

- [54] **EMERGENCY RELEASING SAFETY APPARATUS**
 [76] **Inventor:** Arthur G. Wright, 7585 Raleigh St., Westminster, Colo. 80230
 [22] **Filed:** Apr. 5, 1971
 [21] **Appl. No.:** 131,177
 [52] **U.S. Cl.:** 292/33, 292/DIG. 65, 307/116, 292/254
 [51] **Int. Cl.:** E05c 17/02
 [58] **Field of Search:** 292/144, 33, 259, 292/254, DIG. 65; 340/227.1

[56] **References Cited**

UNITED STATES PATENTS

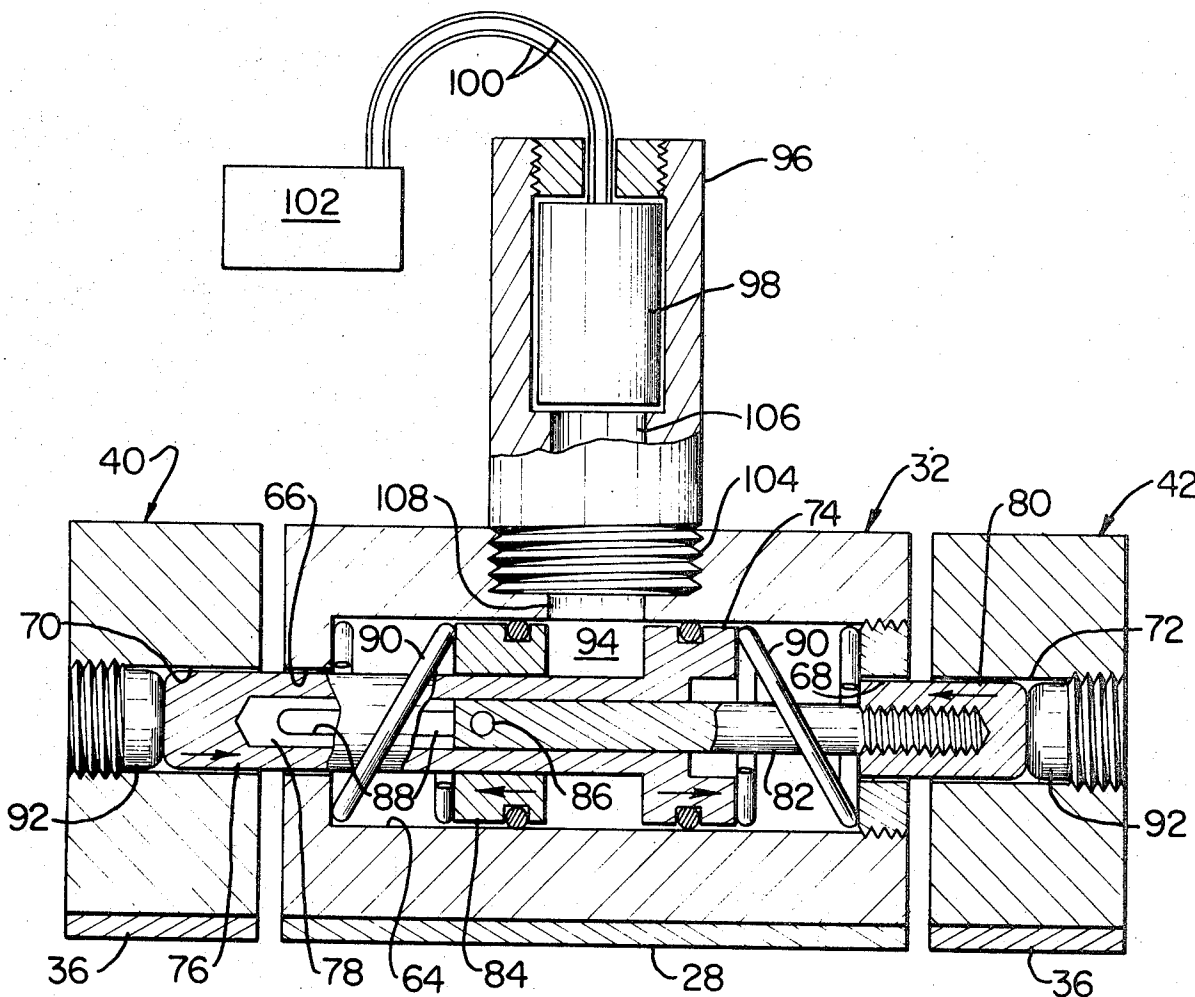
2,530,628	11/1950	Pivero.....	292/33
2,733,918	2/1956	Fischer.....	292/144 X
3,431,998	3/1969	Martin.....	292/254 X
3,183,027	5/1965	Powers.....	292/254 X
2,757,225	7/1956	Dunn.....	339/61 C X

