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H. V. KINGSMORE, SR

3,116,479

FIRE ALARM SIGNAL BOX HAVING HYDRAULIC DELAY OF OPERATING
HANDLE AND HAVING A PRELIMINARY SIGNAL AT THE
BOX FOR DISCOURAGING FALSE ALARMS

Filed Aug. 8, 1960

5 Sheets-Sheet 1

Fig. 1.

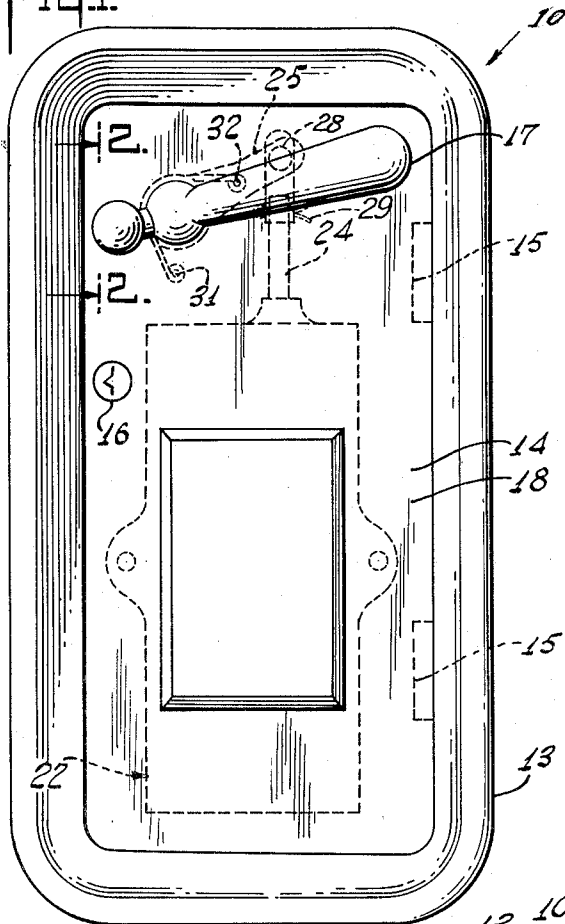


Fig. 3.

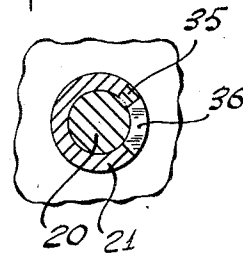
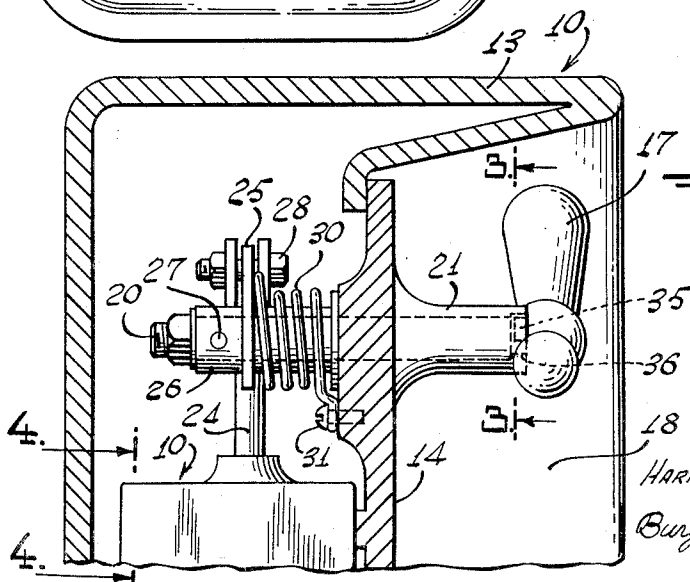


Fig. 2.

INVENTOR
HARRY V. KINGSMORE SR.
BY
Burgess, Ryan, & Hicks
ATTORNEYS

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H. V. KINGSMORE, SR
OF WAITING LINDEN, N. C.

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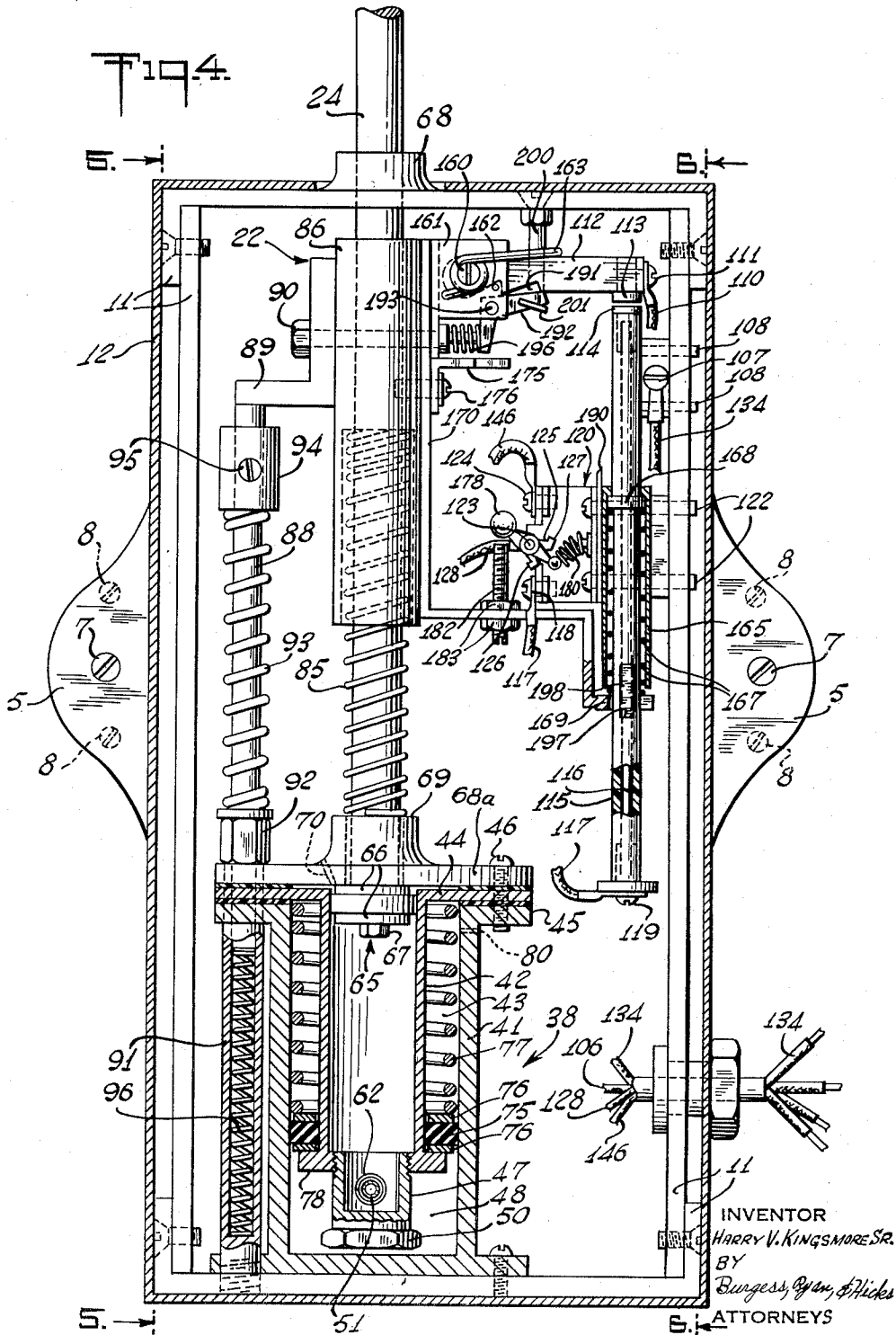
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5 Sheets-Sheet 2



