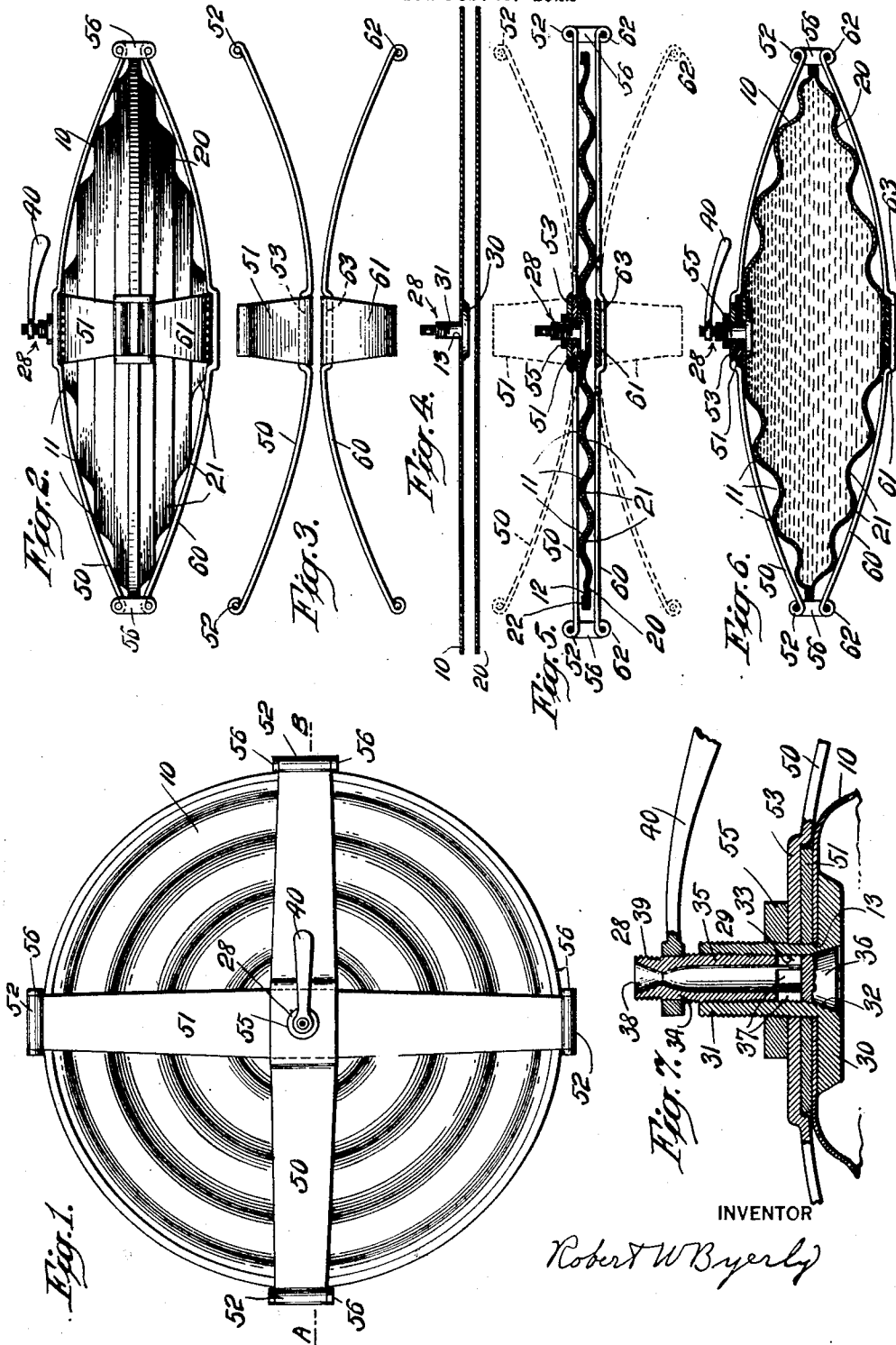


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FIRE EXTINGUISHER

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UNITED STATES PATENT OFFICE.

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FIRE EXTINGUISHER.

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This invention relates to fire extinguishers, and has for an object to provide a simple, reliable fire extinguisher containing a fire extinguishing liquid which is maintained always under pressure so that it may be projected upon a fire by the mere opening of a valve.