Primary Examiner—Richard E. Moore
Attorney—Sheridan, Ross & Burton

[57] **ABSTRACT**
 A safety closure such as a fire door is usually attached

to one side of normally open passage and extendable across passage to block it in emergency. Retainer members at each side and a link means extending across the path of extension surround the door to restrain it in retracted position. The link means comprises a main body member and a second body member separable therefrom each body member being connected to one retainer member. Slidable latch pins extend between the body members to hold them assembled. In one form, cylinder in main body contains two pistons with attached latch pins slidable into secondary body member. Charge of high pressure gas in cylinder moves pistons to retract pins for release. In another form, cylinder contains one piston with attached pin slidable into secondary body member, and secondary body member carries second latch pin slidable into main body member. Gas moves piston to retract first pin, and boss on piston drives second pin to release position. A sensor-operated squib or the like provides the gas charge. Body members include fasteners anchored in low melting point material to allow separation when subjected to predetermined elevated temperatures, as a back-up safety measure.

12 Claims, 5 Drawing Figures



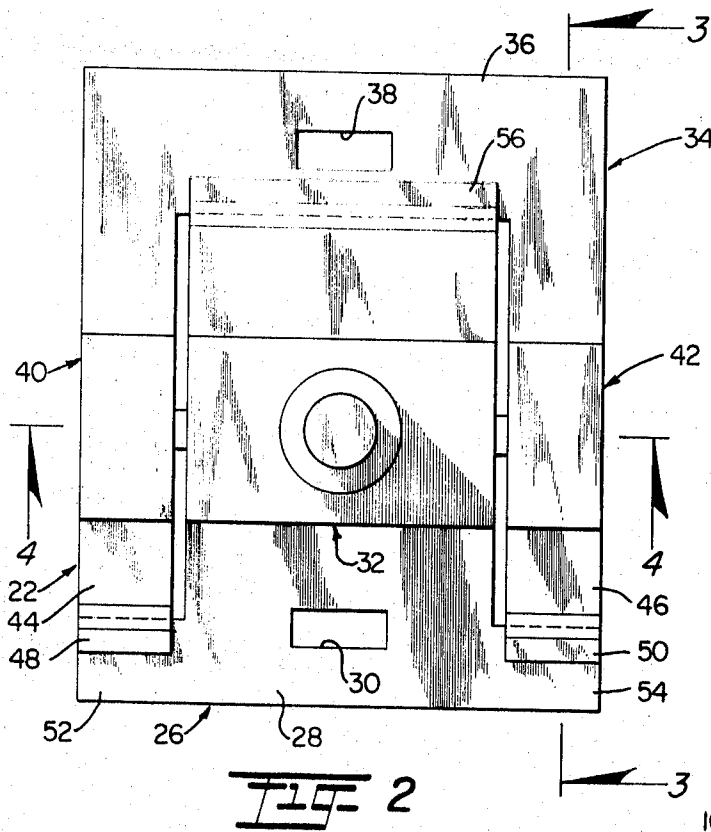


FIG. 2

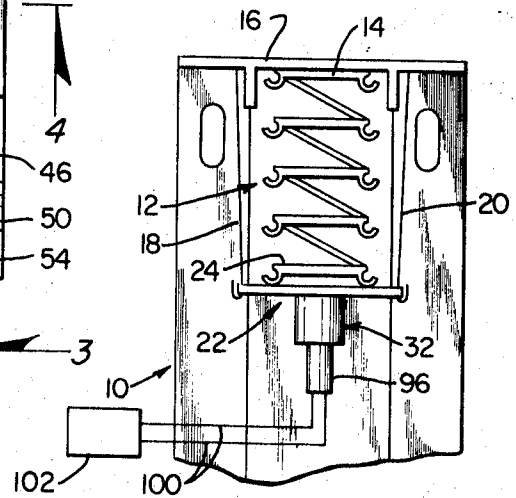


FIG. 1

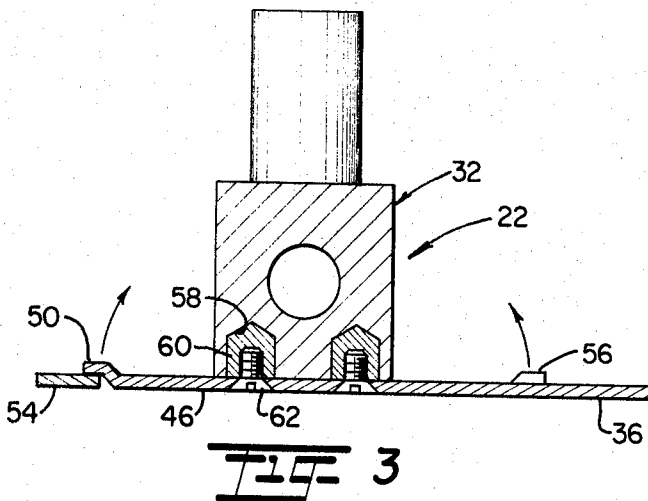


FIG. 3

INVENTOR
ARTHUR G. WRIGHT
BY