Dec. 31, 1963

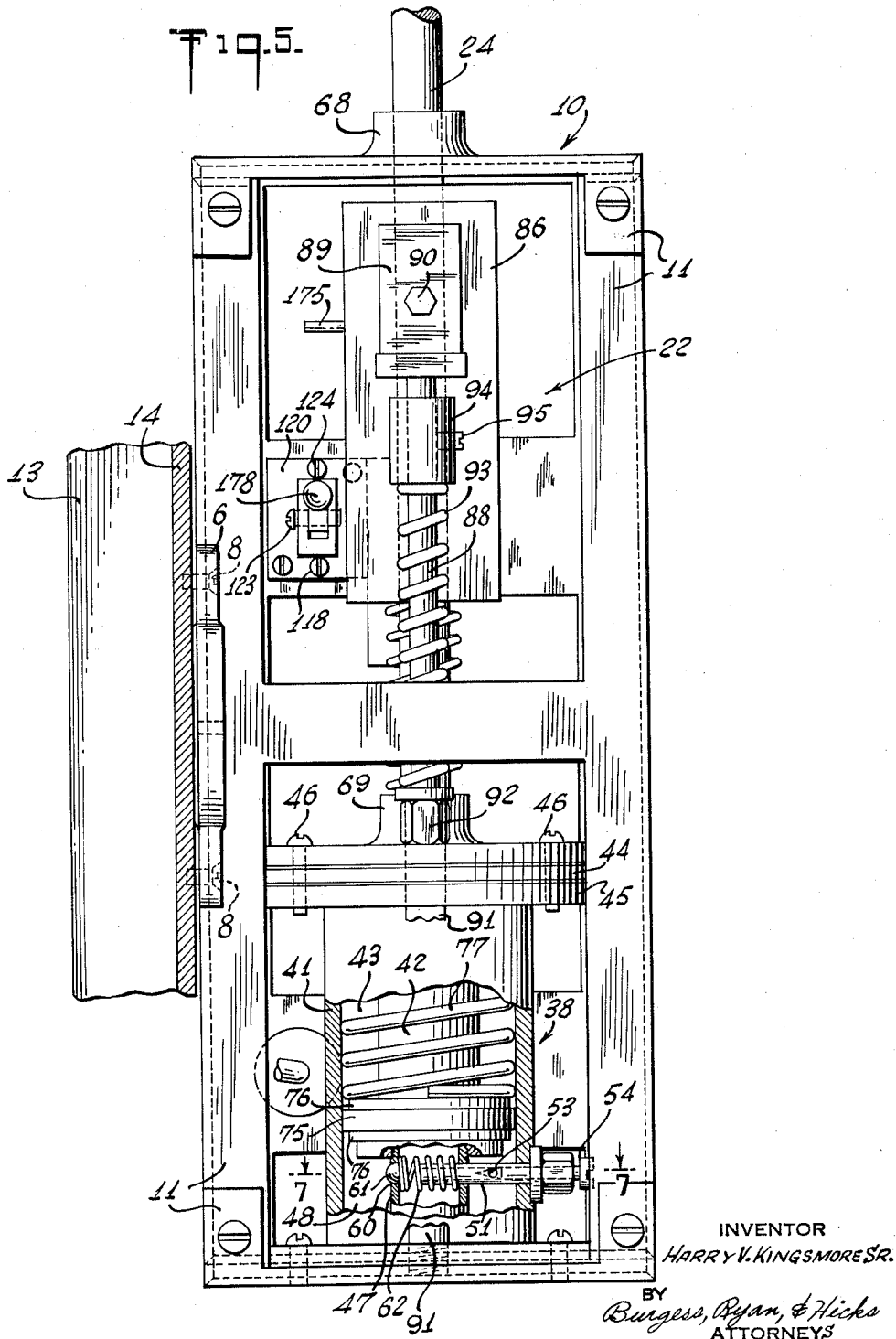
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5 Sheets-Sheet 3