In accordance with the invention a body of fire extinguishing liquid, which is preferably carbon tetrachloride or a liquid containing carbon tetrachloride, is enclosed within a closed container which it completely fills. All or a part of the container is made of flexible sheet material and so formed that the internal volume of the container may be varied by a bending of this flexible sheet material. Resilient means are provided to exert pressure on the outer surface of the container tending to cause a reduction in the volume of the container, and the body of fire extinguishing liquid within the container is thus maintained constantly under pressure. Since the variation in the volume of the container is obtained by bending of the container of parts thereof, the container may be made of sheet material which, while flexible, is substantially inextensible and uncontractable, such as, for example, flexible sheet metal.

The container is preferably given such a form that its internal volume may be reduced, by a bending of the material of which the container is made, to substantially zero, and the external resilient means are most desirably so formed that they exert a substantial pressure against the container when its volume is reduced to zero. As a result, substantially all the liquid in the container is ejected when an outlet in the container is opened, and pressure upon the liquid is maintained throughout the emptying of the container.

Other objects and advantages of the invention are hereinafter pointed out in connection with a description of an extinguisher embodying the invention which is shown in the accompanying drawings and a method of making this extinguisher which also embodies the invention. In the drawings:—

Fig. 1 is a top view and Fig. 2 a side view of the completed extinguisher;

Fig. 3 is a side view of the external springs showing them in their normal form;

Fig. 4 is a sectional view taken on the line A—B of Fig. 1 and showing the form of the

pieces of which the container is made, before the pressing operation;

Fig. 5 is a sectional view taken on the line A—B of Fig. 1 and showing the container after the pressing operation and after the springs have been applied thereto;

Fig. 6 is a section on the line A—B of Fig. 1, showing the completed extinguisher and illustrating the form of the container and springs after the container has been filled; and

Fig. 7 is a detailed sectional view showing the valve.

The container of the extinguisher illustrated is made from two circular pieces 10, 20 of sheet metal. Sheet brass is a satisfactory material for them. A valve is secured to one of the pieces 10, 20, or between the two pieces, and this is most desirably done before the container is formed. While it should be understood that the invention is by no means limited to the use of any particular type of valve or to the insertion of the valve in any particular part of either of the pieces of sheet material, the valve illustrated in the drawing and the method of applying this valve to the container will be described for the purpose of illustration. As best seen in Fig. 7, the valve 28 has a body 29 comprising a disc-shaped portion 30 having a flat upper surface and a tubular portion 31 extending upwardly from the center of the disc-shaped portion. The tubular portion 31 is externally threaded. The body 29 of the valve is provided with a central bore, the inner portion of which forms a conical valve seat 32 while the outer portion 33 is internally threaded. The inner member 34 of the valve includes a hollow stem portion 35 and a solid portion 36 which has a conical valve surface corresponding to the conical valve seat 32. The inner portion of the valve stem 35 is externally threaded and screwed into the threaded portion 33 of the bore of the valve body 29. Lateral openings 37 are provided near the inner end of the valve stem 35. The bore of the valve stem is formed to provide a nozzle 38 at its outer end. The outer surface of the outer end of the valve stem 35 is most desirably provided with an external screw thread 39, this thread being formed in the opposite direction from the thread at the inner end of the valve stem. A handle 40 may be ap-

plied to the valve stem between its two threaded portions.

In order to provide for the insertion of a valve of the type illustrated, one of the pieces of sheet material, for example, the piece 10 is provided at its center with a hole 13. After the valve 28 with the exception of the handle 40, which is applied later, has been assembled, the tubular portion 31 of the valve body 29 is inserted in the hole 13 of the piece 10, while the top of the dish-shaped portion 30 of the valve body is secured to the portion of the piece 10 which surrounds the hole 13 by brazing, spot welding or otherwise. The position of the valve 28 in the piece 10 is illustrated in Fig. 4.

The container is formed from the pieces 10 and 20 shown in Fig. 4 by a single pressing operation. In this pressing operation corresponding concentric corrugations 11, 21 are formed in the pieces 10, 20, while the outermost portions 12, 22 of the two pieces are crimped together so that the two pieces are united about their peripheries and form a container of zero volume which is illustrated in Fig. 5. If desired, the two pieces may be secured together about their peripheries by welding instead of crimping, or by both means, or in other known manner.