Sheridan, Rose & Burton
ATTORNEYS

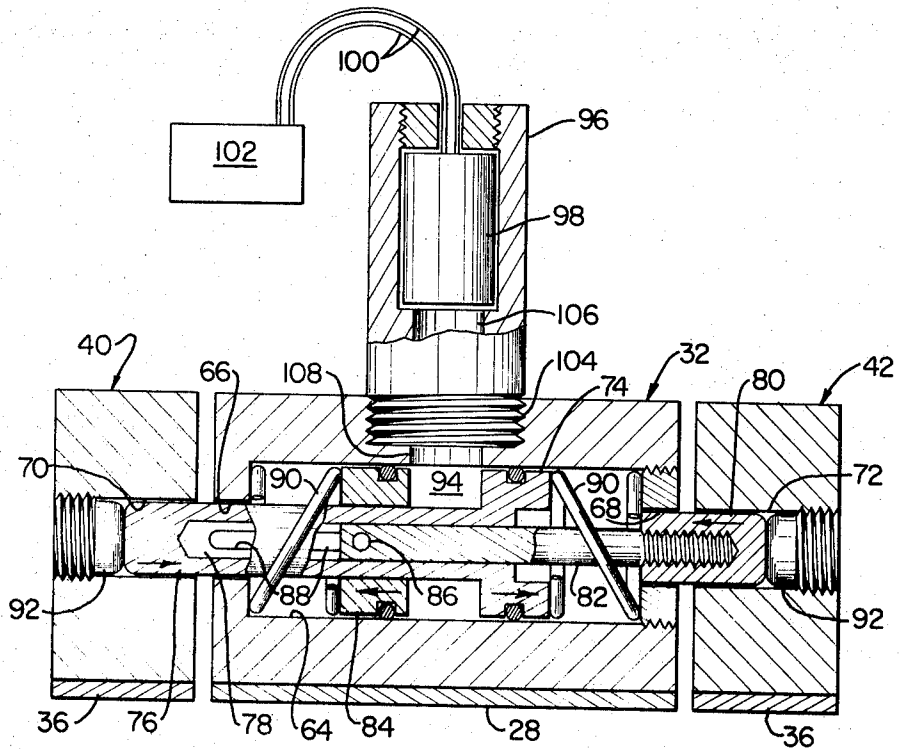


FIG. 4

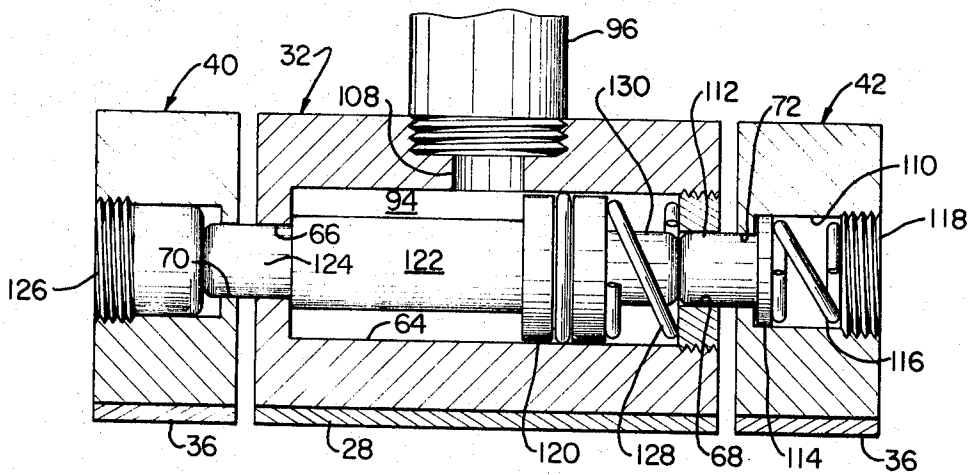


FIG. 5

EMERGENCY RELEASING SAFETY APPARATUS**BACKGROUND OF THE INVENTION**

This invention lies in the field of safety closure apparatus and is directed to apparatus for use in combination with closures such as fire and smoke doors which must close passages promptly in the event of emergency.

It is common practice, particularly in industrial buildings to provide so-called fire doors at strategic locations which may be closed to segregate major portions of the structure and prevent the spread of flames or smoke. Ordinarily the doors are held in retracted or "open" position by various linkages which incorporate a connection formed of low melting point material so that it will fail and allow the door to close when the connection is subjected to temperatures above the melting point.

In other cases, such as where a chemical process is carried on, it is desirable to close the doors in the event of an emergency where acrid or poisonous fumes are produced. In such case a sensor which can detect such fumes may deliver an electric current to a heating coil which then melts the connection in the restraining linkage and allows it to separate.

While these schemes are generally satisfactory, they leave something to be desired. In the first example release is not accomplished until a dangerous amount of heat has been generated at the passage, and fire or smoke may spread before the closure is effective. In the second example the same general problem arises because the fumes may flow through the passage before the connection melts and releases the closure. What is needed is a linkage means which will separate in only a few seconds to provide prompt release of the closure.

SUMMARY OF THE INVENTION

The present invention provides a relatively simple and highly reliable construction which will release the closure for extension in just a few seconds from the inception of the emergency. At the same time it provides a very strong connection which will not release the closure inadvertently under any mechanical load which might normally be applied to it. In addition the major part of the apparatus is re-usable and the only replacement part is quite inexpensive.

Generally stated, the apparatus includes a main body member and a secondary body member separable therefrom in an emergency to release the closure. The main body member includes a base formed at one end for connection to one of the retainer members and an upstanding latch block connected to the base, with a laterally extending cylinder formed in the block. The secondary body member includes a base formed at one end for connection to the other retainer member and a pair of laterally spaced upstanding latch blocks connected to the base. The main latch block extends between the secondary latch blocks with suitable end clearance, and all of the blocks have aligned bores in which latch pins slide across the interfaces to hold the blocks assembled.