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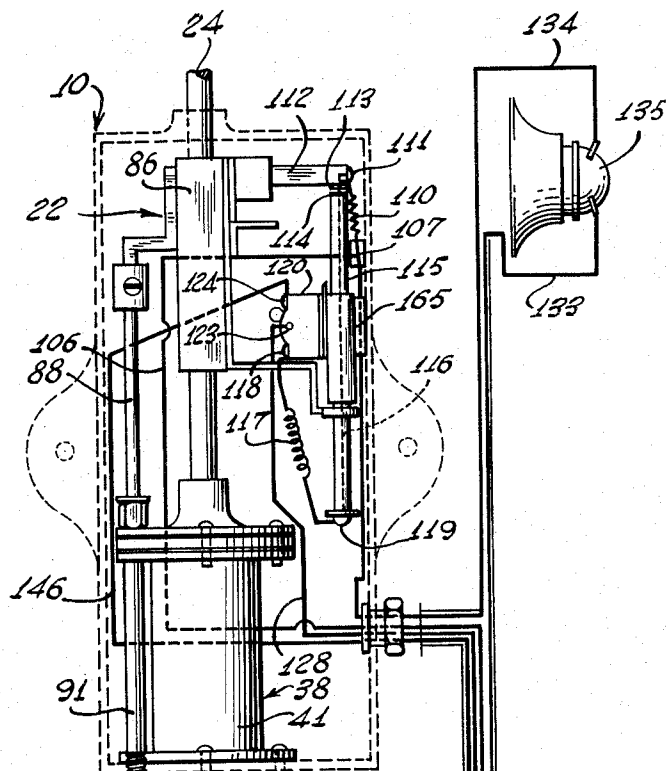
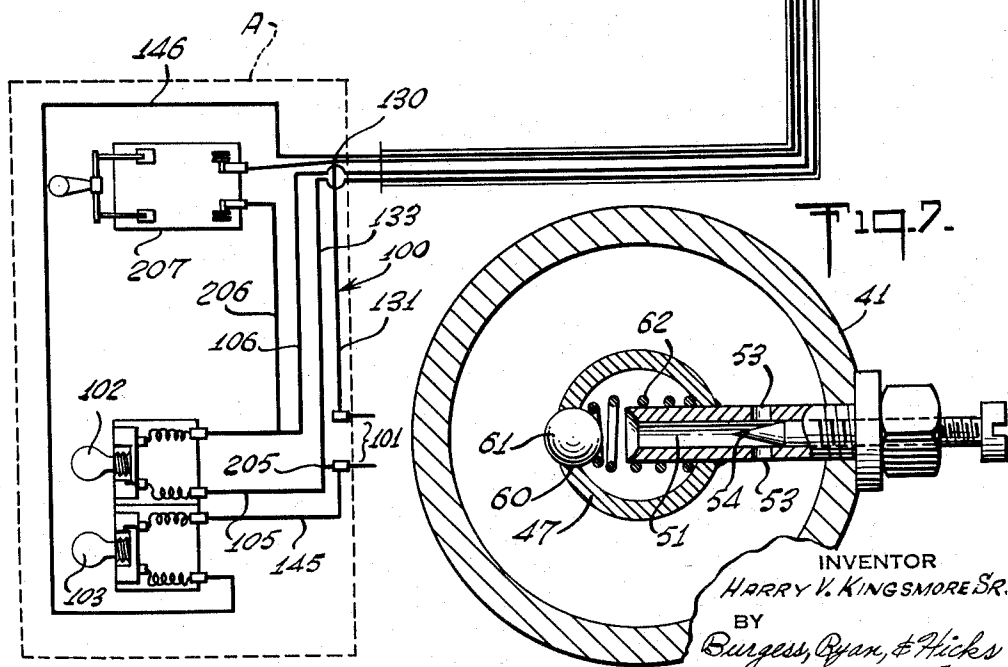
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5 Sheets-Sheet 5

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INVENTOR
HARRY V. KINGSMORE SR.
BY
Burgess, Ryan, & Hicks
ATTORNEYS

1

3,116,479 FIRE ALARM SIGNAL BOX HAVING HYDRAULIC DELAY OF OPERATING HANDLE AND HAVING A PRELIMINARY SIGNAL AT THE BOX FOR DISCOURAGING FALSE ALARMS

Harry V. Kingsmore, Sr., 801 Prescott Place,
Babylon, N.Y.

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The present invention relates to fire alarm systems especially for use by municipalities.

In the usual municipal fire alarm systems, fire alarm boxes located at different public sites are wired to a fire station or stations. When an alarm is set off at the alarm box, an alarm signal is electrically transmitted to the fire station. One of the serious evils plaguing municipalities with the conventional systems are the number of false alarms set off through mischief.

One object of the present invention is to provide a new and improved fire alarm system, which although comparatively simple and inexpensive, nevertheless eliminates or at least materially reduces the number of false alarms, and which makes it easier to apprehend the guilty persons trying to set off the false alarms.

Another object of the present invention is to provide a new and improved fire alarm system, which not only prevents or at least materially reduces the incidence of false alarms but which at the same time it sends an alert signal to the fire station sounds an audible alarm in the vicinity where the alarm is set off, thereby alerting the public of the fact that a fire alarm is being sounded.

A further object of the invention is to provide a fire alarm system of the general improved character described, which does not operate on the principle of the telegraph system in which the signals are sent to the fire station in the form of interrupted make and break signals but which operates to send direct continuous signals.

Another object of the invention is to provide a new and improved fire alarm system in which an audible signal device near the alarm box is set off when the alarm is turned at the box and can also be set off at will from a remote station for civil defense purposes.

Another object of the present invention is to provide a fire alarm system of the improved character described, which automatically resets itself after the operation of turning on the alarm has been initiated or completed, thereby eliminating the necessity of having a staff of men going around resetting the alarm box devices after they have been turned on.

As an important feature of the present invention, there is provided at the alarm box an operating handle and a brake device which retards the manual operation of said handle from initial position to a final position. An audible signal device near the alarm box is set off by the initial operation of the handle and the audible signal is continued until the handle reaches near its final position. As the operation of the handle is initiated, not only is the audible device sounded, but an alert signal is sent to the fire station, giving it the opportunity to make the necessary preparations to respond to the call without leaving the fire station. However, the fire alarm at the station is not sounded until the handle at the alarm box has completed its retarded operation, so that if the final alarm signal does not come into the station, the station personnel knows that the manual operation of the handle at the alarm box was not completed and that, therefore, the abortive alarm was a false one.

A culprit who ventures to transmit a false alarm must exert a constant pull on the handle for a prolonged

2

period. Since the audible alert is sounded at the fire alarm box as soon as the pull on the handle is initiated and is continued for this prolonged period, the attention of the public is directed to the fact that the alarm is being sounded. If the alarm is intended to be a false one, the culprit will be discouraged from completing his illegal act and the fire station will not be called out falsely. Since the fire station receives an initial alert signal upon initial operation of the station, it can send out calls to the police department, which can then apprehend the culprit.

Different municipalities have different systems for receiving fire alarms. Some systems, might for example, have a center of operations for a number of fire houses or companies in which the fire fighting equipment is kept. In such a system, the signals from the fire boxes would be received by this center and relayed to the specific fire house in the district of the fire. Other systems might have the fire alarm signals transmitted directly from the fire box to the fire house or company in the district of that fire box. In the specification and claims herein, reference is made to "fire station" and "fire alarm headquarters" but it must be understood that these are intended to signify broadly any center where fire signals from a fire box are directly received, whether the center be a fire house or a central office from which the fire signals are relayed to the applicable fire house.

