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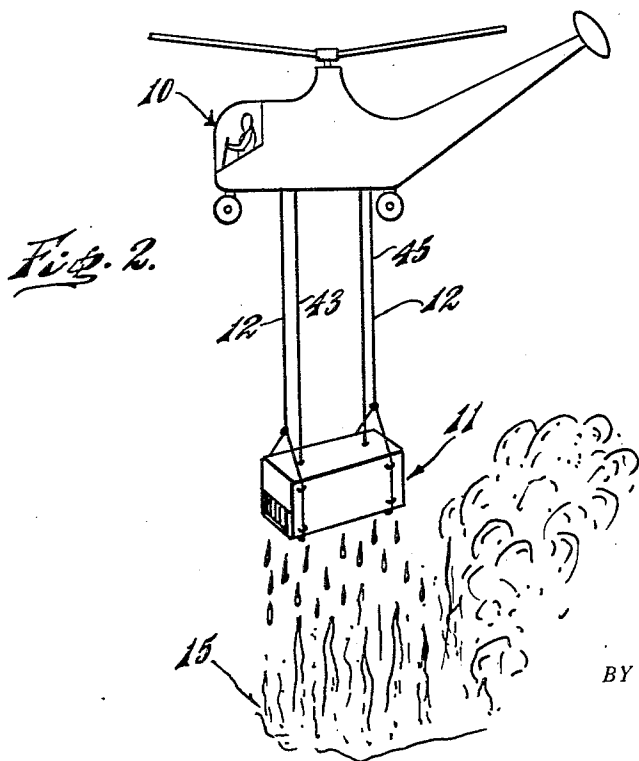
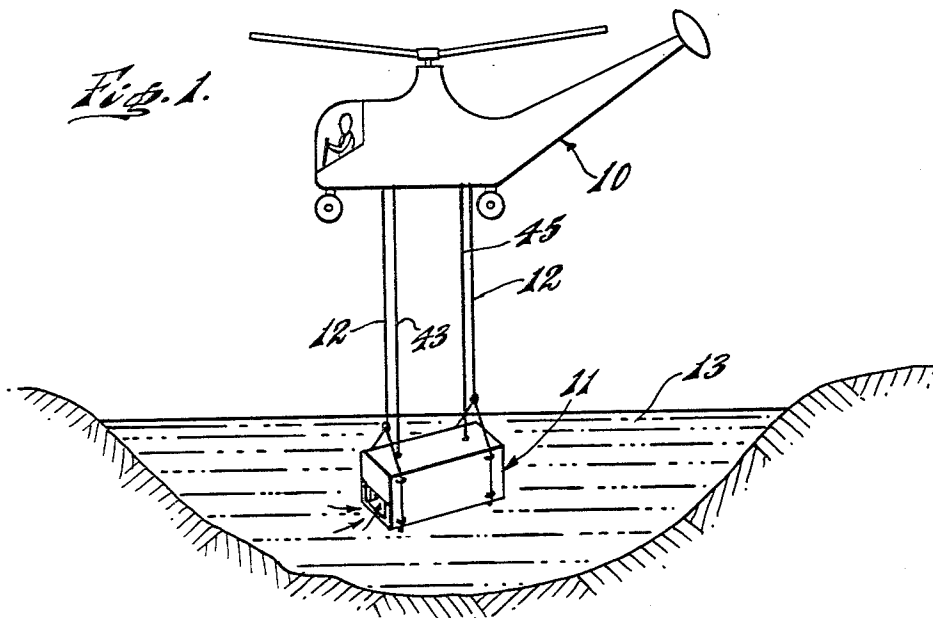
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3,485,302

