

March 20, 1973

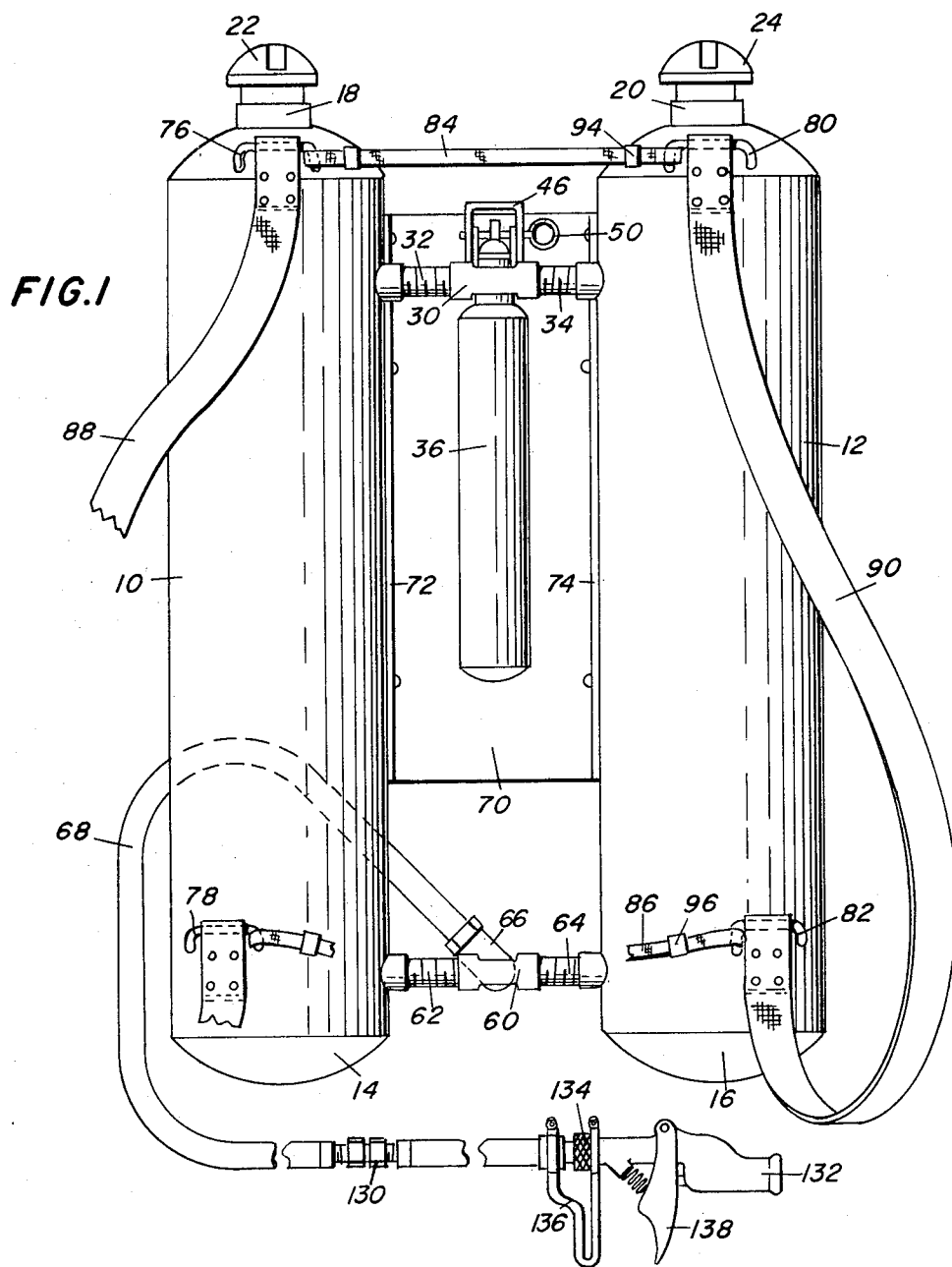
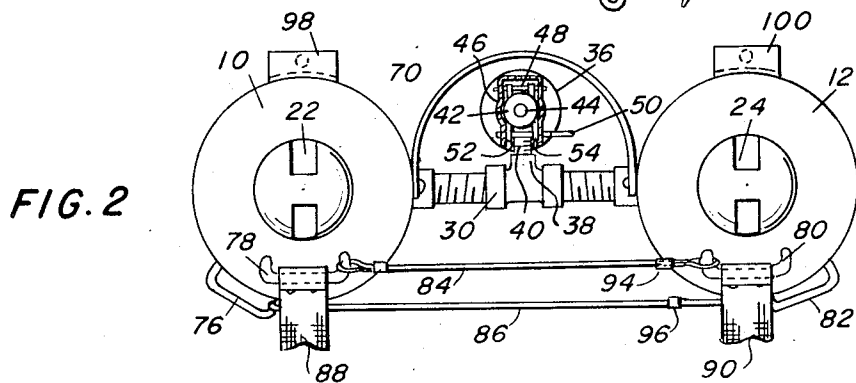
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3,721,299

