Aug. 31, 1943. M. E. KEEFE, JR 2,328,345

FIRE-EXTINGUISHING APPARATUS

Filed April 17, 1942

Fig. 1.

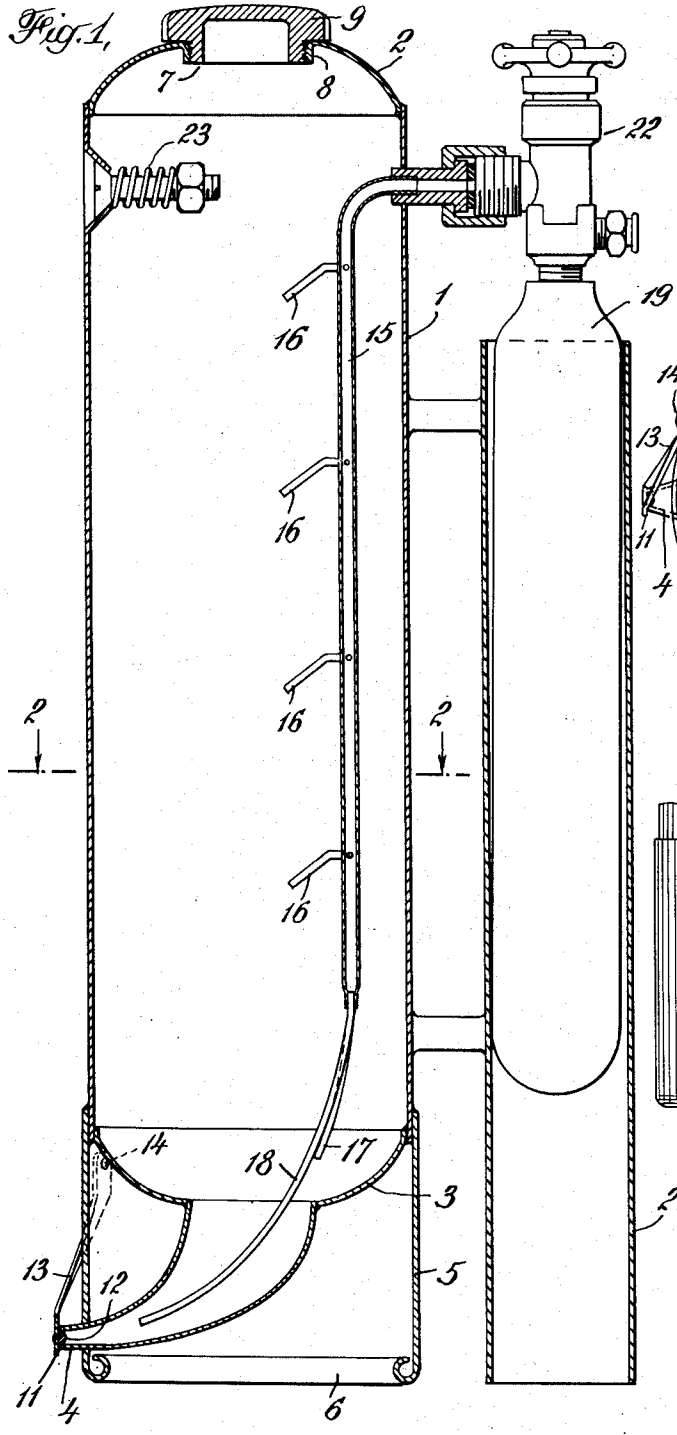


Fig. 2.

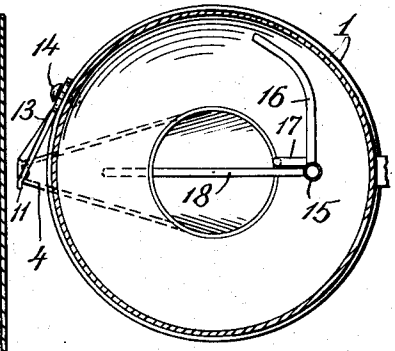
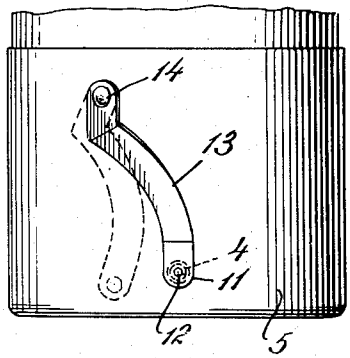


Fig. 3.