APPARATUS FOR FIREFIGHTING AND THE LIKE

Filed March 15, 1968

2 Sheets-Sheet 1



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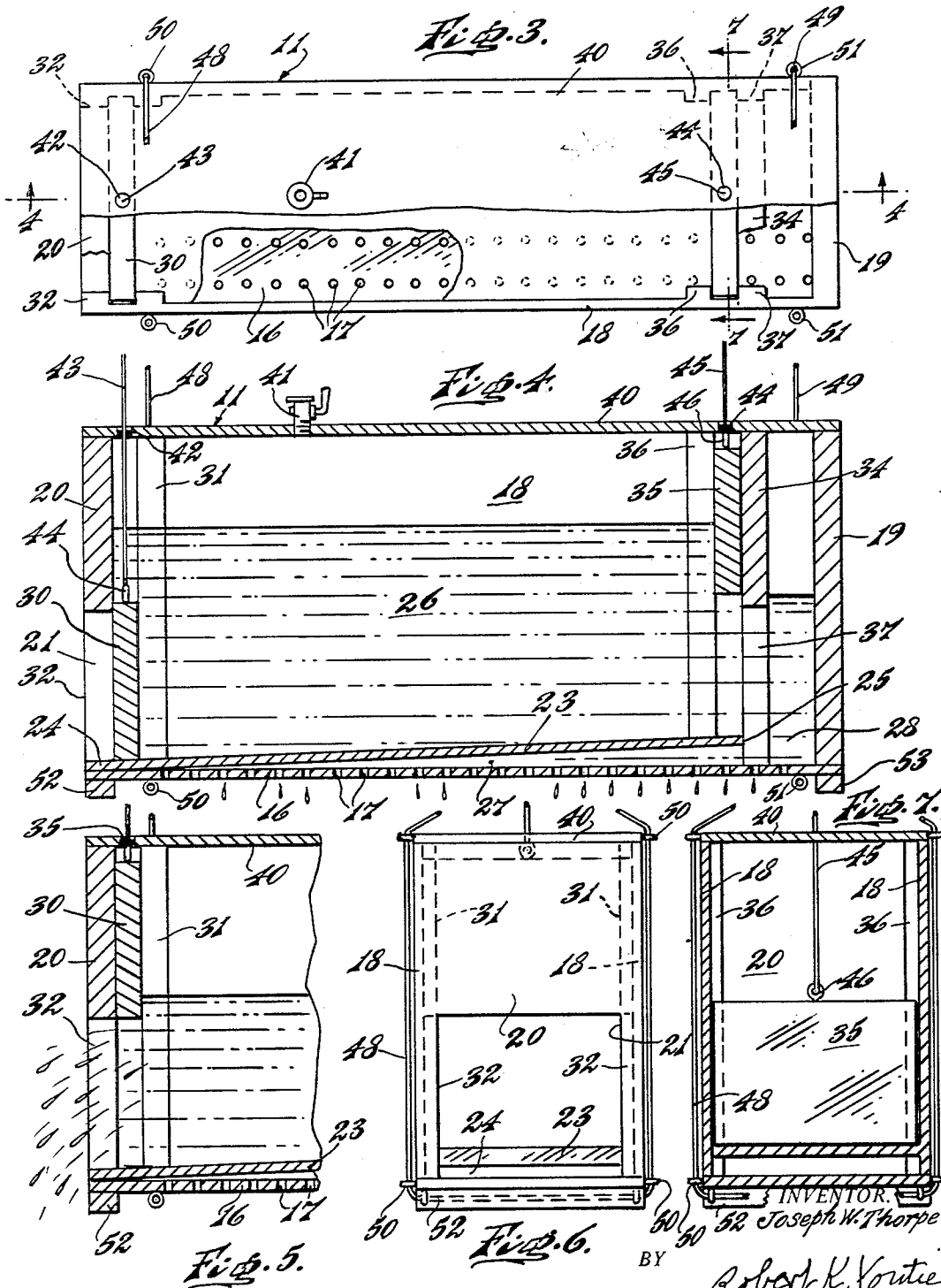
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2 Sheets-Sheet 2



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1

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APPARATUS FOR FIREFIGHTING AND THE LIKE
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9 Claims

ABSTRACT OF THE DISCLOSURE

The instant disclosure relates to a vessel for containing fluid and adapted to be suspended from an air vehicle, the vessel having openings and valve means permitting of convenient filling and discharge of the vessel.