DUAL DRY CHEMICAL FIRE EXTINGUISHER

Filed May 3, 1971

2 Sheets-Sheet 1



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FIG. 3

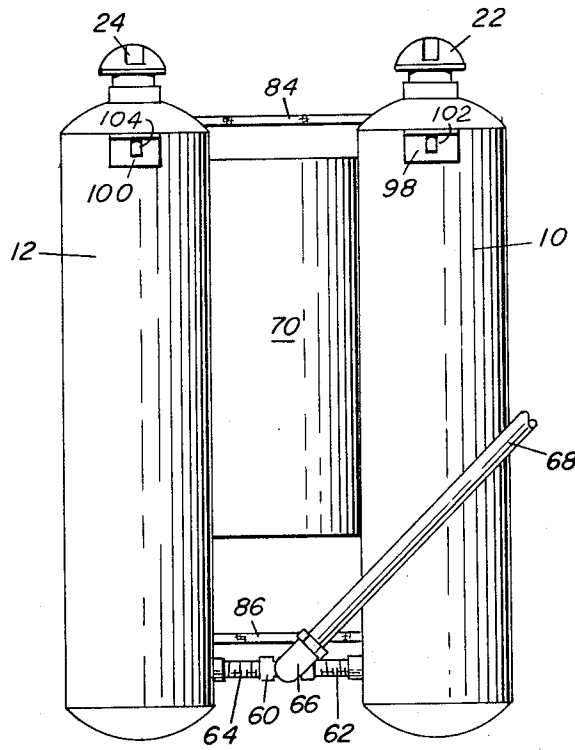
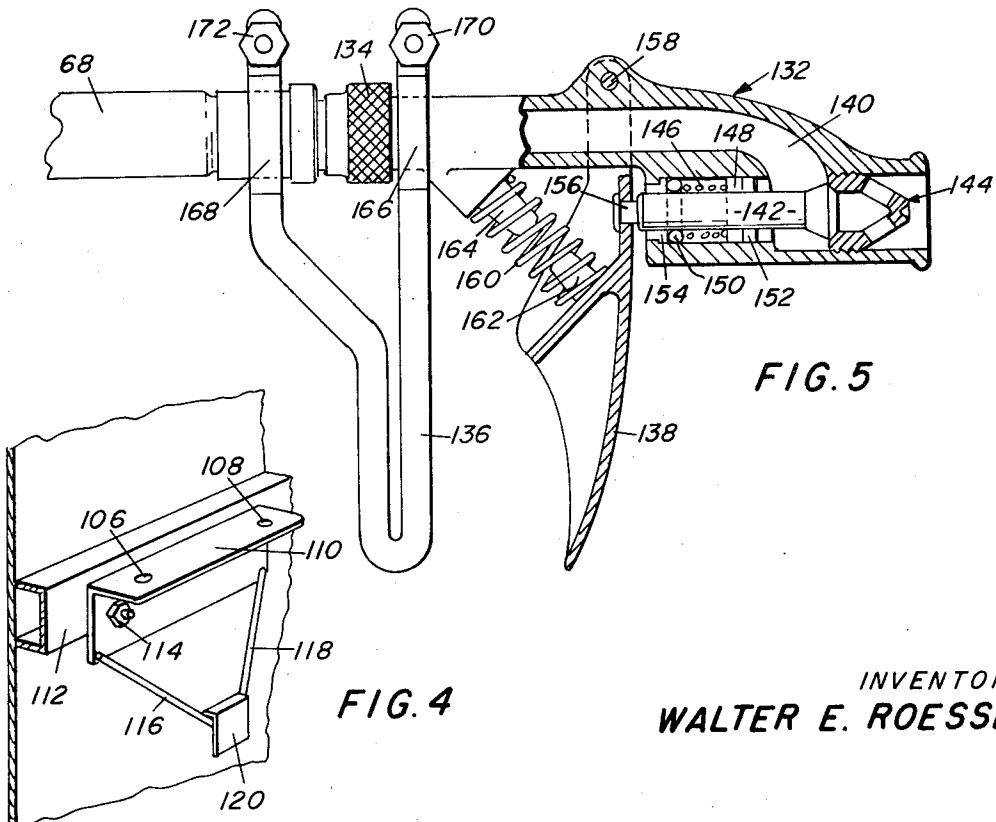


