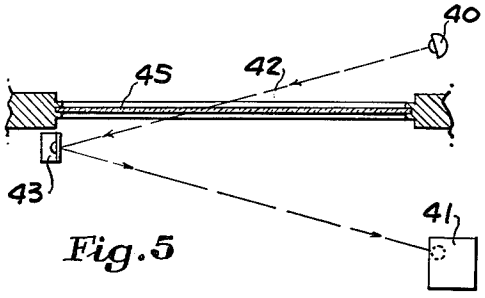


Fig. 5

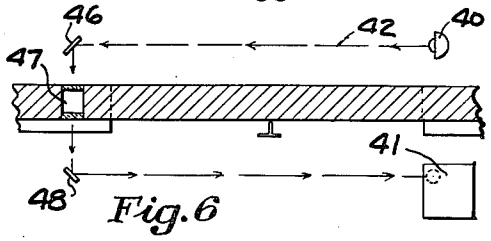


Fig. 6

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Aug. 28, 1962 W. M. HUFF, JR 3,051,281

FIRE DOOR

Filed March 31, 1958 2 Sheets-Sheet 2

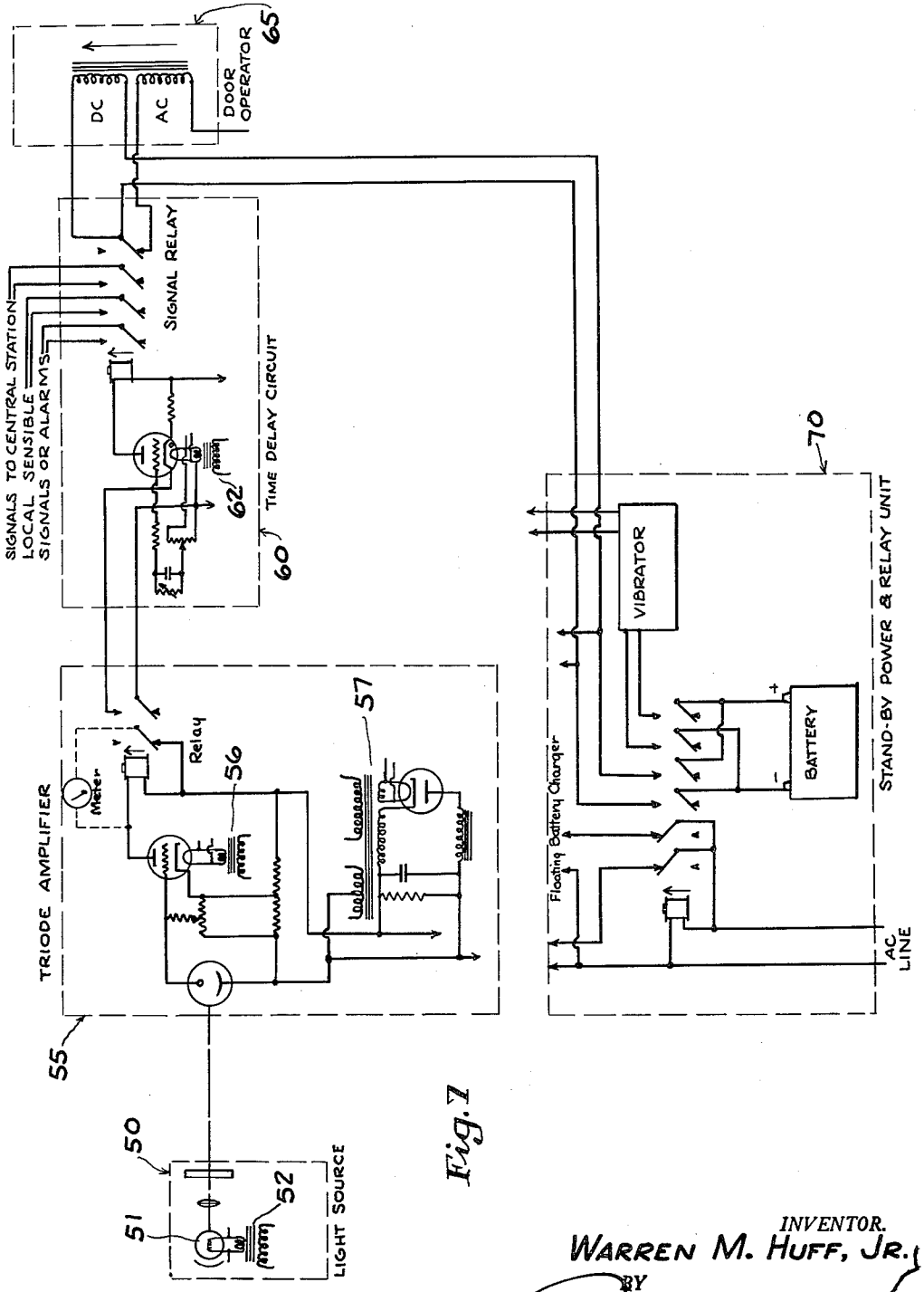


Fig. 1

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FIRE DOOR

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This invention relates to fire safety devices and more particularly to a closure or door automatically closing in case of fire.

The necessity of providing closures separating a building into sections has been realized by those skilled in the art for quite a number of years. Such closures usually referred to as "fire doors" are installed in horizontally extending dividing structures, such as floors and ceilings, in order to separate floors of multiple-floor buildings, as well as in vertically extending dividing structures, such as walls, to separate the floor of a building into sections. In fact, provision of such closures or fire doors in certain types of buildings is required by various building codes. The value of such doors in case of fire has been proven beyond any doubt. In many cases where a fire would ruin the entire building, presence of fire doors, closed in time, localized the fire within the affected sections or delayed spreading of the fire within the affected section.

Such fire doors have been constructed to be closed manually for nights and holidays, i.e. periods of time when the building is empty or has low occupancy, or be closed manually when fire occurs. Moreover, fire doors closing automatically in the case of fire have also been developed. Automatically closing fire doors usually include one or more fusible links made of low melting point metal and adapted to melt due to temperature rise caused by occurrence of a fire. Melting of such a link may operate a trigger permitting the closing means to close the door.