Various other objects, features and advantages of the invention are apparent from the following description and from the accompanying drawings, in which

FIG. 1 is a front elevation of an alarm box device shown with its handle in normal inoperative position;

FIG. 2 is a detail section of the alarm box device taken on the lines 2-2 of FIG. 1 but on a larger scale;

FIG. 3 is a detail section of the alarm box device taken on lines 3-3 of FIG. 2;

FIG. 4 is a rear elevational view partly in vertical section of the alarm device constituting the electromechanical control unit of the fire alarm system and enclosed in the casing or box of the alarm box device shown in FIGS. 1 and 2 and is taken approximately along the lines 4-4 of FIG. 2 but on a larger scale, said alarm device being adapted to be operated manually from the handle shown in FIGS. 1 and 2 and being shown in normal inoperative position corresponding to the position of the handle shown in FIGS. 1 and 2;

FIG. 5 is one side elevational view partly in vertical section of the alarm device taken approximately along the lines 5-5 of FIG. 4;

FIG. 6 is the other side elevational view partly in vertical section of the alarm device taken approximately along the lines 6-6 of FIG. 4;

FIG. 7 is a horizontal detail section of the alarm device taken along the lines 7-7 of FIG. 5; and

FIG. 8 is a wiring diagram for the fire alarm system of the present invention.

Referring to the drawings, there is shown a fire alarm box device 10 which is adapted to be installed at a public site, as for example, at a street corner on a post. This alarm device 10 comprises a frame or chassis 11 (FIGS. 4, 5 and 6), which is enclosed in a housing 12 inside a box 13 (FIGS. 1, 2 and 5) and which contains an electromechanical control unit to be described. The box 13 has a door 14 (FIGS. 1, 2 and 3) hinged at one side 15 to the side pieces of the box and closed by a key lock 16. The housing 12 is removably secured to the frame 11 by means of lugs 5 (FIG. 4) integral with said housing and lugs 6 (FIGS. 5 and 6) integral with said frame, these lugs being in face to face contact and by means of studs 7 (FIG. 4) passing through the lugs 5 and threaded into the lugs 6. Stud 8 passing through the

3

lugs 6 of the frame 11 and threaded into the door 14 support the frame 11 and housing 12 on said door.

Supported on the door 14 (FIGS. 1 and 2) is a handle 17, the door being set in far enough from the front of the box to confine the handle within a hollow or niche 18 defined in front of the door. Secured to the handle 17 and desirably formed integral therewith is a rocker shaft 20 journaled in a bearing 21 formed in the door 14 and projecting into the box 13.

Secured to the inside of the door 14 by means of the frame 11 and the housing 12 as described, so as to be carried thereby as said door is opened, is an electro-mechanical control unit 22 inside said frame containing the different switches and controls of the fire alarm system and the brake device by which the operation of the handle 17 is yieldably resisted to retard its operation and the different signals involved are set-off and/or terminated in proper sequences. The hinges 15 are of the type which permit easy unhinging of the door 14. For example, the hinges 15 may be of the knuckle-pintle type, in which case, the door 14, after it has been opened, can be unhinged by removal of the pintles. Since the whole electro-mechanical control unit 22 and the handle mechanism therefor are secured to the door 14 to form a self-contained unit therewith, it is an easy matter to remove this self-contained unit in case of any defects or deficiencies therein and to replace them immediately with a fresh self-contained unit, without the necessity of making repairs at the fire box.

Projecting upwardly from the interior of the control unit 22 is a plunger rod 24 pressed from the handle 17 by a transmission comprising an arm 25 integral or otherwise rigidly secured at one end to a collar 26 affixed to the rocker shaft 20, as for example, by a pin 27, and having a pivotal connection 28 at its other end to the upper end of the plunger rod 24. The upper part of the plunger 24 comprises two telescoped pieces interconnected by a cotter pin 29 or other type of removable fastening pin to facilitate assembly or disassembly. A coil torsion spring 30 encircling the collar 26 has one end anchored at 31 to the door 14 and its other end secured at 32 to the arm 25 to urge resiliently the handle counterclockwise (FIG. 1) in the inactive position shown, in which position, the plunger rod 24 is in its uppermost position, as shown in the drawings.

The rotary movement of the handle 17 is limited in its inactive position shown in FIG. 1 and in its completely operated position by a lug 35 rigid with said handle, as for example, by forming an integral extension thereof, and movable with said handle in a recess 36 formed at the forward end of the bearing 21. The end walls of this recess 36 serve as stops to limit the handle in either of these two extreme positions.

The plunger rod 24 in the control unit 22 is forced down manually by a steady force on the handle 17 clockwise (FIG. 1) creating a steady downward force on said plunger rod. The downward movement of the plunger rod 24 is yieldably resisted by a braking device 38 (FIGS. 4, 5, 6 and 7) to retard the speed with which this plunger rod can be depressed. To that end, the control unit 22 comprises the frame or chassis 11 secured to the housing 12 and mounting at the bottom a hydraulic cylinder 41 forming part of this braking device 38. Inside this hydraulic cylinder 41 and concentric therewith is an inner hydraulic cylinder 42 forming also part of the braking device 38 and defining with the outer cylinder 41 an annular space 43. The top of this inner cylinder 42 has a mounting flange 44 seated on a flange 45 on the upper end of the outer cylinder 41 and connected thereto by studs 46.

The inner cylinder 42 has a lower tubular extension 47 either constituting a piece separate from the main body of the inner cylinder and screwed therein, as shown, or forming an integral part thereof. This tubular extension 47 is spaced from the peripheral wall of the

4

outer cylinder 41 to form therewith a hydraulic reservoir chamber 48 and has a hexagonal foot 50 in the form of a nut by which the tubular extension 47 may be screwed into the lower end of the inner cylinder 42. A passageway 51 in the form of a tube extending from the interior of the lower tubular extension 47 of the inner cylinder 42 and into the reservoir chamber 48 has an outlet port or ports 53 (FIGS. 5 and 7) controlled by a needle valve 54 and establishing flow communication between the interior of the inner cylinder 42 and the reservoir chamber 48. This valve 54 is shown merely controlling the effective size of the port or ports 53, but may cooperate with an orifice plate in the passageway 51 in the manner of the usual needle valve.

A brake liquid, as for example, suitable oil usually employed for hydraulic brakes or systems is contained in the inner cylinder 42 and in the reservoir chamber 48 and is forced by the depressing action of the plunger rod 24 in the manner to be described from said cylinder into its lower extension and out through the port or ports 53 into the reservoir chamber 48 at a rate controlled by the valve 54. The brake liquid is returned from the reservoir chamber 48 into the inner chamber extension 47 when the right suction conditions are created in the inner cylinder 42, by an inlet port 60 in the wall of said extension normally closed by a check valve shown in the form of a ball 61 in said extension pressed by a spring 62.

For forcing the brake liquid from the inner chamber 42 to the reservoir chamber 48, the plunger rod 24 is connected at its lower end to a plunger 65 slidable in said chamber and having liquid-tight peripheral contact with the wall of said chamber. For that purpose, the plunger 65 may be of any suitable composition normally employed for liquid pumps, as for example, leather and is flanked by two metal washers 66. The plunger assembly 65, 66 embraces a lower reduced extension of the plunger rod 24 to which is threaded a nut 67 securing said assembly to the lower end of the plunger rod.

