May 8, 1934. E. TYDEN 1,958,289

FIRE EXTINGUISHING INSTALLATION

Filed Sept. 14, 1933 2 Sheets-Sheet 1

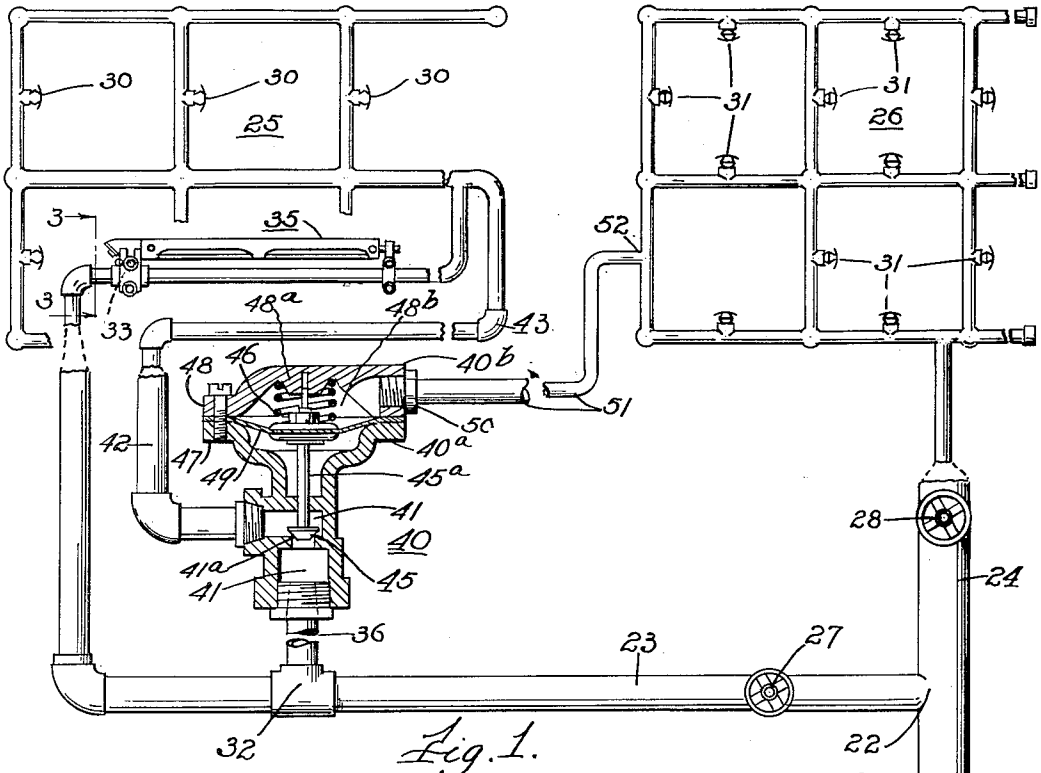


Fig. 1.

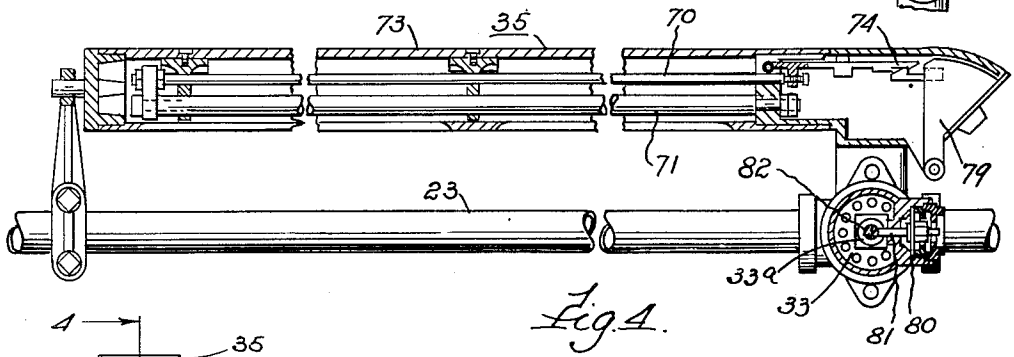


Fig. 4.

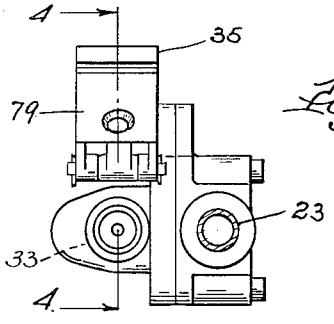


Fig. 3.