It has been found, however, that while such fire doors have been useful to the extent explained above, serious loss of life and property, nevertheless, may occur before such doors come into action. Contrary to the layman's understanding, a fire occurring in a building other than a frame type residential house usually does not manifest itself by open flame easily seen or detected. A fire in an industrial or public building, such as a factory, a warehouse, a school, a hospital and the like, manifests itself by the generation of dense, choking or even poisonous smoke quickly filling the entire building and causing panic. In many instances, loss of life or injuries are caused in fires by panic, in cases of high occupancy of the building at the time, and suffocation. The possibility of such occurrences is greatly enhanced at the time of darkness due to power failure and the lights going out, and resulting in loss of orientation and inability of the people to find their way out of the building. In fact, in many cases generation of smoke is caused by materials which do not produce hot flame, and such fire may not result in fire-produced destruction of the building, the main damage being caused by water, smoke, broken windows, opened roofs and other damage caused to the building as a part of fire-fighting operations. In some instances, the actual conflagration may burn itself out, but the damage by smoke to goods in mercantile establishments may be exceedingly high. Nevertheless, the loss of life and injuries to health during such fires may be very high. In the majority of cases of fires in industrial and public buildings, as well as in apartment houses, the efficiency of the fire fighters is measured by their ability to locate the actual conflagration or source of smoke as quickly as possible, in spite of the fact that smoke may fill the entire building and make remaining in the building very difficult even for experienced firemen. On the other hand, after the actual conflagration is location, it often proves to be rather small, such as an old mattress in the basement of an apartment building, a pile of rags in a warehouse or factory, etc. While in such cases the smoke is abundant and choking, after the actual conflagration is located, the use of a relatively small quantity of water or even of a hand fire extinguisher is sufficient to put out the fire.