The plunger rod 24 is guided in its lengthwise movement in a slide bearing 68 at the upper end of the frame or chassis 11 and in a slide bearing 69, which is secured to the flanges 44 and 45 of the inner cylinder 42 and outer cylinder 41 respectively by the studs 46 and which forms part of the head 68a for the inner cylinder 42. A hole 70 in this cylinder head 68a serves as an air vent for the inner cylinder chamber above the plunger 65.

As the plunger 65 is forced downwardly in the inner cylinder 42, the brake liquid is forced from said cylinder into the reservoir chamber 48 through the valve-controlled passageway 51, and against a pressure created in said reservoir chamber. For creating this pressure in the reservoir chamber 48, a displacement plunger 75 in the form of a ring, embraces the inner cylinder 42 with a snug liquid-tight slide fit and peripherally contacts the wall of the outer cylinder 41 with a snug liquid-tight slide fit. This plunger 75 is made of suitable material ordinarily employed for liquid pump plungers and is flanked by two metal washers 76 connected thereto and forming a slidable unit therewith.

A coil spring 77 in the annular space 43 between the two cylinders 41 and 42 has its upper end bearing against the flange 44 of the inner cylinder 42 and its lower end bearing against the plunger unit 75, 76 to urge said plunger unit downwardly and a flange 78 on the inner cylinder 42 peripherally spaced from the peripheral wall of the outer cylinder 41 serves as a limit stop for the plunger unit 75, 76 in its downward movement. A hole 80 in the wall of the outer cylinder 41 serves as an air vent for the annular space 43 between the inner and outer cylinders 41 and 42 above the plunger unit 75, 76.

As the plunger 65 is forced downward in the inner cylinder 42, the liquid is forced from said cylinder into the reservoir chamber 48 and against the spring-pressed plunger unit 75, 76 causing said plunger unit 75, 76 to move upwardly against the resisting action of the spring

5

77. Upon upward return movement of the plunger 65, which is quicker than the downward movement, suction is created in the inner cylinder 42 causing the check valve 61 to move into position to open the port 60 and causing the liquid in the reservoir 48 under the pressure of the spring-pressed plunger unit 75, 76, to return quickly into the inner cylinder and the plunger unit 75 to move downwardly under the action of the spring 77 until it reaches the stop flange 78.

In addition to the brake device 38, the downward movement of the plunger rod 24 is yieldably resisted by a coil spring 85 encircling the rod and bearing at its lower end against the slide bearing 69 and at its upper end against a carriage 86 secured to the plunger rod 24 for movement therewith. The spring 85 serves not only to resist the downward movement of the plunger rod 24 but assists in effecting rapid upward return of the plunger rod.

The carriage 86 carries a switch contact and a switch tripper for the fire alarm system, as will be described. In order to assure proper alignment of this switch contact and this switch tripper with the other contact and with the switch to be tripped, there is provided guide means for the carriage in addition to that afforded directly to the slide bearings 68 and 69 for the plunger rod 24. This additional guide means comprises a vertical guide rod 88 secured by a bracket 89 to the carriage 86 through a machine screw 90 which also serves to connect the carriage to the plunger rod 24. This guide rod 88 slides in a vertical tubular bolt 91 having its lower end passing through the bottom wall of the outer cylinder 41 and threaded into the bottom part of the chassis or frame 11 and having its upper end passing through the cylindrical flanges 44 and 45 and the base flange of the slide bearing 69 with the hollow head 92 of said bolt bearing down against said bearing flange. A coil spring 93 encircling the guide rod 88 bears at its lower end against the bolt head 92 and at its upper end against a collar 94 on the guide rod adjustable therealong by means of a set screw 95. Inside the tubular bolt 91 is a coil spring 96 bearing at its lower end against the lower closed end of the bolt and at its upper end against the lower end of the guide rod 88 projecting into said tubular bolt. The guide rod 88 fits in the inside of the tubular bolt 91 including its head 92 with a snug slide fit, and as the plunger rod 24 is forced downwardly, the guide rod sliding in the tubular bolt, maintains the carriage 86 in proper alignment for switch closing and tripping operations against the action of the springs 93 and 96. Upon release of downward pressure on the plunger rod 24, the springs 93 and 96 assist in effecting fast return of the plunger rod upwardly. Adjustments in the position of the collar 94 along the guide rod 88, serves to adjust the resistance offered by the spring 93 against the downward movement of the plunger rod 24 and the speed with which the plunger rod 24 is returned in its upward movement.

As the plunger rod 24 moves downwardly, it operates the different switches in the electrical system and this sets off the different signals associated therewith. The circuits for this system shown in FIG. 8, comprises a loop 100 at a fire or central station or headquarters A powered from a suitable source 101 of current. At this fire station A, and forming part of this loop 100 is an alert signal device 102 shown in the form of an electric light to give off an alert signal, and an alarm signal device 103, also shown in the form of an electric light to give off an alarm signal. The signal devices 102 and 103 may be of some other visible signal type or may be of the audible signal type or may be combinations of both, but in any case, they are preferably of the continuous type as distinguished from the telegraphic make and break type, operated from a toothed wheel at the alarm box, as in conventional systems.

6

One side of the alert signal device 102 is connected by a line 105 to one side of the power source 101. The other side of the alert signal device 102 is connected by a line 106 to a branch terminal post 107 secured by studs 108 (FIG. 4) to one side of the chassis 11 of the remote alarm device 10 at the public site where the alarm is set off. A line 110 (FIGS. 4 and 8) connects this terminal post 107 to a binding post 111 secured to an arm 112 of non-conductive material, such as Bakelite, mounted on the carriage 86 for movement therewith in a manner to be described, and wired to an electric contact 113 on the lower face of said arm. Opposite this contact 113 but normally spaced therefrom is a contact 114 on the upper end of a slidable rod 115 of non-conductive material, such as Bakelite, carrying a wire 116 therethrough from said contact 114 to a terminal post 119 at the lower end of said rod. A coil wire 117 connects the terminal post 119 to a contact point 118 of a two-point snap switch 120 secured to one side of the chassis 11 (FIG. 4) of the control unit 22 by studs 122. This snap switch 120 (FIGS. 1 and 4) has its terminal 123 located between the contact point 118 and another contact point 124 and electrically connected to the pivot point of a knife blade 125 having two contact arms 126 and 127, the switch being normally in position to establish contact from contact point 118 through contact arm 126 to the terminal 123. A line 128 from the terminal 123 goes out through the alarm box 13 to the fire station or headquarters A and connects from a branch point 130 (FIG. 8) to the other side of the power source 101 by a line 131 to complete the circuit of the alert signal device 102. The alert signal device 102 is normally deenergized and therefore inactive due to the normal gap between the contacts 113 and 114.