BACKGROUND OF THE INVENTION

As is well known to those versed in the firefighting arts, it has been proposed in the past to carry a fluid-containing vessel suspended from an air vehicle, such as a helicopter or the like, for discharge of fluid from the vessel onto a fire. However, prior devices of this type have not found general acceptance for many reasons. For example, such prior devices have been relatively complex in construction and expensive to manufacture, lacking in reliability and often requiring highly experienced operating personnel.

While the device of the present invention has been primarily developed for use in fighting fires, such as forest fires and the like, and will be illustrated and described herein with particular reference thereto, it is appreciated that the instant device is capable of many varied applications, such as spraying crops and other operations wherein a liquid, gas or particulate solid material may be aerially dispensed, all of which are intended to be comprehended herein.

SUMMARY

Accordingly, it is an important object of the present invention to provide apparatus for fighting fires and like operations which overcomes the above-mentioned difficulties, is extremely simple in structure, entirely reliable throughout a long useful life, and which can be economically manufactured for sale at a reasonable price.

It is another object of the present invention to provide apparatus having the advantageous characteristics mentioned in the preceding paragraph wherein a flowable material may be optionally dispensed in a fine or heavy discharge from an aerial carrier over a selected area in a simple, safe and expeditious manner.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is an elevational view showing apparatus of the present invention in performance of a filling operation.

FIGURE 2 is an elevational view showing apparatus of the present invention in a discharging operation.

FIGURE 3 is a top view of applicant's fluid-holding vessel, partly broken away for clarity of understanding.

FIGURE 4 is a longitudinal sectional elevational view taken generally along the line 4-4 of FIGURE 3, and showing the vessel in a fine-discharging condition.

FIGURE 5 is a partial longitudinal sectional elevational view similar to FIGURE 4, but illustrating a heavy-discharging condition of operation.

FIGURE 6 is an end view taken from the left-hand end of FIGURE 5, showing the heavy-discharge condition.

FIGURE 7 is a transverse sectional view taken generally along the line 7-7 of FIGURE 3, but showing a closed-gate condition.

2

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawing, and specifically to FIGURES 1 and 2 thereof, an air vehicle is there generally designated 10, such as a conventional helicopter. A vessel for containing flowable material is generally designated 11, and illustrated beneath the helicopter 10, being suspended from the latter by cables 12, or other suitable means. The length of cables 12 may advantageously be adjustable remote from the vessel 11, say by winch means interiorly of the helicopter 10 (not shown) different distances of the vessel beneath the helicopter being desirable for different operations and under different conditions.

In the condition shown in FIGURE 1, the vessel 11 is submerged in a pond 13, or other suitable body of water, to fill the vessel with liquid. By suitable valve means, the vessel 11 is selectively opened to receive liquid, closed to retain the liquid, and subsequently opened to discharge the liquid. Such a discharging operation is shown in FIGURE 2, liquid being dispensed from the vessel 11 in a relatively fine discharge, as over a forest fire 15. Of course, the lengths of cables 12 are selected, as by the hereinbefore described winch means in helicopter 10 to locate the vessel a desired distance over the fire, while maintaining the vehicle 10 safely spaced above the fire, and such that the downdraft produced by a helicopter will not adversely affect the firefighting operation.

Referring now to FIGURES 3 and 4, the vessel 11 is there shown in greater detail, as being defined by an elongate tank, which may be of generally rectangular configuration, including a generally rectangular bottom wall 16 which may have formed therethrough a multitude of discharge apertures or openings 17.

Upstanding from opposite longitudinal side edge margins of the bottom wall 16 are a pair of generally parallel, facing spaced side walls 18. At one end of the bottom wall 17, upstanding therefrom and extending laterally between the adjacent ends of the side walls 18, is an end wall 19. The side walls 18 and end wall 19 may be impervious to liquid or flowable material, as illustrated. Remote from the end wall 19, extending laterally between the side walls 18, being generally vertically disposed and spaced over the bottom wall 16 is an end wall 20. Thus, the end walls 19 and 20 are in generally parallel spaced facing relation, the latter end wall being spaced over the bottom wall 16, the space therebetween defining a relatively large discharge opening 21, as will appear more fully hereinafter.