Even in cases where more combustible material is present in industrial buildings constructed of brick, reinforced concrete and similar fire resistant materials, it takes considerable time for the fire to develop over its smoke stage and pass into its flame-and-heat stage. By that time the damage to health and life has already been done and further damages, caused by the fire, are done to the building rather than to personnel.

Thus, in cases of buildings of the type referred to above, the most dangerous period of the fire, as far as human life and health are concerned, is its smoke stage rather than flame-and-heat stage. On the other hand, the fire doors referred to above, particularly those of the automatic type operating in response to rise of temperatures to the point capable of melting of the fusible link, do not respond to the smoke condition. It should be understood that in filling a building, smoke, in spite of its having been generated because of the increase of temperature, quickly cools as it is carried by air currents along cold walls and ceilings of a building, and, therefore, the building even when filled with smoke may not show such a rise in temperature as to provide a condition to which conventional fire doors may respond.

One of the objects of the present invention is to provide an improved fire safety device and particularly a fire door whereby the above difficulties and disadvantages are overcome and largely eliminated without introducing other problems or appreciably increasing the costs involved.

Another object of the present invention is to provide an improved fire door particularly for buildings of the types referred to above which door responds to the conditions present at the earliest stage of the fire and particularly to presence of smoke.

Another object of the present invention is to provide an improved fire door of the nature specified in the preceding paragraph, the response of the door to the smoke condition being effective at the earliest stage of the smoke condition when such smoke fills only the elevated portion of the building or of the story or floor and has not yet filled the portions of the building to the extent that walking or crawling in the building becomes difficult.

A further object of the present invention is to provide an improved fire or smoke door which operates automatically and prevents propagation of smoke through the large areas or portions of a building and restricts smoke conditions to relatively small areas of the building, thereby greatly facilitating detection of actual conflagration and its liquidation by fire fighters, and restricts damage to those goods contained in the affected section.

A further object of the present invention is to provide a fire door which closes automatically at the earliest detectable stage of a fire, means being provided to permit the escape of personnel through or around such doors after the same are closed.

A still further object of the present invention is to provide an improved fire door, the closing of which may be retarded manually to permit escape of personnel, and which stops in its closing when meeting an obstruction such as a human body but which resumes its closing movement after the obstruction is removed.

A still further object of the invention is to provide an improved fire door which is responsive to the density of smoke at the elevated portion of the building section and

commences closing long before any appreciable rise in temperature in such portion occurs.

A still further object of the present invention is to provide an improved fire door of the nature specified above which is self-contained in its operation as far as its closing is concerned and which closes even in case of power failure within the building.

A still further object of the present invention is to provide an improved fire door, the closing of which is controlled by a solenoid which, in turn, is controlled by a photo-electric receiver responsive to interruption of a beam of light by smoke, means being provided to produce the beam of light from the conventional lighting circuit, said means being operative to switch on a battery in case of failure of the power in the lighting circuit.

It is a further object of the present invention to provide an alarm system similarly responsive to smoke conditions rather than temperature rise, which alarm system may operate either in combination with the fire door controlling means, or independently thereof, to give a sensible alarm.

It is an added object of the present invention to provide a fire safety device of the nature specified above which is simple and rugged in construction, safe and reliable in operation and is relatively inexpensive to manufacture and to install, and is easy to repair and service.

Further objects and advantages of this invention will be apparent from the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification, wherein like reference characters designate corresponding parts in the several views.

FIG. 1 is an elevational view illustrating a fire or smoke door embodying the present invention.

FIG. 2 is a view showing on a larger scale one of the door holders, with its arm being shown in released position.

FIG. 3 is an elevational view of the eye bracket engageable by the door holder arm for holding the door in its open position.

FIG. 4 is a top view of the eye bracket of FIG. 3.