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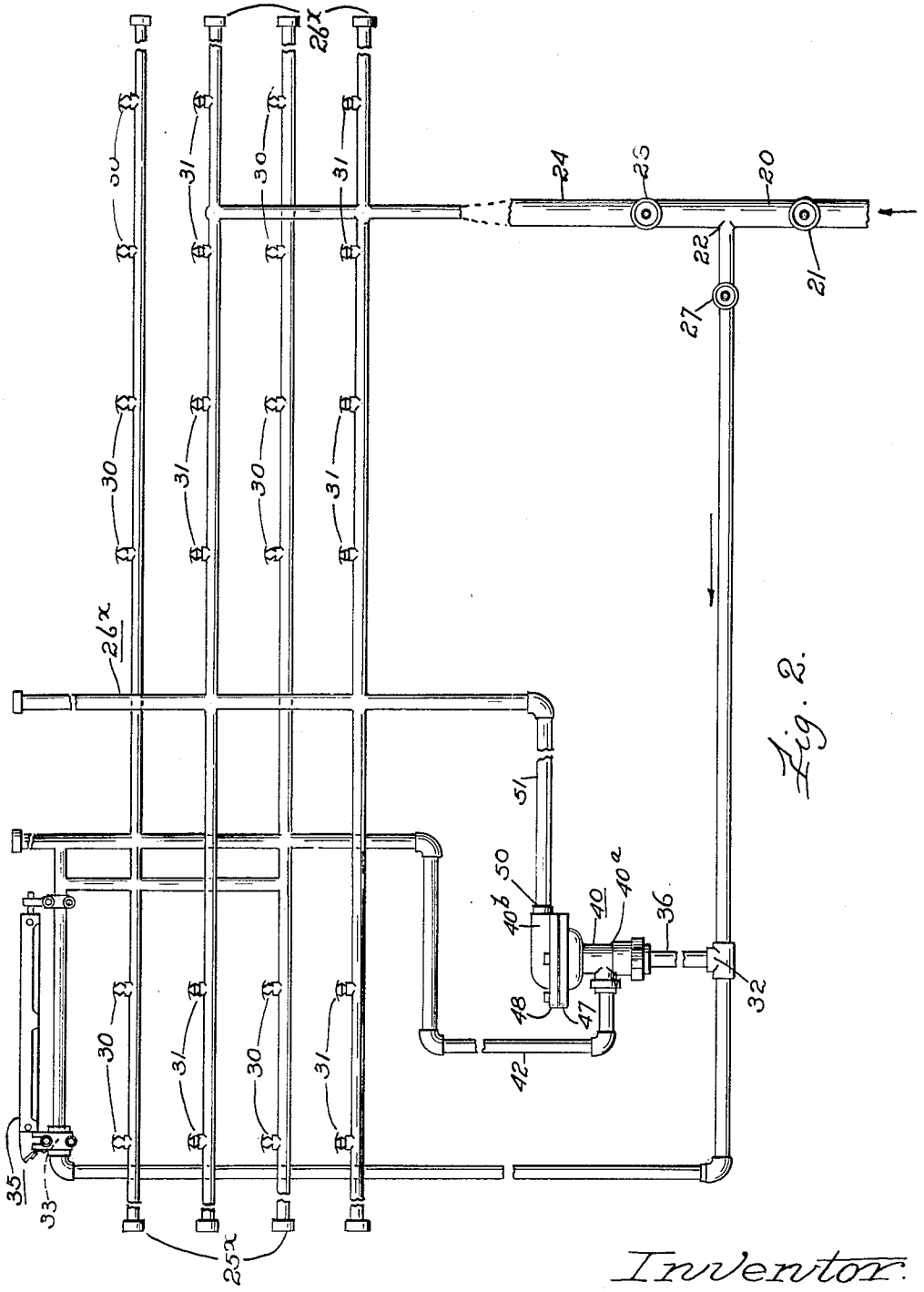


Fig. 2.

Witness
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UNITED STATES PATENT OFFICE

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FIRE EXTINGUISHING INSTALLATION

Emil Tyden, Hastings, Mich.