Connected in parallel with the alert signal device 102 by lines 133 and 134 is an audible signal device 135 in the form of a siren or horn, connected at the public post or station where the alarm box device 10 is installed. The line 133 connects from a branch point on one side of the alert signal device 102 fed from one side of the power source 101 to one side of the audible signal or warning device 135, and the line 134 connects from the other side of the audible signal device into the branch terminal post 107 at the control unit 22 with this electric arrangement, when the alert signal device 102 at the fire station A is sounded or activated by operation of the plunger rod 24 through the turning of the handle 17, the audible signal device 135 in the vicinity of the alarm box 13 is sounded at the same time.

The alarm signal device 103 at the fire station is connected on one side by a line 145 from one side of the power source 101. A line 146 connects the other side of the alarm signal device 103 to the contact point 124 of the snap switch 120. This contact point 124 is normally inactive or open, but after the plunger rod 24 has been depressed to nearly its full stroke, the knife blade 125 in said switch is tripped in the manner to be described, to open the connection to the contact 113 in said switch and thereby open the circuits of the alert signal device 102 and of the audible signal device 135 and at the same time to close the connection between the terminal point 123 and the contact point 124, thereby closing the circuit of the signal alarm device 103 and sounding the alarm from the latter device.

Reverting back to the control unit 22 of the alarm device 10 (FIGS. 4-7), the arm 112 carrying the contact 113 is pivotally connected by a pivot pin 160 to a bracket 161 affixed to the carriage 86 by the screw 90 and its angular movement about the axis of said pivot pin is limited clockwise (FIG. 4) by a stop pin 162 supported on said bracket. A spring 163 wound around the pivot pin 160 has one end anchored to the bracket 161 and the other end bearing against the top of the arm 112 to urge

said arm clockwise (FIG. 4) against the limit stop pin 162.

As the carriage 86 is initially moved downwardly by the downward movement of the plunger rod 24, the contact 113 on the arm 112 engages the contact 114 on the upper end of the slidable rod 115 and this closes the circuit of the alert signal device 102 at the fire station A and at the same time closes the circuit of the audible signal or warning device 135 (FIG. 8) at the alarm box post. The slidable rod 115 is mounted and supported to follow the downward movement of the arm 112 with the contacts 113 and 114 in engagement until near the end of the downward stroke of the plunger rod, whereupon the arm 112 is moved into position to separate these contacts, and the circuits of the alert signal device 102 at the fire station A and the circuits of the audible signal device 135 at the alarm box post are opened. The mounting of the slidable rod 115 to achieve this purpose comprises a guide 165 (FIGS. 4 and 6) in the form of a housing through which the rod extends, secured to one side of the chassis 11 of the alarm device 10 by the studs 122 and receiving a coil spring 167, the upper end of which bears against a shoulder 168 on said rod, the lower end bearing against a washer 169 of horseshoe shape, as shown, or of any other suitable shape, which straddles the rod or embraces it with a slide fit and which is secured to a bracket 170 affixed by the screw 90 to the carriage 86 for movement therewith.

As the carriage 86 begins its downward movement, the washer 169 moves down with it, but the spring 167 under compression maintains the slidable rod 115 in its uppermost position until the contact 113 reaches the contact 114 while said spring is still under compression. Further downward movement of the carriage 86 moves the slidable rod 115 downward, but since the support for the spring afforded by the washer 169 is also moving downward, the spring pressure between the contacts due to the fact that the spring 167 is under compression is maintained substantially constant, as the carriage 86 continues its downward movement. The closing of the contacts 113 and 114 sounds the audible alert signal device 135 at the alarm box post and activates the alert signal device 102 at the fire station. The snap switch 120 is shown of novel construction to effect the opening of the circuits of the alert signal device 102 (FIG. 8) at the fire station A and of the audible signal device 135 at the alarm box post when the plunger rod 24 reaches nearly the end of its downward stroke and at the same time to close the circuit of the alarm signal device 103, advising the fire station that the operation of setting off the fire alarm has been properly completed and that attendance at the fire is in order. This switch 120, as already described, has the terminal 123 located between the contact points 118 and 124 and the blade 125 (FIG. 4) pivotally connected to this terminal and having contact arms 126 and 127 for engagement with said contact points respectively. For tripping the blade 125 into proper contact with either of the contact points 118 and 124, there is provided a tripper 175 secured to the carriage 86 by a stud 176 and having an elongated opening through which the stud passes to permit adjustments in the vertical position of the tripper in relation to the carriage. This tripper 175 operates on a trigger 178 in the form of a lever secured intermediate its ends to the shaft of the blade 125 and having one end projecting in the downward path of the tripper 175. The other end of the trigger 178 is biased by a spring 180 anchored at one end to the frame of the switch 120 and extending at an angle with the trigger to form a snap toggle connection by which the trigger and the spring, after passing a dead center position of alignment, will snap in either direction to establish spring-pressed contact between the blade 125 and either of the contact points 118 and 124.

The downward movement of the plunger rod 24 causes the tripper 175 moved therewith to trip the trigger 178

and causes thereby the blade arm 126 to disengage the contact 118, whereupon the circuits of the alert signal device 102 at the fire station A and of the audible signal device 135 at the alarm box post are opened, and also causes thereby the blade arm 127 to engage the contact 124, whereupon the circuit of the alarm signal device 103 at the fire station is closed.

The plunger rod 24 is pushed down to the bottom of its downward stroke by manual operation of the handle 17 and then released, causing the plunger rod to move upwardly under the actions of the springs 30, 77, 85, 93 and 96. During the upward movement of the plunger rod 24, the switch 120 is snapped back into the position shown in FIG. 4 with the contact blade arm 126 in engagement with the contact 118 and the contact blade arm 127 out of engagement with the contact 124. For that purpose, a tripper 182 in the form of an upstanding pin is secured to the bracket 170 and is made adjustable by means of two locking nuts 183. The trigger lever 178 when in position reversed from that shown in FIG. 4, is in the path of the tripper 182 as it moves upwardly, and is flipped by the tripper during the upward movement of the plunger rod 24 into the position shown in FIG. 4, to reestablish electrical connection between the blade arm 126 and the contact 118 and to break the connection between the blade arm 127 and the contact 124.

The length of time the alarm signal device 103 at the station A is activated during the complete cycle of operation of the plunger rod 24 can be controlled by adjusting the position of the tripper 175 along the carriage 86 and/or by adjusting the elevational position of the tripper 182 in relation to the bracket 170.