FIG. 5 is a sectional view illustrating the arrangement of the light source and photo-electric receiver on two different sides of a wall having a wire glass panel above the fire door.

FIG. 6 is similar in part to FIG. 5 and showing a similar installation in cases where there is no glass panel over the fire door.

FIG. 7 is a diagram of one exemplary installation embodying the invention.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that phraseology and terminology employed herein is for the purpose of description and not of limitation.

In accordance with the invention I discard the former practice of depending on the rise in temperature to control the fire door closing means as inadequate, particularly for the purposes of safety of personnel within the building in which a fire occurs.

In accordance with the invention I provide fire door control means responsive to presence of smoke. In accordance with the invention the means responding to the smoke are of the optical type, and respond to the changes in the transparency of the air in localities to which the smoke would naturally rise in a given building. In accordance with the invention I utilize a photo-electric receiver responsive to interruptions or decrease in the intensity of light within a light beam passing from a light source to such receiver. Under normal conditions the light beam passes without any interruption or obstruction between the light source and a photo-electric receiver. However, in the case of fire, as soon as an appreciable amount of smoke is generated, such smoke rises to the top of the enclosure, such as a room or a corridor, interfering with the passage of light from the source to the photo-electric receiver. Such interruption causes the receiver to operate an electric relay which, in turn, operates an electric switch actuating the door controlling or holding means and moving them into a position in which they do not interfere with the operation of the door closing means. Thereupon the door closing means, which can be of any suitable type, such as electrical, hydraulic, spring or of the gravity type, become effective to cause closing of the door. I prefer to make the door self-contained as far as their closing is concerned in order to prevent their inoperativeness in case of a power failure within the building. Moreover, while the electric light source may depend on a regular lighting circuit for supply of current, in accordance with the invention a battery may be interposed within the circuit with switch means being provided to control such battery in a manner that in case of a power failure a suitable relay causes separation of the light source from the regular lighting circuit and switching on the battery circuit to ensure continued operation of the light.

The doors may be of any suitable type, such as one or two-panel sliding doors, swinging doors, or rolling doors, and may be designed to close vertically extending as well as horizontally extending openings. Such doors should include the requisite safety featurs, such as stopping means when meeting an obstruction such as a human body, and continuance of its closing movement upon removal of such obstruction. Moreover, means are provided to permit passage of personnel who may be trapped in a smoke filled section of a building after closing of the fire doors. Such means may be in the form of small doors provided in the fire door or in a wall adjacent thereto, or both. A smoke responsive alarm can also be provided to act in conjunction with the door or independently thereof and to give an alarm or a sensible signal, visual or audible, in any desired place in the building or outside thereof.

The light source and the photo-electric receiver or cell are disposed, preferably at the highest practicable point of the enclosure in order to ensure its location in a place to which smoke would naturally rise, as well as to prevent tampering with the device, such as by boys in schools. Invisible light beams, such as of filtered, infra-red or ultra-violet light, may be used for the same purpose.

In accordance with the invention, the photo-electric device is so constructed and installed that the light beam traverses the space on both sides of the door and, therefore, is responsive to accumulation of smoke on either side of the door.

In order to prevent undesired response of the fire door and false alarms, such as may be caused by a puff of smoke from a cigarette, throwing a hat or cap through the light beam, a suitable adjustable time delay device is provided to ensure that the control means respond to sustained and not merely momentary conditions.

By virtue of such construction generation of smoke in one part of the building would cause the fire doors to close, isolating such a section and preventing the smoke from filling the entire building. This would permit orderly evacuation of personnel from other portions of the building. Personnel who become trapped within the affected section would still have an opportunity to pass through the door and escape. Thereupon, locating the source of the actual conflagration would require a search through a much smaller area or portion of the building. While the swinging fire door may be successfully controlled with the aid of my improved device, I prefer to use sliding doors closing by gravity as providing for greater safety. Swinging doors have been known to cause accidents, particularly when the escaping crowds begin to press in the direction opposite to the direction in which such doors open.