Application September 14, 1933, Serial No. 689,383

1 Claim. (Cl. 169—16)

The purpose of this invention is to provide an installation of fire protective apparatus in adjacent or interlapping areas, or in a continuous area, such installation comprising an open head system and a closed head system having independent connections with a source of water under pressure, and inter-connected in such manner that the occurrence of moderate fire heat effecting the open head system shall cause the admission of water in limited quantity to the open head system, and the spread or increase of fire to the degree for fusing the normally closed heads of the closed head system causing the discharge of water in additional amount from the closed head system shall also cause the admission of water in additional amount to the open head system for additional discharge from the open heads.

In one form of such installation the closed head and open head systems are installed in the adjacent protected areas; and in another form the two systems are extended adjacent to each other throughout one continuous protected area.

The invention consists in the elements and features of construction shown and described as indicated in the claim.

In the drawings:

Figure 1 is a diagrammatic view showing an open head system and a closed head system installed in adjacent communicating areas.

Figure 2 is a similarly diagrammatic view showing an open head system and a closed head system installed with the water conducting pipe lines extending adjacent to each other throughout continuous areas to be protected by both systems.

Figure 3 is a vertical section at the line 3—3 on Figure 1 showing in end elevation a temperature-responsive device associated with the open head system.

Figure 4 is a section at the line 4—4 on Figure 3.

Referring to the drawings in detail:

A main water supply pipe, 20, may be understood as leading from a source of water under pressure with a shut-off valve, 21, controlling access of water. This supply pipe is branched, as seen at 22, in two branches-in-parallel, 23 and 24, leading respectively to an open head sprinkler system, indicated at 25 in Figure 1, and at 25×, in Figure 2, and a closed head sprinkler system indicated at 26 in Figure 1, and 26× in Figure 2. The shut-off valves, 27 and 28, in said branches respectively control access of water to the open head and closed head systems respectively. The open heads are indicated conventionally at 30, and the closed heads are indicated conventionally at 31 in Figures 1 and 2.

In the branch pipe line, 23, extended to the open head system, there is interposed antecedent to the open heads a valve device indicated at 33, and shown in detail in Figure 4 of which the valve is normally closed and arranged to be opened by the operation of a temperature-responsive device indicated in entirety at 35, and shown in detail of its operative relation to the valve device, 33, in Figures 3 and 4, and hereinafter described, the construction of said temperature-responsive device and said valve device being arranged for opening the valve to admit water to the open head system upon the operation of the temperature-responsive device in response to predetermined fire hazard conditions affecting said temperature-responsive device.

The branch pipe line, 23, is sub-branched, as seen at 31, at a point antecedent to the thermostatically controlled valve device, 33, the sub-branch, 36, leading to a second valve device indicated in entirety at 40, comprising a flow passage, 41, which leads for connection to a pipe line, 42, which extends into connection with the open head system, as seen at 43. In the valve device, 40, the flow passage, 41, is controlled by a valve, 45, arranged to seat against flow toward the connection with the pipe line, 42; and said valve device comprises a valve body in two parts, 40^a and 40^b, of which the part, 40^a, contains the flow passage, 41, and the seat, 41^a, for the valve, 45, which is held normally lightly seated against the flow, as stated above, by a spring, 46, as hereinafter further described.

The two body members, 40^a and 40^b, have respectively flanges, 47 and 48, formed with mated faces for clamping between them a flexible diaphragm, 49, to which the stem, 45^a, of the valve, 45, is secured at the center of the diaphragm, and the spring, 46, is lodged on the diaphragm for reacting between the latter and the body member, 40^b, which body member is furnished with a central boss, 48^a, for centering the spring which thus reacts on the valve, 45, for holding it normally lightly seated, as stated above. The body member, 40^b, is interiorly recessed, as indicated at 48^b, forming a cavity or chamber on the upper side of the diaphragm, and to said chamber there is connected, as seen at 50, a pipe line, 51, which leads to and is connected with a pipe line of the closed head system, as seen at 52.