While any suitable materials may be employed in constructing the instant vessel 11, it is believed that metal, such as aluminum, having welded joints, will serve advantageously by reason of its strength and corrosion resistance. Of course, wood, plastic or other materials may be employed, if desired.

Interiorly within the vessel 11, spaced over the bottom wall 16, is an inner floor or platform 23. The inner floor or platform 23 may be of generally rectangular configuration, having one end region 24 resting on the bottom wall 16 in a lower region of the opening 21. From the adjacent end of bottom wall 16, the inner floor or platform 23 may extend longitudinally along the bottom wall, obliquely upward in space relation over the latter, terminating at an end edge 25 spaced short of the vessel end wall 19. The inner floor or platform 23 extends laterally between the side walls 18 and may be secured in sealed relation thereto along its side edges by any suitable means. In this manner, the inner floor or platform 23 subdivides the interior of the vessel 11 into an upper space 26 over the platform, and a lower space 27 beneath the platform. The end edge 25 of plat-

form 23, by its termination short of the vessel end wall 19, combines with the latter to define in the space therebetween a transfer passageway 28, as for passing fluid between the upper space 22 and lower space 27 as will appear more fully hereinafter.

Just inward of the end wall 20 is disposed a valve element, gate or plate member 30, slidable between a generally vertical lower position (as seen in FIGURE 4) and a generally vertical upper position (as seen in FIGURE 5). That is, the gate 30 is disposed in a generally vertical plane for shifting movement between its upper position in facing relation with the interior surface of the end wall 20, wherein the space 21 is open, and a vertically disposed lower position extending across and closing the opening 21. For simplicity, the valve gate 30 may slide on the inner face of end wall 20, being constrained to movement in a vertical plane by suitable guides or way means 31 fixed on the inner surfaces of side walls 18, spaced inward from the end wall 20, and additional guides or way means 32 fixed on the inner surfaces of the side walls bounding the opening 21. Thus, the gate 30, its guide means 31 and 32, and end wall 20 combine with the end wall opening 21 to define a valve for communication therethrough between the interior and exterior of the vessel 11.

Interiorly of the vessel 11, adjacent to and spaced inward from the end wall 19, there is fixed a partition or inner wall 34 adjacent and spaced over the end 25 of platform 23. More particularly, the partition or inner wall 34 is disposed in a generally vertical plane, parallel to and spaced from the adjacent end wall 39, extending laterally between and fixedly secured to upper regions of the side walls 18. The partition or inner wall 34 is suitable secured in sealed relation to the side walls, being spaced over the bottom wall 16 and above the platform 23. On the inner side of the partition 34 is vertically disposed a valve member, gate or plate 35. The valve member or gate 35 is vertically shiftable, in a vertical plane between its upper position of FIGURE 4 and a lower position of FIGURE 7. In its lower position, the valve member or gate 35 may have its lower edge seated in substantially sealing relation on the upper surface of platform 23, proximate to the platform end 25, and extends laterally between the side walls 18 and vertically upward beyond the lower edge of partition 34. Thus, the gate 35 in its lower position of FIGURE 7 effectively closes the space between partition 34 and bottom wall 23. Suitable guide members or way means may be fixed to the inner surfaces of side walls 18, such as guide members 36, just inward of the plate 35. Additional guide members or way means 37 may be fixed to respective side walls 18, depending beneath and substantially coplanar with the partition 34, so that the guide members 36 and 37 combine with the partition to effectively constrain the valve member or gate 35 to vertical coplanar movement between its upper and lower positions.

If desired, a top wall 40 may extend across the upper side of vessel 11, in closing relation with respect thereto. In particular, the top wall 40 may extend laterally between the upper edges of side walls 18, and longitudinally between the upper edges of end walls 19 and 20, being suitably fixed thereto in sealed relation therewith. Further, the partition or inner wall 34 may have its upper region fixedly secured in sealed relation to the underside of the top wall 40.

Advantageously, the top wall 40 may be provided with a vent valve 41, which may also serve as the fill hole. The vent-fill hole 41 may be any suitable valve, and may be adapted for remote operation, say from a suspending vehicle, if desired.