One photo-electric device may be installed to control two or more fire or smoke doors installed on both sides of a section of a building in order to isolate such section from the adjoining sections on both sides thereof as well as from the upper floors of the building. Also, several photo-electric smoke-responsive devices such as disclosed herein may be installed in various places of a building section as well as in ventilation or air conditioning conduits or ducts provided in the building and may be made to control the door or doors adapted to isolate the building space served by such conduits, and/or shutters installed in such ducts to close the same and thus prevent propagation of smoke through ventilation or air conditioning systems. When installed in a ventilation duct, a photo-electric device may project its light beam obliquely along the duct to attain desired sensitivity of the device in smoke detection.

In addition to smoke-responsive elements, heat-responsive elements, such as fusible links or thermostats, may also be inserted in the door controlling circuits or in the door-holding mechanical means and thus make such door responsive to both heat or smoke, whichever condition occurs earlier.

When a suitable adjustable time delay circuit is incorporated in the photo-electric receiver to prevent false alarms as mentioned, the relay may be of the lock-out type and not self-restoring, particularly when connected to a house, a central station, or to other warning devices. The relay may be self-restoring when connected only to the solenoids, providing that such construction is permissable under local fire codes.

In the drawings there is shown, by way of example, a fire or smoke door embodying the invention. The door shown therein is of the gravity type and comprises two panels **10** and **11** suspended on inclined track rails **12** and **13** with the aid of brackets **14** and **15** secured to the door panels **10** and **11**, respectively, and having wheels **14***a* and **15***a* running along the track rails **12** and **13**. In FIG. 1 the panels **10** and **11** are shown in their open and, therefore, uppermost position. Because of the inclination of the track rail members **12** and **13**, if the door panels **10** and **11** are left to themselves, they would roll on their wheels toward the center **17** of the track, closing the opening **18**, with their lower edges **20** and **21** coming down to the floor surface **19**.

The weight of the doors and the inclination of the track members **12** and **13** are so selected that the door panels **10** and **11** can be stopped by manual effort in their closing movement and yet to resume their further closing movement as soon as the stopping effort is released. By virtue of such as expedient, injury to personnel and particularly to persons who may be caught between the closing panels **10** and **11** is prevented, and yet stopping the doors in their closing movement is made to last only as long as the manual effort continues. Thus, as soon as a person who was caught between the door panels **10** and **11** passes through the opening **19** and releases his hold on any of the panels, the panels continue their downward movement toward their fully closed position unless again there is interference with such movement. After interference disappears, the panels resume their closing movement.

Means are provided to lock the door panels **10** and **11** in their uppermost position and to hold said panels in such position until the control device becomes operative to close the doors in case of a fire. In the present embodiment of the invention such means are exemplified by door holders **25**, each provided with a locking arm **26** hinged as shown at **27** and having a hook end **28** provided with a roller **29** adapted to enter the opening **30** of the eye bracket **31** secured in a manner described below to the respective door panel. The opposite end of the arm **26** is hingedly connected as indicated at **32** to the armature **33** of a solenoid **34**. When the solenoid is energized, the armature **33** is drawn all the way into the solenoid causing the opposite end of the arm **20** carrying the roller **29** to move and to remain in its upper

position, engaging the eye bracket **31** and thus holding the door panel in its open position. On the other hand, should the solenoid current be interrupted, the arm **26** is adapted by the provision of suitable spring means (not shown) to move in the opposite direction, withdrawing its hook end **28** from the opening **30** of the eye bracket **31** and thus releasing the respective door panel for its downward rolling on its track rail for closing the corresponding portion of the opening **18**. With both door panels being released simultaneously, they move downwardly and meet along the center line **35** of the opening **18**, closing the entire opening and thus preventing passage of smoke, hot gases and flame through the opening **18** and spreading of the fire throughout the entire building.