In a first form, a pair of pistons are located in the cylinder and each piston carries a latch pin slidable in a bore of the main block and into the bore of one of the secondary blocks to hold the parts assembled. When a charge of high pressure gas is introduced into the cylinder, it moves the pistons in the release direction and

they withdraw the pins from the secondary blocks, allowing the two body members to separate.

In another form, a single piston is located in the cylinder and carries a latch pin slidable in a bore of the main block and into the bore of one of the secondary blocks. A second latch pin is carried in the bore of the other secondary block and slides into the other bore of the main block. The two pins extending across the interfaces hold the body members assembled. A boss on the head of the piston abuts the second pin. When a charge of high pressure gas is introduced into the cylinder, it moves the piston in the release direction, and the piston withdraws its pin. At the same time, the piston boss drives the second pin out of the main block, completing the release of the body members from each other.

Actuation is provided by a cartridge attached to the main block and containing a gas producing squib which is ignited by an electric current from a sensor which may be sensitive to heat or other factors constituting an emergency. Since the squib is the only component used up in the operation, the replacement expense is nominal. Because of this, the apparatus may be deliberately actuated at regular inspection periods at insignificant cost.

Since the separation force is taken by two steel pins in shear it is obvious that there is no likelihood of failure under any mechanical loads which would normally be applied to the apparatus. It is normally required that devices of this kind be releasable when subjected to high temperatures such as produced by fire, regardless of what basic type of operation is involved. To satisfy this requirement, at least one and preferably all of the latch blocks are formed with cavities containing threaded plugs of low melting point material and the bases are attached to the blocks by headed screws secured in the plugs. When the material melts, the bases will separate from the blocks and release the closure even if the latch pins have not retracted for some reason.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other advantages and features of novelty will become apparent as the description proceeds in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematical and elevational view of a typical safety closure and restraining means incorporating the invention;

FIG. 2 is a top plan view of the restraining assembly;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 1 illustrating one internal arrangement; and

FIG. 5 is a view similar to FIG. 4 showing another form of internal arrangement.

DESCRIPTION OF PREFERRED EMBODIMENTS

A typical safety closure installation is schematically illustrated in FIG. 1, where a generally rectangular frame 10 defines a normally open passage between two areas of a building separated by a wall, the frame normally being built directly into the wall as a part of the permanent structure. An accordion type door 12 has its upper blade 14 fixedly secured to the upper side 16 of the frame and, in the absence of restraint, the remaining blades would extend entirely across the frame to block the passage. In the vertical position shown, the blades would extend by gravity. If the installation is

horizontal, they are drawn across by a cable and a spring motor. The means for holding the closure in retracted position is shown as comprising a pair of retainer members 18 and 20 located at each side of the closure and having hooked ends for attachment to the ends of restraining assembly 22 to surround the closure, with assembly 22 engaging the bottom blade 24 of the closure.

The external details of the restraining assembly are shown in FIGS. 2 and 3, in which a main body member 26 includes a base 28 in the form of a plate having an opening 30 at its one end to be attached to retainer member 18 and a main latch block 32 extending laterally across and attached to the base. A secondary body member 34 includes a base 36 in the form of a plate having an opening 38 at its one end to be attached to retainer member 20 and a pair of laterally spaced secondary latch blocks 40 and 42 attached to base 36. It will be seen that block 32 spans the gap between blocks 40 and 42 with a suitable endwise clearance for easy separation on occasion.

Base 36 is centrally cut away so that base 28 may lie in the same plane, and defines a pair of legs 44 and 46 having joggled ends 48 and 50 which overlie ears 52 and 54 of base 28. The opposite end of base 28 is joggled at 56 to overlie a portion of base 36. The bases are secured to the latch blocks in the manner shown in FIG. 3. Each block is formed with two or more sockets 58 in which are secured plugs 60 of low melting point material, preferably a metal alloy having a melting point suitable for the installation. Headed screws 62 passing through the bases are secured in threaded bores in the plugs to fasten the bases to the latch blocks. In any case where the latch arrangements about to be described fail to release for any reason, plug 60 will melt, screws 62 will pull out, and the bases will fall away from the latch blocks to release the closure. This is a secondary back-up safety measure required or desirable in most installations.