FIG. 4

FIG. 5

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DUAL DRY CHEMICAL FIRE EXTINGUISHER
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U.S. Cl. 169—31 P

4 Claims

ABSTRACT OF THE DISCLOSURE

A portable chemical fire extinguisher is disclosed which comprises two containers, each carrying a dry chemical fire extinguishing powder, connected together to form a unitary, back-carried, extinguisher. The two containers feed a single discharge manifold so that they may be discharged through a single hose and pistol grip nozzle. A propellant gas cartridge is connected to the two containers through a common pressure manifold to provide equal pressure in the tanks, whereby both discharge at the same time. The pistol grip nozzle has a modified trigger which facilitates operation of the extinguisher.

BACKGROUND OF THE INVENTION

The present invention relates, in general, to an improved dry chemical fire extinguisher, and more particularly to an extinguisher which is made up of two containers manifolded together and serviced by a common high pressure gas cartridge and discharge hose, each being disposed between the containers, thereby producing a balanced, easily carried unit with improved handling and fire extinguishing characteristics.

Dry chemical fire extinguishers of the portable type are, of course, well known and are commonly used. Such extinguishers generally provide a pressure-resistant container that is adapted to receive a quantity of dry powder composition in a finely divided state. A high pressure fluid medium such as dry air, nitrogen, carbon dioxide, or the like is introduced into the upper part of the container either initially, or is stored in an auxiliary container and introduced into the powder container immediately prior to use. The powder which is generally used in a bicarbonate of soda either by itself or as a base with modifying agents. Such powders are well known in the art, and do not constitute a part of the present invention. The high pressure gas which is fed into the dry chemical container fluidizes or aerates the dry chemical which may then be discharged at the bottom of the powder container through an outlet nozzle which is hand manipulated for directing a stream of the chemical agent at the fire.

One of the main problems encountered in the use of dry chemical extinguishers is that of providing a construction that will provide a flow of extinguishing powders of sufficient dispersion, flow rate and quantity as to effectively smother various types of fires, and in particular Class B fires involving highly flammable liquids such as gasoline and oil. Because of the design of past portable extinguishers, a practical limit was placed on their weight, for they had to be carried in one hand by the operator while he manipulated the nozzle with the other hand. It has been found that the normal limit for such devices is approximately thirty pounds of extinguishing powder, for this amount together with the weight of the container and CO₂ charge represents about the maximum that the average man can easily handle during a fire fighting operation.

It has been further found that the hand-held portable extinguisher limits the mobility of the operator, for not only is the container awkward and difficult to handle, but it requires the use of both hands at all times. These devices may be provided with a sling that permits the ex-

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tinguisher to be supported on one shoulder, but this is not a great improvement for it throws the operator off balance, and does not free him to perform acts such as climbing a ladder. Although there have been many advances in the fire extinguisher art in the past few years, the foregoing limitations are still found on commercially available extinguishers, thus limiting their effectiveness and usefulness.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide an improved portable fire extinguisher which may be easily carried and handled by an operator, increasing his mobility and thus his effectiveness in fighting fires.