In accordance with the present invention, operation of the solenoids **25** intended to release the door panels for closing same automatically is made responsive to presence of smoke in the upper portion of the room, corridor or other enclosure in which the fire door is installed. Furthermore, in accordance with the invention the sensitive element thereof responding to the presence of smoke is of the optical nature and is made to sense a decrease in the transparency of the air space, which decrease inevitably occurs in a space where smoke accumulates. In accordance with the invention the optical device is a photo-electric receiver or cell responsive to the decrease of transparency of the air space in the predetermined locality through which space a beam of light is made to pass.

In the present embodiment of the invention the photo-electric device comprises a source of light **40** and a photo-electric receiver or cell **41** responsive to the condition of the light beam **42** produced by the source **40** and projected unto the photo-electric receiver **41**. While the light source **40** may be placed directly in front of the photo-electric receiver **41**, in accordance with the invention the light source and the photo-electric receiver are placed at two different sides of the door, and a suitable mirror means are utilized for reflecting the light beam, as illustrated in FIGS. 5 and 6.

By virtue of such an expedient the light beam is made to pass on both sides of the door, and, therefore, the device responds to accumulation of smoke on either side of the door and operates the door-controlling means to close the fire and smoke door without the loss of time necessary for accumulation of smoke to the extent that the cloud of smoke descends low enough to pass through the door. FIG. 5 illustrates an installation utilizing a wire reinforced glass panel **45** closing a window provided above the door panels. A single mirror such as **43** is sufficient for such an installation. In instances where building codes do not permit use of such glass panels, installations of the type illustrated in FIG. 6 may be used. In such installations a mirror **56** receiving the light beam from the source **40** reflects such a beam through a small opening **47** provided in the wall and having glass lenses provided at both sides thereof. After passing through the opening **47**, the light beam is reflected by the second mirror **48** and is projected on photo-electric receiver **41**.

Since smoke tends to accumulate in the highest portion of an enclosure, such as a room or a corridor, I prefer to install the photo-electric device near the ceiling thereof with due consideration given to the natural air currents in the particular part of the building. In this connection operation of the ventilation or air conditioning systems installed in the building should also be taken into consideration.

In schools and other public places where children are permitted to spend time alone, it is desirable to place the device at a height of at least eight feet from the floor. Such a construction, in addition to its enabling the device to detect presence of smoke very early also prevents tampering with the device. It can be appreciated that

an electrical device of such a nature arouses natural curiosity and invites school boys to examine and try to operate it. Therefore, the installation should be as inconspicuous as possible, and should preferably be concealed. Mounting all devices flush with the wall, wherever practicable, is desirable.

It will now be understood, in view of the foregoing, that in case of a fire, as soon as any appreciable amount of smoke is generated, the same rises and following the ceiling of the enclosure reaches the location in which the photo-electric device described above is installed. Presence of smoke in such space immediately affects transparency of the air, and this condition is sensed by the light beam. Decrease in the intensity of light in the beam operates the photo-electric cell, which operation is caused in a manner well known in the art to interrupt or to close the solenoid circuit, depending on the construction selected, and thus to cause the solenoids **25** to operate in a manner to move their hook arms **26** to release the respective panels **10** and **11** for closing the opening **18**.

When the opening **18** is closed, the smoke condition is localized to the section of the building in which conflagration occurred, thus facilitating detection of the place of actual conflagration. Therefore, inspection of only one section would be required to detect the source of the fire. Moreover, propagation of smoke into other sections of the building, be it a factory, a mercantile establishment, school, hospital or other public building, is stopped, thus preventing a panic and permitting evacuation, if necessary, in a speedy and safe manner, and also greatly decreasing probability of damage by smoke, water, etc.

Should any person be trapped within the smoke filled section of the building, he may escape through one of the escape doors which are provided in one or both of the door panels as well as in the wall adjacent to the opening **18**.