One of the presently preferred latching arrangements is illustrated in FIG. 4. Main latch block 32 is formed with an elongate gas chamber or cylinder 64 extending laterally, with coaxial bores 66 and 68 extending through the end walls of the block. The secondary blocks 40 and 42 are provided with bores 70 and 72 coaxial with bores 66 and 68. A first piston 74 has connected to it an elongate latch pin 76 slidably mounted in bore 66 to slidably extend into bore 70. Pin 76 has an elongate bore 78 throughout the major portion of its length, opening at piston 74.

A second latch pin 80 is slidably mounted in bore 68 to extend into bore 72 in block 42. Pin 80 is provided with an elongate stem 82 slidable in bore 78 and its inner end is connected to second piston 84 by a cross pin 86 which passes through slots 88 in pin 76. Springs 90 between the cylinder ends and the pistons yieldingly urge them in the latching direction to cause pins 76 and 80 to engage the bores in the secondary blocks. Plugs 92 threaded into blocks 40 and 42 limit the latching movement so that the pistons define a central expandible chamber 94 between them. The latch pins are located in shear and can resist many times the mechanical load normally applied to them, thus providing a very reliable latching action.

For the closure releasing operation pistons 74 and 84 are actuated by high pressure gas in chamber 94 which pushes the pistons toward the ends of the cylinder and

withdrawing pins 76 and 80 from blocks 40 and 42. The source of the high pressure gas is a cartridge 96 containing a squib 98 of any suitable gas producing pyrotechnic mixture. The squib is ignited by an electrical current passing through conductors 100 and triggered by sensor 102 which is selected to detect the particular type of danger against which protection is desired. The cartridge is threaded into bore 104 in block 32 and is provided with a gas passage 106 communicating through passage 108 with the expandible chamber 94.

A modified form of the restraining assembly is illustrated in FIG. 5, where the main latch block 32 is substantially identical with that of FIG. 4. Blocks 40 and 42 are essentially similar but block 42 is provided with a counterbore 110, and latch pin 112 sliding in bore 72 has a head 114 which is slidably mounted in the counterbore and yieldingly urged by spring 116 to enter bore 68 in block 32, the spring being backed up by plug 118. A single piston 120 is slidably mounted in the cylinder and carries a stem 122 and a reduced diameter latch pin 124, the shoulder between the stem and pin being adapted to engage the end of the cylinder and limit extension of pin 124 into block 40. Plug 126 in block 40 also limits such extension. Spring 128 between the piston and the adjacent cylinder end yieldingly urges the piston toward latching position.

A boss 130 on the face of the piston opposite to stem 122 abuts latch pin 112. When the gas charge from cartridge 96 enters chamber 94, it forces piston 120 toward the adjacent end of the cylinder, which withdraws pin 124 from bore 70. At the same time, boss 130 drives pin 112 out of bore 68, and the two body members are released from each other, and the closure is released for extension. Thus the basic operation is the same as in the modification of FIG. 4 but only one piston is used for the purpose.

I claim:

1. Emergency releasable restraining apparatus adapted for use in combination with an extendable safety closure, having retainer members located at each side of the closure, comprising: a restraining assembly adapted to extend across the path of extension of the closure and to be connected at its opposite ends to the retainer members to restrain the closure in its retracted position; the assembly including a main body member and a secondary body member separable therefrom; each body member being connectible to one of the retainer members; movable latch means extending between the body members to hold them in assembled relation; and actuating means to move the latch means to release position to allow the body members to separate, including gas chamber means carried by the main body member and piston means within the chamber means arranged in driving relation to the latch means; and a cartridge mounted in fluid communication with the cylinder, said cartridge containing high pressure gas actuable by a warning signal to supply gas to the chamber means and move the piston means to drive the latch means to release position.