It is a further object of the present invention to provide a portable fire extinguisher having an increased load of extinguishing material, thereby substantially increasing the usefulness of the device without providing an excessive burden for the average operator.

It is an additional object of the present invention to provide a portable fire extinguisher which is adapted to be carried on the operator's back and which provides a balanced, distributed load that enables the average operator to easily handle a much greater amount of extinguishing material than was normally the case with prior portable extinguishers.

An additional object of the present invention is to provide a dual chamber portable fire extinguisher which is adapted to be carried on the back of the operator in such a manner as to provide a balanced and distributed load while at the same time providing a greater capacity for extinguishing powder, whereby a greater fire area can be extinguished by an operator than was possible with prior conventional devices.

Briefly, the present invention is a portable dry chemical fire extinguisher which consists of two cylindrical containers connected together at the upper end by a gas pressure manifold and at the lower end by a discharge manifold to form a unitary device. A source of high pressure gas such as a carbon dioxide cartridge is connected in common to the two cylinders by way of the single pressure manifold, while a single hose with a pistol grip nozzle is connected to the two containers in common through the outlet manifold. The use of these manifolds insures a balanced delivery of powder from both cylinders so that in operation the powder is delivered at approximately the same rate from each container to maintain the proper balance. Suitable support webbing and shoulder straps are provided to permit the device to be carried on the back of the operator, with the hose being of sufficient length to enable him to discharge the extinguishing powder accurately and without hand fatigue. The container is provided with a suitable bracket to permit it to be supported in an upright position, as on a wall, so that the operator can quickly slip into the carrying harness and lift the extinguisher from its bracket for immediate use.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and additional objects, features, and advantages of the present invention will become evident from a consideration of the following specification, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of the dual fire extinguisher of the present invention;

FIG. 2 is a top view of the device of FIG. 1;

FIG. 3 is a back view of the fire extinguisher of FIG. 1;

FIG. 4 is a perspective view of a bracket suitable for receiving the fire extinguisher; and

FIG. 5 is a cross-sectional view of a nozzle suitable for use with the device of FIG. 1.

3 DESCRIPTION OF A PREFERRED EMBODIMENT

Turning now to a detailed consideration of the drawings, there is illustrated in FIG. 1 a dual portable dry chemical fire extinguisher in accordance with the present invention. The extinguisher consists of two dry chemical containers 10 and 12 which are of substantially conventional design, being rounded at the bottom to facilitate aeration of the dry powder extinguishing material, as at 14 and 16, and having wide-mouthed necks 18 and 20 at the tops by which the containers may be loaded with extinguishing material. Removable closures 22 and 24 provide air-tight seals so that there will be no leakage when the containers are charged with a high pressure propellant gas. The closures 22 and 24 are easily removable to permit the containers to be loaded with standard extinguisher powder cartridges of commercially available extinguishing powder such as, for example, that known as "Purple K." In the illustrated example, each container is designed to hold twenty pounds of the dry chemical fire extinguisher powder, thereby providing a total of forty pounds of powder in a container arrangement that is easier to handle than the standard, presently available thirty-pound dry chemical extinguishers. As presently contemplated, containers 10 and 12 will be of conventional steel construction; however, as lighter metal alloys become available for fire extinguisher use, it will be possible to reduce the weight of the present unit by some fifteen to twenty pounds, thereby further facilitating the handling of the extinguisher.

The two containers are interconnected near their upper end by a charging manifold 30 which is connected by way of pipe 32 to a suitable fitting on container 10 and by way of pipe 34 to a suitable fitting on container 12. Pipes 32 and 34 preferably are threaded and back welded into manifold 30 and into their corresponding fittings on the containers.

A standard high pressure gas cartridge 36 is also connected to the manifold 30, as better illustrated in FIG. 2. As shown there, manifold 30 includes an inlet fitting 38 to which the outlet of the gas cartridge 36 is connected by way of an outlet passage 40. The gas container 36 may be of conventional design, and preferably will contain an inert propellant gas such as carbon dioxide. The upper end of the cartridge carries a valve firing assembly 42 of a conventional type which is adapted to be actuated when the powder containers 10 and 12 are to be charged with gas; in the preferred mode, this is done immediately prior to the use of the extinguisher. Any one of a variety of valves may be used for the carbon dioxide container, but a preferred form utilizes a frangible diaphragm seal (not shown) closing the top of the charged gas cartridge. The valve assembly 42 is provided with a movable puncture pin such as that indicated at 44 which may be pressed down by means of a movable hand lever 46, illustrated in section in FIG. 2. A valve arrangement of this general type is illustrated and described, for example, in U.S. Pat. No. 2,719,590 to Guise, issued Oct. 4, 1955.