I prefer to make controlling circuits in such a manner that the same are closed when the fire or smoke doors are in their fully opened position. By virtue of such a construction in cases of power failure, which is probable to occur in case of a fire, all of the devices will operate because or in spite of failure and will cause the door panels to close. In fact, in the embodiment of the invention herein illustrated and described, any foreseeable failure of the separate components thereof would merely cause the fire or smoke doors to close safely.

On the other hand, should the construction be such as to require constant current, at least in some of the circuits such as in the light source circuit, a stand-by power unit including a battery may be provided and connected to the source of light and other portions of the device in such a manner that failure of the light current would cause the battery to become a part of the operating circuit and to serve as a source of electric energy therefor.

In accordance with the invention I also provide an alarm device adapted to give a sensible signal, audible or visual, in any desired place, one or more, such as in a guard house or within the smoke filled section. Such arrangement may work in combination with the fire or smoke doors or may be made in the form of an independent device sensitive to smoke condition and controlled in the same manner as the fire or smoke door disclosed above. Such alarm device may also be made responsive to both rise in temperature and accumulation of smoke. In the embodiment illustrated in FIG. 4 such means are exemplified by the bracket **31** being soldered with the aid of a low melting point solder to a metal plate **36** secured to the door panels, such as with the aid of screws **37**, a sheet of thermal insulation, such as a piece of asbestos **38** being interposed between the plate **36** and the door panel structure to prevent transfer of heat to the door panel. In case of fire, melting of the solder layer **39** would cause release of the door panel for closing.

FIG. 7 is an electrical diagram of one exemplary installation. It should be appreciated that this diagram includes not only the basic elements of my improved construction but also additional devices which give extra advantages or safeguards but which are not essential for the operation of the basic construction disclosed above. Particularly, this diagram, in addition to the basic elements of my improved combination, also includes a stand-by power-and-relay unit mentioned above. However, it shall be understood that provision of such stand-by power unit may be dispensed with due to the fact that my improved device disclosed above will operate in the case of power failure to permit the fire or smoke doors to close and thus give indication of power failure in such a manner. Provision of a stand-by power-and-relay unit will ensure that no closing of the fire and smoke doors will occur in case of mere electric power failure, such as may be caused by a burned out fuse. My improved device, including a stand-by power unit, will continue to operate in spite of such failure and will hold the fire doors open.

Referring particularly to FIG. 7, the numeral **50** designates generally the light source unit, including a light source **51** and a transformer **52** connected to a suitable source of power. The light source unit may also include condensing lenses and infra-red filters when used remotely from the photoelectric tube itself. It may also include one or more mirrors utilized to direct or reflect light rays in a desired manner, particularly as disclosed above. It may be desirable under certain conditions to contain the entire unit in the same box with the photo-tube, in which case it will operate by the passage of smoke between the light source and the photo-tube. The smoke detecting device may also be in the form of a gas ionization chamber in which no light source will be included but in which the presence of smoke could be detected due to difference in voltage between a sealed chamber and an unsealed chamber causing a signal to appear at the grid of the amplifier tube.

The numeral **55** designates a triode amplifier which is an element that may be used in all devices disclosed above. The numeral **60** is a thyratron operated time delay circuit. In this device the time delay element may also be a simple resistor-condenser circuit, or a thermal unit producing a time delay for the purposes explained above.

The numeral **65** designates a solenoid unit operating to hold the door panels in open position and to release them for closing in case of a fire. The solenoid of such unit may be either A.C. or D.C. unit, or be a combination A.C.-D.C. wound solenoid, if desired. In the diagram of FIG. 7 the combination A.C.-D.C. wound solenoid is illustrated.