Before the snap switch 120 is restored into the normal position shown in FIG. 4 in which electrical connection is established between the blade arm 126 and the contact 118, and electrical connection is broken between the blade arm 127 and the contact 124, the contacts 113 and 114 are opened and are maintained open during upward return movement of the plunger rod 24; otherwise the reversal of the snap switch 120 to this normal position during the upward movement of the plunger rod 24 will again activate the alert signal device 102 and sound the audible alert signal device 135. For that purpose, there is provided an upstanding trip bar 190 affixed to the guide housing 165 and in the path of downward movement of the arm 112. When the arm 112 moving downwardly with its contact 113 pressing against the contact 114 on the slidable rod 115 reaches the trip bar 190 about the time the tripper 175 flips the trigger 178 of the snap switch 120, said arm is lifted by said bar about the axis of its pivotal support 160 against the action of the spring 163, causing said arm to be lifted upwardly about said axis and causing the contact 113 on said arm to be separated from the contact 114 on the slidable rod 115. The underside of the arm 112 has a recess 191, and a pawl 192 pivoted at 193 to the bracket 161 has one arm pressing against the underside of said arm and its other arm urged by a spring 196. When the descending arm 112 has been angularly raised by its contact with the upstanding trip bar 190, the spring-pressed pawl 192 will snap into the recess 191 in said bar and latch the arm in angularly elevated position.

The upward angular movement of the arm 112 in the manner described does not cause the slidable rod 115 under the action of the spring 167 to follow said arm with the contacts 113 and 114 interengaging, because shoulders 197 on the slidable rod below the washer 169 come immediately into engagement with the underside of the washer under the action of said spring. The shoulders 197 may be formed by flattening down diametrically opposite sections 198 of the slidable rod 115, as for example, by machining, the transitions from these flattened sections to the cylindrical section of the rod producing these shoulders. The flattened sections 198 of the slidable rod 115 also serve to prevent the slida-

ble rod from turning about its longitudinal axis since the arms of the U-shaped washer 169 straddling said rod come sufficiently close to these flattened sections to prevent the turning of the rod.

The washer 169, although moving upwardly with the carriage 86, holds the slidable rod 115 back against the action of the spring 167 sufficiently to keep the contacts 113 and 114 separated, although both the slidable rod and the arm 112 are moving upwardly. Under these conditions, all of the signal devices 102, 103 and 135 are inactive.

To restore the arm 112 back to its normal original angular position in relation to the carriage 86 when the plunger rod 24 has returned to its uppermost position, a trip pin 200 connected to the upper end of the chassis 11 of the control 22 and located in the vertical path of a finger 201 extending laterally from the pawl 192 will push the pawl out of the recess 191 of the arm as the plunger rod reaches the end of its upward return stroke and will permit the arm to move angularly downwardly about the axis of its pivotal support 160 under the action of the spring 163. When the arm 112 is restored to its original position, the contacts 113 and 114 will remain in separated relationship and the alarm device 10 will be automatically reset in preparation for the next fire alarm set-off.

The audible signal device 135 (FIG. 8) at the alarm device post can not only be controlled by manipulation of the handle 17 (FIGS. 1 and 2) at the post, but can also be controlled from the fire station A or from some other remote control point, as for example, for civil defense purposes. For that purpose, there is connected between a terminal 205 in the line 105 and the branch point 130 a line 206 containing a switch 207, and by-passing the contacts 113 and 114 and the switch 120. This line 206 places the audible signal device 135 in series with the switch 207 in a loop across the source of power 101. With this arrangement, when the alarm device 10 is in inactive condition shown, the audible signal device 135 can be sounded by merely closing the switch 207. The closing of the switch 207 closes the circuit from one side of the source of power 101 to terminal 205, through the line 133, through audible signal device 135, through line 134 to terminal 107, through line 106, through line 206, through closed switch 207 to branch point 130 and through line 131 to the other side of the source of power 101. The audible signal device 135 can thereby be sounded as an alert or may be sounded for an all clear, or may be activated for any other purpose.

In the electrical system of the present invention, the alarm devices 10 in a district are connected directly and separately to a central fire alarm station and are not connected in series or interdependently looped as in the present conventional systems. In such conventional systems, if two alarms are set-off from separate alarm boxes, only one signal can be transmitted to the fire alarm headquarters, while the transmission of the other signal is delayed. If the first signal from one alarm box is a false alarm, the delay in transmitting a real subsequent alarm signal from another alarm box becomes even more intolerable. With the system of the present invention, when two or more alarms are set-off from different alarm boxes at the same time, the corresponding signals will be transmitted immediately without delay at the same time to the fire alarm headquarters.

Also with the system of the present invention, each alert signal device and each alarm signal device at the fire alarm headquarters, will correspond to a specific alarm box, either by appropriate indicia or otherwise, so that the usual conventional system in which the handle at the alarm box releases a clockwork mechanism setting in motion a small wheel with teeth operating a lever which makes and breaks contact in the manner of a telegraph key and in which the number and spacing of the teeth

identifies the location of the alarm box is dispensed with.

Although the operation of the fire alarm system has been described, it is herein summarized:

To set off an alarm, a person turns the handle 17 clockwise (FIG. 1) with constant force. This transmits a steady downward push on the plunger rod 24 and since the downward movement of the plunger rod is yieldably resisted by the braking device 38 and the different springs 77, 85, 93 and 96, this turning of the handle requires the application of steady manual force for a prolonged period before the setting off of the alarm is completed. The time required for the complete operation of the handle 17 can be adjusted by adjusting the valve 54.

At the beginning of the downward stroke of the plunger rod 24, the contacts 113 and 114 are brought together into engagement and this closes the circuit of the audible alert signal device 135 at the alarm box and the circuit of the alert system device 102 at the fire station A. The immediate sounding of the audible signal device 135 calls attention to the fact that an alarm is being set off, and if the person setting off the alarm intends his act to be one of mischief, he will be discouraged from continuing this illegal act, especially since he must remain at the box and continue to exert a turning force on the handle 17 against a steady retarding resistance if he is to complete his act. At the same time the audible alert through the device 135 is being sounded at the alarm box, the alert signal is being transmitted to the fire station A, through the alert signal device 102, advising personnel at the station that the setting off of an alarm is being initiated. The fire station upon receiving the alert signal will wait until the final alarm comes in before sending out its engines. If the final alarm does not come in, then it becomes apparent that a false alarm was intended.

The sounding of the audible alarm at the alarm box through the audible signal device 102 calls the public's attention to the fact that a fire alarm is being sounded and also will attract the police, so that if the person is setting off a false alarm, he can be apprehended. At the same time, the fire station receiving the alert signal can call the police, so that proper police attention can be given to the fire or to the culprit venturing to send out the false alarm.