Hand lever 46 is pivotally attached to the valve assembly by means of a pin 48, and is prevented from being moved by means of a ring pin 50 which passes through the lever near its forward end which also passes through a pair of lugs 52 and 54 which are mounted on the valve assembly. When the extinguisher is to be used, ring pin 50 is pulled and the hand lever 46 is pressed downwardly, depressing pin 44 to puncture the sealing diaphragm in the gas cartridge. This releases the propellant gas which then flows into manifold 30 and through pipes 32 and 34 to the two containers 10 and 12, thereby charging the extinguisher and preparing it for use. Ten ounces of carbon dioxide will provide a sufficient charge for the dual system of the present invention, and will serve to discharge the forty pounds of dry powder with the required flow velocity. It will be apparent that the particular size of the gas cartridge, the pressure, the specific valve

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arrangement and the gas used may be varied as required by variations in the type of dry chemical powder used and the amount provided in the two containers.

Since manifold 30 provides an open path to containers 10 and 12, the pressure charge within the containers will be equal; thus, the flow rate of powder out of the containers will also be equal. The powder discharge is effected by way of an outlet manifold 60 which is connected by way of an outlet pipe 62 to the lower portion of powder container 10 and by way of an outlet pipe 64 to the lower portion of container 12. Again, these connector pipes are threadedly connected to the outlet manifold (back welded) 60 and the corresponding outlet fittings on the powder containers, or they may be connected by other suitable methods. As illustrated in FIG. 3, the outlet manifold 60 is provided with a discharge fitting 66 to which is connected a conventional fire extinguisher discharge hose 68. The manifold 60 is open to both containers 10 and 12, whereby an equal amount of powder from each container is delivered to the discharge hose 68 during operation of the device.

The inlet and discharge manifolds 30 and 60, together with the connectors by means of which they are coupled to the powder containers 10 and 12, serve to rigidly interconnect the two containers to form the dual configuration of the present invention. In addition to these fittings, however, an additional connecting bracket 70 is provided which, as may be seen in FIG. 2, curves around the carbon dioxide cartridge to provide a shield for it, thereby preventing damage to the cartridge or its valve assembly. The connector bracket 70 preferably is snap fastened to the neck portion of the inlet manifold 30 and rests against containers 10 and 12, as at 72 and 74 in FIG. 1, thereby aiding in providing a unitary construction.

As illustrated in FIGS. 1 and 2, the containers 10 and 12 are provided with webbing brackets to which a suitable harness arrangement may be connected to provide easy carrying of the fire extinguisher assembly. Thus, container 10 carries brackets 76 and 78 located at the upper and lower ends thereof, respectively, while container 12 carries brackets 80 and 82 which are similarly located. These brackets are welded or otherwise attached to the surface of the containers, and carry a plurality of webs or straps which serve to support the extinguisher on the back of an operator in such a manner as to provide a distributed load that is relatively comfortable and which greatly facilitates the handling of the extinguisher. A suitable webbing arrangement is shown as including an upper cross strap 84 which is connected between brackets 76 and 80 and a lower cross strap 86 similarly connected between bracket 78 and 82. These straps are stretched relatively tightly between the two containers to provide support at the shoulders and lower back of the operator while he carries the extinguisher. A pair of shoulder straps 88 and 90 are also provided, these straps passing over the operator's shoulders in known manner whereby the weight of the extinguisher may be easily supported. Shoulder strap 88 is connected between brackets 76 and 78, this strap being partially cut away in FIG. 1 in order to better illustrate bracket 78. Strap 90 is similarly connected between brackets 80 and 82, one end of the webbing being connected to bracket 80 by a loop which is formed in the webbing and riveted together, and the other end being looped over bracket 82 and also riveted together to carrying strap 90. It will be apparent that the support webs 84 and 86 are similarly fixed at each end of the brackets. No adjusting buckles are provided, as support straps 88 and 90 are of sufficient fixed size for a person to slip into. The weight of the unit pulls these straps up tight.