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UNITED STATES PATENT OFFICE

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FIRE-EXTINGUISHING APPARATUS

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4 Claims. (Cl. 169—31)

This invention relates to fire-extinguishing apparatus by means of which a dry fire-extinguishing powder is blown upon the fire by means of an inert gas, such as carbon dioxide. The powder is commonly stored within a cylindrical container and discharged through a nozzle at the lower end by means of gas introduced under pressure. Although the powder must be free-flowing, and remain free-flowing even after long storage, it does not possess the fluidity of a liquid and is subject to arching under pressure. It is, therefore, not possible to expel the powder by pressure applied from above no matter how great, and the gas must be introduced at different levels along the powder column beginning at a point just back of the nozzle mouth in order to keep the powder mass loose and free from packing and arching. Various means have been proposed for expelling the powder in this way, but none, so far as I am aware, has been wholly successful.

It is the object of my invention to provide a dry powder fire extinguisher capable of expelling the powder in a free-flowing stream without packing or arching and without the use of excessive gas pressures, and generally to improve upon apparatus of this type.

In the accompanying drawing I have illustrated a preferred embodiment of my invention. In the drawing Figure 1 is a vertical section through the apparatus; Figure 2 is a transverse section taken along line 2—2 of Figure 1; and Figure 3 is a detail showing a novel closure for the nozzle.

The fire extinguisher illustrated comprises a cylindrical container 1 having a dome-shaped top 2, a similarly shaped bottom 3 and a tapering discharge nozzle 4, the whole being supported by a depending skirt 5 provided around its bottom with an inwardly rolled peripheral edge 6 which serves as a convenient and simple hand grip when the extinguisher is in use. The powder is introduced into this cylinder through a feed opening 7 in the top 2 defined by an inwardly turned threaded flange 8. This opening is closed by a cap nut 9 making threaded engagement with the flange 8. I have found that the natural resiliency of the sheet metal of which the top is made, is sufficient to produce an air-tight seal with the cap nut without the interposition of a gasket.

Spilling of the powder through the discharge end of the nozzle when the extinguisher is not in use is prevented by means of a closure 11 comprising a rivet head 12, or similar structure, which fits over the end of the nozzle and is normally held in place by means of a supporting spring arm 13 pivoted on the skirt at 14, offset vertically from the nozzle.

The gas for expelling the powder is introduced through a vertical one-piece copper tube 15 of uniform diameter parallel to and spaced from the container wall and extending from a point adjacent the upper end of the cylinder to a point adjacent the lower end. This tube is provided with four branch tubes 16 which extend laterally from the tube at equally spaced intervals and are normal to a radius passing through the tube 15. The outer ends of these four branch tubes follow substantially the curvature of the cylindrical wall of the container, as shown in Figure 2, and turn downwardly as shown in Figure 1. The discharge ends of the four tubes are in vertical alinement. Two other branch tubes 17 and 18 extend downwardly from the lower end of the tube 15. These also are of reduced diameter. The shorter tube 17 terminates within the dome-shaped bottom 3 just above the upper end of the nozzle, while the longer tube 18 extends down within the nozzle and approaches its discharge end.

The gas source is a carbon dioxide cylinder 19 lying within a cylindrical casing 21 spaced from but connected to the cylindrical container 1. The cylinder 19 is provided with a valve 22, the outlet from which is suitably coupled to the upper end of the tube 15.