Upon considering this installation, as thus far described, it will be recognized that upon opening the main shut-off valve, 21, and both of the shut-off valves, 27 and 28, water will occupy

the pipes of the closed head system developing pressure therein equal to the supply pressure, and water will occupy the pipe line, 23, of the open head system to the valve of the valve device, 33, and the sub-branch, 36, to the valve, 45; and upon the occurrence of fire heat effecting the temperature-responsive device causing the valve of the valve device, 33, to be opened, a limited quantity of water will be discharged from the open heads of the open head system; and upon increase or spread of fire heat causing fusion of one or more of the normally closed heads of the closed head system, relieving the pressure in the pipe lines of the closed head system, and thereby relieving the pressure on the diaphragm, 49, of the valve device, 40, the valve, 45, will be opened, and additional quantity of water admitted by way of the sub-branch pipe line, 36, to the open head system. And upon still further spread or increase of fire heat causing the fusion and opening of all the normally closed discharge heads of the closed head system, a maximum quantity of water will be discharged for extinguishing the fire.

The detail construction of the temperature-responsive device and valve controlled thereby is not a part of the present invention, but for full understanding of the operation of the installation described, the detail construction of said temperature-responsive device and valve will now be described.

This temperature-responsive device is of the type commonly called a "rate-of-rise thermostat", being constructed for operating for opening the valve controlled by it, not at a predetermined temperature, but when the temperature rises rapidly beyond a predetermined rate, as when such rise of temperature is due to dangerous fire conditions, and not merely to increase of temperature, such as might be due to water conditions or to the normal warming of the protected apartment by the heating equipment. For operating in this manner the device comprises two metal bars, 70 and 71, mounted parallel with each other, as seen in Figure 4, under a hood indicated at 73, on a support with respect to which both bars are fixed at one end and free to move longitudinally at the other end, one of said bars being quite slender relatively to the other, from which it results that upon slow rise of temperature both bars will lengthen equally so that the relative position of their free ends will be unchanged; but upon rapid rise of temperature the slender bar 70, due to its small transverse diameter will be elongated very substantially before the heavier bar 71, becomes heated through its greater transverse dimension sufficiently to experience any substantial elongation; and there is associated with the two bars at their free ends a latch device, 74, pivoted to the heavier bar and exposed to actuation by the free end of the slender bar, said latch being arranged for latching in upheld position a weighted lever, 79, which is released by the movement of the latch due to the elongation of the slender bar, as described.

The weighted lever, 79, is arranged with respect to the valve device, 33, for operating the valve thereof for opening by the impact of the falling weight against a flexible diaphragm, 80, which seals an opening in the wall of the body of the valve device, 33, which diaphragm at its inner side is related to a lever arm, 81, of a displaceable strut, 82, so that the inthrust of the diaphragm by the impact of the weight at the outer side thereof displaces the strut and releases the valve, 33^a, for opening by the water pressure, permitting the water to flow through the pipe lines to the open head system.

It should be understood that any other form or type of temperature-responsive device may be substituted for the rate-of-rise thermostat above described, the essential characteristic of this element of the invention being that the temperature-responsive device shall be adapted to respond for causing the opening of the valve which it controls at an earlier stage in the progress of the fire in the protected area than that at which the closed heads are opened by fusion. This earlier response is most reliably obtained by employing a rate-of-rise thermostatic device, or one adapted in any manner to respond to lower temperature than that at which the normally closed heads are opened by fusion; and under some circumstances this may be assured by selection of location of a thermostat of any other character where it will experience the fire heat, as from smoke, before the closed heads are exposed to the same.

I claim:

In an apparatus for protecting buildings against fire hazard, in combination, an open head system; a closed head system; a water supply pipe leading from a source of water under pressure; a shut-off valve in said pipe, said pipe being branched subsequent to said shut-off valve, the branches leading to the two systems respectively; personally and independently operable shut-off valves in said branches respectively for controlling the admission of water to the two systems independently of each other; a valveless three-way pipe fitting interposed in the pipe branch leading to the open head system subsequent to the personally operable valve of said branch; a valve controlling flow through said branch to the open head system and temperature-responsive means located in the open head area controlling said last mentioned valve, a sub-branch pipe connected with one of the limbs of said three-way fitting, and a unitary fitting having a flow passage through it and connected at the inlet of said flow passage with said sub-branch, said flow passage including a valve seat; a valve mounted in said unitary fitting seating at said seat against inflow; pipe connection from the outlet of said flow passage leading to the open head system independently of the main branch continuation from the three-way fitting, a pressure-responsive device comprised in said unitary fitting operatively associated with the valve of said unitary fitting for holding said valve normally seated against inflow, and flow pressure connection to said pressure-responsive device from the closed head system.

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