Affixed to the back of each of containers 10 and 12 is an angle bracket for supporting the extinguisher on a corresponding wall bracket. As shown in FIGS. 2 and 3, angle bracket 98 is welded to cylinder 10 at or near its upper end. The bracket is generally L-shaped with a horizontal leg extending out from the cylinder and carrying

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a depending peg 102. Similarly, L-shaped bracket 100 is welded to cylinder 12 near its top edge, with a horizontal portion of the bracket extending out from the cylinder and carrying a depending peg 104. Pegs 102 and 104 are adapted to be received by a pair of spaced apertures 106 and 108, respectively, in a wall mounting bracket 110, illustrated in FIG. 4. Bracket 110 is generally L-shaped to provide a horizontally extending shelf portion in which the apertures 106 and 108 are located, and has a depending steel leg portion which is adapted to act as a support for the twin unit cartridge cover 70. As shown, bracket 110 is attached to a channel bar 112 forming a part of a building wall by means of nut and bolt assemblies such as that at 114. A pair of rods 116 and 118 are fastened to the angle bracket 110 and extend downwardly to an apex where a suitable support pad 120 is fastened. This support pad serves to maintain the fire extinguisher in a generally vertical position when it is hanging on the wall bracket 110. The support pad preferably will contact the lower portion of the connecting bracket 70 on the fire extinguisher unit, thereby preventing the extinguisher from pivoting about the cylinder brackets 98 and 100 into a position that would make it difficult for the operator to pick the unit up.

In order to insure a sufficient length of hose 68, two or more lengths of standard dry chemical fire extinguisher hose may be coupled together, as by a suitable coupling 130; it will be apparent, however, that a single length of hose of the appropriate dimensions may be used. This hose should be long enough to permit the operator to hold the nozzle at arm's length, thereby facilitating the use of the extinguisher. As illustrated in FIGS. 1 and 5, the present invention contemplates the use of a pistol grip type of nozzle 132 which is connected to the hose 68 by a conventional threaded coupling 134. A hand grip 136 is fastened to the nozzle and the hose coupling, and the operating lever 138 for the nozzle is formed as a trigger so that the operation of the nozzle is greatly improved. This arrangement reduces hand fatigue on the part of the operator, and enables the operator to aim the discharge of fire extinguishing powder accurately so as to produce a maximum fire fighting effect.

As illustrated in the sectional view of FIG. 5, the discharge line 68 leads to a main flow channel 140 in the nozzle 132, the channel being closed at its outer end by a spring-biased valve 142. The nozzle outlet 144 is of conventional design and is so constructed as to provide the desired pattern of extinguishing powder for optimum fire control. Valve 142 is biased to its closed position by a coil spring 146, the spring extending between a shoulder 148 on the valve stem and a retainer 150 mounted in the nozzle housing. A suitable sealer 152 is provided around the valve stem to prevent leakage of the discharge material after the container has been pressurized.

The stem of valve 142 extends through a bushing 154 to the exterior of the nozzle housing where it is connected by means of a stud, screw, bolt or the like 156 to the valve lever, or trigger 138. Lever 138 is pivotally connected to the nozzle housing by a pin 158 and is biased in a direction to close valve 142 by a coil spring 160. This spring is shown as extending between a projection 162 on the lever and a corresponding oppositely extending projection 164 on the nozzle housing.

Grip 136 may be formed from a steel rod, for example, and it may include two yoke-like portions which extend around the nozzle housing 166 and 168 whereby the grip may be clamped to the nozzles and to the hose fitting by nut and bolt assemblies 170 and 172. This grip allows the operator to squeeze the trigger lever 138 against the compression of springs 146 and 160, thereby opening valve 142 to permit a flow of extinguishing material.