The apparatus operates as follows: The valve 22 is opened to permit the compressed carbon dioxide to enter the tube 15. The diameter of this tube is such that the pressure throughout its length is substantially equal. The gas passes from the tube 15 into the branch tubes 16 and because of the shape of these tubes enters the powder mass tangentially and downwardly. This tends to set up a whirling action within the mass having a downward direction. The use of a single piece of copper tubing as a main line of substantial diameter permits expansion of the gas to take place throughout the required perpendicular dimension of the container. The even spacing of the four branch lines permits the gas to be injected through them virtually simultaneously at points within the container so spaced as to compel the whirling motion of the powder to be accomplished evenly throughout the container. Each of these smaller branch lines being of the same length, they terminate in a line parallel to and within the container so that the whirling motion begins throughout the entire container at points along a vertical line and at approximately the same instant, and continues evenly during the entire period of the discharge

of the powder. The discharge ends of the branch tubes turning downwardly, there is no possibility that the powder may fall into the tube 15 and interfere with the immediate discharge of gas when the valve 22 is opened. The tube 15 is spaced away from the side of the container, thus offering little, if any, resistance to the whirling powder within the container. The gas emerging from the branch tube 17 tends to agitate the powder at the base of the container and overcomes any tendency to arch; while the gas passing through the branch tube 18 expels the powder which has reached the nozzle in a continuous stream having a substantial pressure and range. As soon as the increased gas pressure reaches the discharge end of the nozzle, the closure 11 is unseated and immediately drops to one side, as shown in dotted lines in Figure 3 so that it in no way interferes with the discharge of the powder.

The pressure developed in the container 1 is normally about 150 pounds per square inch. In order to protect the container, which is made of relatively thin metal, in the event of some stoppage I provide a safety valve 23 in the upper side wall of the container.

I claim:

1. Fire-extinguishing apparatus of the dry powder type comprising a cylindrical container for the powder, a discharge nozzle at the lower end of the cylindrical container, a vertical tube of uniform diameter extending from a point within the container near the top to a point near the nozzle, branch tubes of smaller diameter extending laterally from the tube at spaced intervals, the outer ends of the branch tubes following generally the curvature of the cylindrical wall of the container, other branch tubes extending downwardly from the end of the tube toward the nozzle, and means for introducing gas under pressure into the tube.

2. Fire-extinguishing apparatus of the dry powder type comprising a cylindrical container for the powder, a discharge nozzle at the lower end of the cylindrical container, a vertical tube of uniform diameter extending from a point within the container near the top to a point near the nozzle, branch tubes of smaller diameter extending laterally from the tube at equally spaced intervals, the outer ends of the tubes turning downward and following generally the curvature of the cylindrical wall of the container and terminating one above the other in a vertical line, other branch tubes extending downwardly from the end of the tube toward the nozzle, and means for introducing gas under pressure into the tube.

3. Fire-extinguishing apparatus of the dry powder type comprising a cylindrical container for the powder, a discharge nozzle at the lower end of the cylindrical container, a vertical tube of uniform diameter extending from a point near the top of the container to a point near the nozzle and spaced from the cylindrical wall of the container, tubes of smaller diameter branching laterally from the vertical tube at spaced intervals normal to the radius of the cylinder passing through the tube, extending close to the cylindrical wall of the container, and bending downwardly while following substantially the curvature of the wall, other branch tubes extending downwardly from the end of the vertical tube toward the nozzle, and means for introducing gas under pressure into the tube.

4. Fire-extinguishing apparatus of the dry powder type comprising a cylindrical container for the powder, a discharge nozzle at the lower end of the cylindrical container, a vertical tube of uniform diameter extending from a point near the top of the container to a point near the nozzle and spaced from the cylindical wall of the container, tubes of smaller diameter branching laterally from the same side of the vertical tube, extending close to and following the curvature of the cylindrical wall of the container, the outer ends of the branch tubes being bent downwardly and terminating in the same vertical line, other branch tubes extending downwardly from the end of the vertical tube toward the nozzle, and means for introducing gas under pressure into the tube.

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