As the person setting off the alarm continues to turn the handle 17, the plunger rod 24 continues to move downwardly at a retarded rate with the audible alert at the alarm box continuously sounding and the alert at the fire station continuously on, until near the bottom of the downward stroke of the plunger rod, the tripper 175 moving downwardly with the plunger rod trips the trigger 178 on the snap switch 120 and reverses the switch so as to break the connection between the terminal 123 and contact 118 and to establish the connection between the terminal 123 and the contact 124. Since the connection between the terminal 123 and contact 118 is in the circuits of the audible alert signal device 135 at the alarm box and the alert signal device 102 at the fire station A, the reversing of the switch 120 as described will cause the operation of these devices to be discontinued. At the same time, the establishment of the connection between the terminal 123 and the contact 124 by this reversal of the switch 120 will close the circuit of the alarm signal device 103 at the fire station and will set off the alarm at the station.

The fire station, upon the transmission thereto of the final alarm signal, will send out its fire engines.

As the plunger 24 reaches the end of its downward stroke, and after the final alarm signal has been transmitted to the fire station A, the trigger 178 on the snap switch 120 engaging the tripper 182 will reverse the switch to its original position in which the connection between the terminal 123 and the contact 124 is broken, and the connection between the terminal 123 and the contact 118 is established. At about the same time, the arm 112 striking the trip bar 190 will be snapped angularly into elevated position to separate the contacts 113 and 114 on said arm and on the slidable rod 115 respectively, and

this arm will be latched in this elevated position by the pawl 192.

After the person has completed the clockwise turning of the handle 17 as far as it will go, he releases the handle, and the plunger 24 under the action of the springs 30, 77, 85, 93 and 96 will move quickly upwardly and the hydraulic braking device 38 will be restored to its original position. As the plunger rod 24 reaches the upper end of its stroke, the trip pin 200 striking the finger 201 on the pawl 192 will knock out this pawl from latching engagement with the arm 112, causing said arm to return into normal position shown in FIG. 4 under the influence of the spring 163.

It should be noted that the alarm device 10 is reset automatically upon the mere release of the handle 17 and therefore will be ready for the next alarm set-off operation.

While the invention has been described with particular reference to a specific embodiment, it is to be understood that it is not to be limited thereto but is to be construed broadly and restricted by the scope of the appended claims.

What is claimed is:

1. A fire alarm system comprising a fire alarm device installed at a site remote from fire alarm headquarters and having a handle, means for setting off an alert signal at said headquarters in response to the initial manipulation of said handle, means for yieldably resisting the manipulation of said handle, by such force as to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length, and means responsive to the manipulation of said handle only after said handle has been operated against said resisting means for a prolonged period for setting off an alarm signal at said fire alarm headquarters.

2. A fire alarm system comprising a fire alarm device having a handle, hydraulic brake means for yieldably resisting the manipulation of said handle by such force as to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length, means for sounding an audible alert signal in the vicinity of said device in response to the initial manipulation of said handle, and means responsive to the manipulation of said handle but only after a prolonged period of its operation against the resistance of said brake means for setting off an alarm at said alarm headquarters.

3. A fire alarm system comprising a fire alarm device having a handle, hydraulic brake means for yieldably resisting the manipulation of said handle by such force as to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length including a pair of hydraulic chambers, means for transferring brake liquid between said chambers as said handle is manipulated, a manually adjustable valve between said chambers, means for sounding an audible alert signal in the vicinity of said device in response to the initial manipulation of said handle, and means responsive to the manipulation of said handle but only after a prolonged period of its operation against the resistance of said brake means for setting off an alarm at said headquarters.

4. A fire alarm system as described in claim 2, wherein said brake means comprises a plunger rod operated lengthwise from an original normal position in response to the manipulation of said handle, an inner hydraulic cylinder, said rod having a plunger connected thereto and operable in said inner cylinder, an outer hydraulic cylinder, valve means establishing restricted flow communication between said inner cylinder and said outer cylinder, whereby upon movement of said plunger in said inner cylinder in one direction in response to the manipulation of said handle, the liquid in said inner cylinder flows through said valve means at a restricted rate into said outer chamber to re-

sist yieldably movement of said plunger in said direction, a plunger in said outer cylinder slidably encircling said inner chamber and moved in one direction by the liquid flowing into said outer chamber from said inner chamber, spring means for resisting movement of the latter plunger in the latter direction, spring means for returning said plunger rod to said original position, the return movement of said plunger rod creating a suction in said inner cylinder, and check valve means for restoring the liquid from said outer cylinder to said inner cylinder in response to the suction created in said inner cylinder.

5. A fire alarm system comprising a fire alarm device having a handle, hydraulic brake means for yieldably resisting the manipulation of said handle from initial inoperative position by such force as to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length, signal circuits controlled in response to the manipulation of said handle from said position and including an alarm signal circuit, means responsive to the manipulation of said handle only after said handle has been operated against said resisting means for a prolonged period for closing said alarm signal circuit and thereby setting off an alarm, and means for automatically returning said handle to said inoperative position and for restoring said signal circuit to corresponding inoperative conditions upon release of said handle to reset said fire alarm device.

6. A fire alarm system comprising a fire alarm device adapted to be installed at a site remote from fire alarm headquarters and having a handle, means supporting said handle for movement from initial inoperative position to an operative position, means for sounding an audible alert signal in the vicinity of said device in response to the initial manipulation of said handle from said initial position, means for yieldably resisting the manipulation of said handle with sufficient force to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length from said initial position to said operative position while said signal is sounding, said resisting means including means for urging said handle towards said initial position while said handle is being moved from said initial position and for returning said handle to said initial position automatically when manual exertion on said handle manipulating said handle away from said initial position ceases, and means operable after said handle has been moved against said resisting means and has reached said operative position for automatically setting off an alarm.

7. A fire alarm system comprising a fire alarm device adapted to be installed at a site remote from fire alarm headquarters and having a handle, means supporting said handle for movement from initial inoperative position to an operative position, means for sounding an audible alert signal in the vicinity of said device in response to the initial manipulation of said handle, means for setting off an alert signal at said headquarters in response to the initial manipulation of said handle, means for yieldably resisting the manipulation of said handle with sufficient force to prolong the operative period of manipulation of said handle under the most forcible manual exertion possible to one of substantial length from said initial position to said operative position while said signal is sounding, said resisting means including means for urging said handle towards said initial position while said handle is being moved from said initial position and for returning said handle to said initial position automatically when manual exertion on said handle manipulating said handle away from said initial position ceases, and means operable after said handle has been moved against said resisting means and has reached said operative position for automatically setting off an alarm.

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14

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