The next step in making the extinguisher consists in applying to the container the external springs 50, 51, 60, 61. The normal form of these springs is illustrated in Fig. 3. It will be noted that the springs are normally curved and that the outer end of each spring is turned over to form the eyes 52, 62. Each of the springs 50, 60 is provided near its center with an offset portion 53, 63 adapted to fit over the springs 51, 61 respectively when the two springs of each set are assembled so as to cross each other at right angles. The springs 50, 51 each contain at their center a hole of substantially the same diameter as that of the tubular portion 31 of the valve body 29.

After the container has been given the form illustrated in Fig. 5, the springs 50, 51 are placed on top of the container with their convex sides inward, and the tubular portion 31 of the valve body is inserted in the holes in these springs. The springs are then firmly secured to the container by a nut 55 which is screwed upon the tubular portion 31. The springs 60, 61 are placed below the container with their convex sides inward. Means may be provided for securing the center of these springs to the center of the container, but such means have been found unnecessary. The position of the two sets of springs when first applied to the container is illustrated in dotted lines in Fig. 5.

The next step consists in securing together the corresponding ends of the two sets of springs. This is done by bending the outer portions of the springs toward the container

by applying sufficient external pressure, by means of a press, or otherwise, to overcome the resiliency of the springs. While the springs are held flat against opposite sides of the container by the external pressure applied, the outer end of the spring 50, 51 are secured to the outer ends of the springs 60, 61 by means of shackles 56. The external pressure may then be released and the parts will retain the position illustrated in Fig. 5. It will be noted that when in this position the springs exert an inward pressure upon opposite sides of the container. It should be noted also that each spring is slightly longer than the diameter of the container so that a clearance is allowed between the shackles 56 and the periphery of the container.

The next step in making the extinguisher consists in filling the container with carbon tetrachloride or a liquid containing carbon tetrachloride or other fire extinguishing liquid. Before this is done, however, the handle 40 should be applied to the valve stem 35. The filling is accomplished by connecting the valve stem 35 with a supply of liquid under pressure and opening the valve 28 by screwing the valve stem inwardly in the valve body. The liquid may be supplied through a pipe having an internal thread at its outer end and the thread 39 of the valve stem may be screwed into this pipe by turning the handle 40 which at the same time screws the valve stem inwardly in the valve body, opening the valve. The liquid under pressure passes through the bore of the valve stem 35 through the lateral openings 37 between the seat 32 and the conical portion 36 and enters between the pieces 10, 20. The liquid forces the two sides of the container apart, bending each of the springs in the reverse direction from its normal curvature. When the desired quantity of liquid has been introduced the supply of liquid is cut off and the valve stem 35 is screwed outwardly, closing the valve and disconnecting the valve stem from the liquid supply. The extinguisher then has the form shown in Figs. 1, 2 and 6. It should be noted that as the springs are bent during the filling of the container the outer ends of the springs are drawn inwardly toward the periphery of the container. The clearance allowed between the shackles 55 and the periphery of the container when the container is empty and the springs straight is, however, made sufficiently large so that the shackles do not strike the periphery of the container until the container is completely filled.

After the container has been filled, the liquid therein is retained constantly under pressure by the resiliency of the springs which tend to press opposite walls of the container inward. In order to use the extinguisher it is merely necessary to turn the handle 40 so as to open the valve 28 and

direct the nozzle 38 toward the fire. When this is done the resiliency of the springs will compress the container and force the liquid through the nozzle. The pressure of the springs upon the container and consequently upon the liquid is continued throughout the discharge of the contents of the container.

The extinguisher is dependable and remains ready for use over long periods. The ends of the springs are free from constraint in directions longitudinal of the springs so that the springs tend always to resume their normal form. The springs conform closely to the contour of the container whether the container is filled or empty and so do not materially increase the size of the extinguisher.

It should be understood that the extinguisher illustrated and described is merely an example of an embodiment of the invention and that many changes in the form, shape and arrangement of the embodiment described may be made without departing from the scope of the invention.

I claim as my invention:

1. A fire extinguisher, comprising a metal container of variable volume having a continuous self-sustaining wall adapted to confine a body of liquid, and a spring secured to said container and urging its wall inwardly to maintain a body of liquid in the container constantly under pressure.