To prepare the extinguisher of the present invention for use, the dry chemical containers 10 and 12 are filled to an appropriate level with a conventional dry chemical extinguishing powder. As has been indicated, this mate-

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rial is inserted by way of the container openings 18 and 20, and after filling the sealing caps 22 and 24 are screwed down tightly to seal the containers. A charged CO₂ cartridge 36 is then threaded into the bottom of the valve assembly 42, with firing pin 44 being in its upward position and the firing lever 46 being held in its upper position by pin 50. The extinguisher is then hung on bracket 110 and is ready for use. When the extinguisher is needed, the operator pulls pin 50 and depresses lever 46, thereby pressing firing pin 44 down through the seal on the CO₂ cartridge 36. This releases the gas in cartridge 36 and charges containers 10 and 12 to the desired pressure. The operator then slips his arms through the loops formed by straps 88 and 90, positioning the extinguisher on his back, and lifts the apparatus off of the bracket 110.

The extinguisher provides a balanced load on the operator's back, leaving his hands free to manipulate the nozzle to operate the extinguisher. If the operator requires both hands, as for climbing a ladder or the like, the discharge hose is long enough to allow it to be looped over his shoulder. The nozzle arrangement allows the extinguisher to be operated with great ease and flexibility, and permits the discharge to be aimed so as to direct the spray at the proper point on the fire. The balanced arrangement of the containers permits the operator to carry a greater amount of fire extinguishing material without any appreciable increase in effort, thereby providing a significantly greater fire fighting capability than is possible with existing thirty-pound hand-held fire extinguishers, which are the present standard. These improved capabilities have been proven in tests of the present device in comparison with a standard hand-held extinguisher, and the results of such tests are included here as being illustrative of these improved characteristics.

EXAMPLE I

The dual container extinguisher of the present invention was first compared with a standard hand-held 30 pound dry chemical extinguisher in tests that did not involve fires to provide a basis for comparing the two devices. The results of these tests are set forth in the following table:

TABLE

Characteristic	Standard hand-held extinguisher	Dual container extinguisher
Powder charge.....	30 pounds Purple K.	40 pounds Purple K.
Propellant.....	8 1/4 ounce CO ₂ cartridge.	8 1/4 ounce CO ₂ cartridge.
Time of discharge.....	23.7 seconds.	27.0 seconds.
Reach of discharge.....	40 feet 6 inches.	47 feet 0 inch.
Height of nozzle above grade.....	3 feet 2 inches.	3 feet 2 inches.
Weight fully loaded.....	53 pounds.	73 pounds.
Weight, discharged.....	34 pounds.	47 pounds.

This test was conducted outdoors with negligible wind velocity. It was found that a small quantity of dry chemical powder was left in the bottom of each container in the dual container unit, indicating that a larger CO₂ cartridge could be used and would provide further improved results.

EXAMPLE II

The fire extinguishing ability of the dual container device of the present invention was compared to the standard hand-held extinguisher to illustrate the improved capability of the present device. A fire was ignited in a cylindrical drum fifteen feet in diameter and eighteen inches high loaded with 200 gallons of No. 6 fuel oil, with five gallons of gasoline being used as a starter. A fifty-five gallon drum was located in the middle of the cylinder and a four-foot by six-foot steel plate was mounted on the wall of the cylinder to provide fire hiding places. After the fire had been ignited, the standard thirty-pound hand-held extinguisher was used by an experienced operator in an attempt to put out the fire. This unit provided twenty-three seconds of firing the extinguishing powder, and when

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the extinguisher was depleted, the fire was still burning. This unit was thus unsuccessful in extinguishing the fire.

The dual container extinguisher of the present invention was then used on a fire of the type described above. An experienced operator fired the extinguisher in short bursts and in a period of thirty-six seconds succeeded in extinguishing the fire. After the fire was out, four seconds of continuous powder firing remained in the extinguisher.

EXAMPLE III

In a second test to establish the fire extinguishing capability of the present invention, a fire was set in a cylinder that was five feet in diameter and twenty feet long, the cylinder lying on its side on the ground. One end of the cylinder was open, and a side door was provided. A fuel oil fire was started in two split fifty-five gallon drums located on a rack adjacent the cylinder, with oil spillage in the cylinder. In addition, a forty-foot long, sixteen inch diameter, sloping trough with small holes at six foot intervals was fed with a continuous flow of gasoline from its upper end, and the gasoline ignited. The holes in the trough allowed gasoline to fall to the ground, causing a continuous surface fire.