2. Apparatus as claimed in claim 1; in which the gas chamber means is formed within the main body member.

3. Apparatus as claimed in claim 1; in which the latch means comprises at least one latch pin axially slidable in one of the body members, and the other body member is provided with a bore to receive the pin to hold

the body members in assembled relation by shear load on the pin.

4. Emergency releasable restraining apparatus adapted for use in combination with an extendable safety closure having retainer members located at each side of the closure, comprising: a restraining assembly adapted to extend across the path of extension of the closure and to be connected at its opposite ends to the retainer members to restrain the closure in its retracted position; the assembly including a main body member and a secondary body member separable therefrom; each body member being connectible to one of the retainer members, said secondary body member including a base and a pair of laterally spaced upstanding latch blocks, and said main body including a base and a single upstanding latch block extending between the secondary latch blocks; axially aligned bores in all of the blocks; latch pins slidable in the bores and extending between the main block and each secondary block to hold them in assembled relation; and actuating means to move the latch means to release position to allow the body members to separate, including gas chamber means carried by the main body member and piston means within the chamber means arranged in driving relation to the latch; and a source of high pressure gas activatable by a warning signal to supply gas to the chamber means and move the piston means, thereby driving each latch pin completely out of one of the blocks to release the main body member from the secondary body member.

5. Apparatus as claimed in claim 4; in which the gas chamber means comprises an elongate cylinder formed in the main block coaxial with the bores for the latch pins; the piston means includes two pistons in the cylinder; and one latch pin is connected to each piston; the pistons being movable in first directions to move the pins to latching position and being movable in second directions in response to gas pressure in the cylinder to move the pins to release position.

6. Apparatus as claimed in claim 5; in which a first latch pin has an axial bore extending through a major portion of its length and is connected to a first piston; and a second latch pin has a stem slidable in the bore of the first latch pin and is connected to a second piston; the pistons in latching position being axially spaced to provide a central chamber to receive the pressurized gas.

7. Apparatus as claimed in claim 6; and a spring mounted in each end of the cylinder and engaging the adjacent piston to yieldingly urge the pistons and pins toward latching position.

8. Apparatus as claimed in claim 4; in which the gas

chamber means comprises an elongate cylinder formed in the main block coaxial with the bores for the latch pins; a first latch pin slidably mounted in one secondary block and movable to enter a bore in the main block in latching position; the piston means being a single piston slidably mounted in the cylinder; a boss on a first side of the piston engageable with the first latch pin to drive it out of the main block upon releasing movement of the piston; and a second latch pin connected to the second side of the piston with its free end slidable into the bore of the other secondary block in latching position; the piston serving to withdraw the second latch pin upon releasing movement of the piston.

9. Apparatus as claimed in claim 8; a spring in one end of the cylinder engaging the piston to yieldingly urge it toward latching position; and a spring in the first mentioned secondary block engaging the first latch pin to yieldingly urge it toward latching position.

10. Apparatus as claimed in claim 4; at least one of the latch blocks being distinct and separable from its base; anchorage means of low melting point material connected to the block; and fastening means secured in the anchorage means to connect the block to its base.

11. Apparatus as claimed in claim 10; the anchorage means comprising plugs formed in recesses in the block and provided with threaded bores; and the fastening means comprising headed screws secured in the plugs.

12. Emergency releasing safety apparatus comprising: a generally rectangular frame defining a normally open passage; an extensible safety closure secured to one side of the frame and extendible to the other side thereof to block the passage; a retainer member located at each side of the closure and secured to the first mentioned side of the frame; a two-piece restraining assembly extending across the path of extension of the closure and attached at its ends to the retainer members to surround the closure and restrain it in its retracted position; the assembly including a main body member and a secondary body member separable therefrom; each body member being connected to one of the retainer members; movable latch means extending between the body members to hold them in assembled relation; expansible chamber means to move the latch means to release position to allow the body members to separate; pyrotechnic means to produce a supply of high pressure gas to actuate the expansible chamber means; a sensor to determine the presence of a dangerous condition and to emit a signal in the form of an electric current; and means to conduct the current to the pyrotechnic means to ignite it.

* * * * *

55

60

65