2. A fire extinguisher, comprising a closed container including a portion of substantially inextensible and uncontractable flexible sheet material formed so as to permit a variation in the volume of the container by a bending of the said sheet material, and resilient means located outside the container and so as to exert an inward pressure upon said flexible material tending to reduce the volume of the container and to maintain a body of fire extinguishing liquid in the container under pressure, said flexible sheet material having sufficient strength to resist the pressure of the confined liquid.

3. A fire extinguisher, comprising a closed receptacle having a self-sustaining wall made of substantially inextensible and uncontractable flexible sheet material so formed that the volume of the container may be reduced to substantially zero by a bending of said material, and resilient means located outside said container and so as to exert an inward pressure upon a wall of said container tending to reduce the internal volume of the container and to maintain a body of fire extinguishing liquid in the container constantly under pressure.

4. A fire extinguisher, comprising a closed receptacle composed of pieces of metal rigidly secured together and including a portion of flexible sheet metal formed so as to permit a variation in the volume of the container by a bending of said sheet metal, and resilient

means secured to said container and adapted to exert an inward pressure against said flexible portion of the container tending to reduce the volume of the container and to maintain a body of fire extinguishing liquid in said container under pressure, said flexible sheet material being of sufficient strength to resist the pressure of the confined liquid.

5. In a fire extinguisher, the combination of a container formed of two pieces of sheet metal secured together at their peripheries, one of said pieces consisting of flexible sheet metal and being formed so as to be stretchable and contractable in directions perpendicular to its periphery, and a spring arranged to exert an inward pressure upon said flexible piece.

6. In a fire extinguisher, the combination of a flexible container and a pair of spring bars disposed upon opposite sides of said container with their ends secured to each other and adapted to pinch the container between them.

7. In a fire extinguisher, the combination of a flexible container and a pair of spring bars disposed upon opposite sides of the container with their ends secured together, the normal form of said spring bars being such that the middle portions of the two spring bars are urged together by the resiliency of the spring bars.

8. In a fire extinguisher, the combination of a flexible container and a pair of normally curved springs disposed upon opposite sides of said container with their normally convex sides inward and secured together at their ends by means which are spaced outwardly from the periphery of the container when the springs are held substantially straight.

9. In a fire extinguisher, the combination of a flexible container and a pair of normally curved springs disposed upon opposite sides of said container with their normally convex sides inward and secured together at their ends by means which are spaced outwardly from the periphery of the container when the springs are held substantially straight, said pair of springs being secured to the container near the center of one of the springs.

10. In a fire extinguisher, the combination of a container formed of two concentrically corrugated pieces of sheet metal secured together at their peripheries, and a pair of spring bars extending across the container upon opposite sides thereof and secured together at their ends.

11. In a fire extinguisher, the combination of a container formed of two concentrically corrugated pieces of sheet metal secured together at their peripheries, and a pair of springs extending across the container upon opposite sides thereof and secured together

at their ends, the normal form of said springs being such that the middle portions of the springs are urged toward each other by the resiliency of the springs.

12. A fire extinguisher, comprising the combination of a container formed of two concentrically corrugated pieces of sheet metal secured together at their peripheries, and a pair of normally curved springs extending across the container upon opposite sides thereof with their normally convex sides inward and connected together at their ends by means which are spaced outwardly from the periphery of the container when the springs are held substantially straight.

13. A fire extinguisher, comprising a container consisting of two circular pieces of sheet metal concentrically corrugated and secured together about their peripheries, a plurality of springs disposed diametrically of said container at one side thereof and secured to said container at their middles, a plurality of corresponding springs disposed diametrically at the other side of the container, and means connecting the ends of the

springs upon one side of the container to the ends of the corresponding springs upon the other side of the container and spaced outwardly from the periphery of the container when the container is empty.

14. In a fire extinguisher, the combination of a flexible container and a pair of bars disposed on opposite sides of the container with their ends secured together, one of said bars being resilient and adapted to pinch the container between it and the other bar.

15. In a fire extinguisher, the combination of a container formed of two pieces of sheet metal secured together at their peripheries, one of said pieces consisting of flexible sheet metal and being concentrically corrugated, and a pair of bars extending across the container on opposite sides thereof and secured together at their ends, one of said bars being resilient and adapted to pinch the container between it and the other bar.

In testimony whereof I have hereunto set my hand.

ROBERT W. BYERLY.