A standard thirty-pound hand-held extinguisher operated by an experienced fire fighter was first used on the fire. One minute and fifty-six seconds of short and long bursts of powder from the hand-held unit failed to extinguish the fire in the cylinder, and no powder was left for the trough fire.

The dual container extinguisher of the present invention was operated for forty seconds of short and long bursts of powder by an experienced operator. This succeeded in extinguishing both the cylinder and trough fires, with fifteen seconds of continuous powder firing remaining. It was observed that the dual extinguisher discharged a greater amount of powder per unit time than the standard unit, and this appeared to be a factor in the success of this unit.

EXAMPLE IV

To illustrate the ease of operation of the present device, a fire was established in a forty-foot long, sixteen inch diameter sloping trough. The trough had holes at six-foot intervals, and was provided with a continuous feed of gasoline into the upper end of the trough. Leakage of gasoline through the holes produced a continuous surface fire. An inexperienced, untrained operator was asked to extinguish this fire with the device of the present invention. This operator had only fired a single thirty-pound hand-held extinguisher prior to this test.

The untrained operator easily extinguished the trough fire and the surface fire caused by the gasoline leakage. The gasoline was again ignited and with the residual powder in the extinguisher, the same operator again extinguished the fire; thereafter, the operator fired eight seconds of continuous powder from the dual extinguisher of the present invention. The preceding tests clearly illustrate the greatly improved operation of the fire extinguisher of the present invention as compared with presently used standard dry chemical extinguishers.

Thus, there has been described a dual container dry chemical fire extinguisher which produces by reason of its construction a significant advantage in extinguishing fires. By arranging the device to be carried on the back of the operator, the operator's hands are freed for other activities such as climbing ladders or the like, and enables him to use one or both hands to direct the spray. The back-pack arrangement provides the operator with greater mobility while the long discharge hose and pistol grip nozzle provide increased flexibility of operation and improved aim. Although the present invention has been described in terms of a specific embodiment, it will be apparent that numerous modifications can be made without

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departing from the true spirit and scope of the invention as defined in the following claims.

I claim:

1. A unitary portable dry chemical fire extinguisher comprising:

- first and second generally cylindrical containers for receiving dry chemical fire extinguishing powder;
- a gas pressure manifold connected between the upper ends of said first and second containers;
- a discharge manifold connected between the lower ends of said first and second containers, said pressure and discharge manifolds interconnecting said containers;
- a generally cylindrical propellant gas cartridge connectable to the interiors of said containers through said pressure manifold said cartridge being connected to said pressure manifold between said first and second containers and through a valve assembly, said valve assembly being operable to retain said propellant gas in said gas cartridge until said fire extinguisher is to be used, and being operable to charge said containers equally with said propellant gas;
- a curved connecting plate extending between and joining said first and second container in spaced parallel relationship to form a rigid and strong container structure, said connecting plate partially enclosing said gas cartridge;
- a bracket means located at the upper and lower ends of each said cylinder;
- harness means secured to said bracket means, said harness means being so arranged that said extinguisher may be carried on the back of an operator and will provide a balanced, evenly distributed load;
- a discharge hose connected to the interiors of said containers through said discharge manifold so that said powder is discharged evenly from said two containers to maintain a balanced load;
- a discharge nozzle for said discharge hose;
- a manually operated discharge valve for regulating the flow of said powder to said nozzle; and
- means for operating said valve, including a trigger means pivotally connected to said nozzle and operatively connected to said discharge valve, and grip means secured to said nozzle adjacent and generally parallel to said trigger means, whereby the operator may squeeze said trigger toward said grip means to operate said discharge valve.

2. The fire extinguisher of claim 1, wherein each of said first and second containers includes an opening for receiving said first extinguishing powder, whereby said extinguisher can be loaded and reloaded after use.

3. The fire extinguisher of claim 1, wherein said gas cartridge is parallel to said first and second containers.

4. The fire extinguisher of claim 1, further including mounting brackets on said containers for hanging said extinguisher in a vertical position, whereby an operator can quickly pick said extinguisher up for use.

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