Numeral **70** indicates a stand-by power-and-relay unit, the function of which is explained above. The four transformers shown in the diagram of FIG. 7 and indicated by the numerals **52**, **56**, **57** and **62** are transformers either of filament or plate types, depending on the particular requirements. They may also be replaced by copper oxide selenium or silicon rectifiers if D.C. is needed, and power resistors may be employed to achieve voltage reduction. Other improvements in the electrical part of my system may also be made in accordance with practice in electrical art without departing from the scope of my invention.

By virtue of the above disclosed construction, objects of the invention listed above and numerous additional advantages are attained.

I claim:

1. A safety smoke closure device for a building having at least two separate space compartments and an opening providing communication between said two compartments, a track mounted at said opening, a closure provided on said track and movable thereon to close and

to open said opening, said track and said closure being adapted to have said closure move on said track from its upper position at which the opening is open to its lower position at which the opening is closed by gravity alone and thus, unless restrained by extraneous means, constantly tends to move from its open position to its closed position; locking means provided on the building structure at said opening and engaging said closure in the upper position thereof to hold it in such upper position and thus to keep said opening open and to restrain said closure from downward movement on said track that would close said opening; solenoid means normally energized and maintaining said locking means in their closure-engaging position but releasing said means when de-energized to cause said closure to move by gravity to its closed position; an electric circuit including a source of electric energy and connected to said solenoid means to keep the same normally energized; a source of artificial light adapted to produce a beam of light, said source of light being disposed adjacent said closure in one of said compartments, a photo-electric receiver disposed adjacent said closure but in the other compartment, said photo-electric receiver including circuit-interrupting means normally closed but adapted, when operated, to open said circuit; a glazed opening provided in the building structure separating said compartments and adapted to pass the light beam from said source of light to said photo-electric receiver, said photo-electric receiver being adapted to actuate its circuit-interrupting means to de-energize said solenoid means and thus to release the closure for its downward closing movement when smoke is present in a predetermined concentration in the space traversed by the light beam in either one of said two separate building compartments.

2. A safety smoke closure device defined in claim 1 with the photo-electric receiver thereof including a time delay circuit with a relay means, whereby only those interruptions of the light beam which continue for not less than those of predetermined duration cause interruption of the solenoid energizing circuit.

3. A safety smoke door device for a building having at least two separate space compartments and an opening providing communication between said compartments; a downwardly inclined track mounted at said opening, a door provided on said track and movable thereon from its upper position at which said opening is open to a downward position at which said opening is closed, the angle of inclination of said track being so selected that said door starts from rest and moves thereon by gravity alone and thus, unless restrained by extraneous means, moves from its open position to its closed position; locking means provided on the building structure at said opening and engaging said door in the upper position thereof to hold it in such upper position in order to have said opening open and to restrain the door from downward movement on said track that would close said opening; solenoid means normally energized and maintaining said locking means in their door-engaging position but releasing said means when de-energized to cause said door to move by gravity to its closed position; an electric circuit including a source of electric energy and connected to said solenoid means to keep the same normally energized; a source of artificial light adapted to produce a beam of light and disposed adjacent said door on one side thereof; a photoelectric receiver disposed adjacent said opening but on the opposite side thereof from said source of light, said photo-electric receiver including circuit-interrupting means normally closed but adapted to open said circuit when actuated by said photo-electric receiver; a glazed opening provided in the building structure between said separate compartments thereof for passage of the light beam from said source of light to said photo-electric receiver, said photo-electric receiver being adapted to actuate its circuit-interrupting means to de-energize said solenoid means and thus to release the locking means and said door for its downward closing movement when smoke is present in a predetermined concentration in the space traversed by the light beam in either one of said two separate building compartments.

4. The invention defined in claim 3, the weight and the mounting means of the door being so selected in view of the angle of inclination of the track that downward movement of said door thereon is resistable by human effort to the degree of being stopped by such effort.

5. The construction defined in claim 3 and including in combination therewith a heat responsive device operatively interposed in the locking means and adapted to release the same in response to the rise of ambient temperature beyond a predetermined limit and irrespective of presence and absence of smoke in the space traversed by the light beam.

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