The top wall 40 is further provided with a thru opening 42, which slidably receives a control cable 43 passing through the hole and having its lower end connected, as at 44 to the valve gate 30. The cable 43 may extend upwardly as for connection in the helicopter 10 to a control

mechanism, such as a winch, or the like. The top wall 40 is similarly formed with a thru opening 39 over the valve gate 35 and slidably passes a cable 45 in sealed relation through the opening for connection at its lower end 46 to the gate 35. The cable 45 may also extend upwardly for connection to an actuating mechanism in the helicopter 10. In this manner, the gate valves 30 and 35 are both remotely operable from the suspending vehicle 10.

In order to reinforce the vessel 11 when suspended from the vehicle 10, a pair of cables 48 and 49 may extend about respective end regions of the vessel, and each be connected to a respective suspension cable 12. The reinforcing-carrying cables 48 and 49 may be retained in position about the vessel 11, as by passage through eyes 50 and 51 fixed to the vessel exteriorly thereof. Also exteriorly of the vessel may be secured a pair of elongate support members, as at 52 and 53. The support members 52 and 53 are secured to the underside of the bottom wall 16, extending along respective ends of the bottom wall and depend therefrom for engagement with a ground surface to maintain the bottom wall spaced over the ground surface. This effectively prevents interference with the bottom wall apertures 17.

The operation is believed apparent from the foregoing description, so that a brief summary will suffice. In the condition of FIGURE 1, the vessel 11 is suspended from the carrying air vehicle 10 and submerged in a body of liquid 13. The cable 43 is taken up to raise the valve gate 30 and open the opening 21 for entry therethrough of liquid into the interior of the vessel. During this filling procedure, the valve gate 35 is lowered to closed position by letting out on the cable 45, so that liquid is retained in the space 26 over the inner floor 23. Upon lowering or closing of the valve gate 30, the filled vessel 11 may be transported to the desired location of use, and the contents there discharged.

One manner of discharge is illustrated in FIGURES 2 and 4, the valve gate 35 being drawn upward to an open position, for gravitational movement of the fluid contents through the passageway 28 into the space beneath platform 23 for discharge through the bottom wall aperture 17. This effects a relatively fine discharge in the manner of a spray or shower. Alternatively, or simultaneously, the valve gate 30 may be elevated to an open position for discharge through the end wall 20 of the vessel contents, as indicated in FIGURE 5. This is a relatively heavy or high-volume discharge, if required.

Of course, the vessel 11 may be filled otherwise than by submergence as in FIGURE 1, say by a conduit communicating through the vent-fill hole 41. If desired, the vessel 11 may be filled through the hole 41 at a pressure greater than atmospheric, for pressurized discharge of the contents. This may be advantageous in certain operations, such as crop spraying, the discharge of firefighting chemicals, or other. The use of the vent-fill hole for filling also frees the vessel 11 from the carrying vehicle 10 during the filling procedure, so that a single vehicle may be employed in conjunction with more than one vessel, carrying the vessels sequentially while those not being carried are filled.

From the foregoing, it is seen that the present invention provides apparatus for aerial firefighting, and for other uses which fully accomplishes its intended objects and is well adapted to meet practical conditions of manufacture and operation.

Although the present invention has been described in some detail by way of illustration and example, for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. Apparatus for firefighting and the like adapted to be suspended from an air vehicle, said apparatus comprising a vessel for containing fluid and having a bottom wall and a peripheral side wall upstanding from said bottom

5

wall, said bottom wall having discharge openings for dispensing fluid, a platform interiorly of said vessel and spaced over said bottom wall, said platform having a transfer opening adjacent to one region of said side wall for passing fluid between the spaces above and below said platform, valve means on said platform adjacent to said transfer opening and closable to prevent the passage of fluid between said spaces, and operating means connected to said valve means for opening the latter and extending exteriorly of said vessel for remote operation from a suspending vehicle.

2. Apparatus according to claim 1, said valve means comprising a partition extending across said vessel and having a thru opening, and a gate shiftable along said partition between closed and open positions with respect to said partition.

3. Apparatus according to claim 1, in combination with additional valve means mounted in another region of said side wall above said platform, said additional valve means being selectively openable to discharge fluid directly from the vessel space above said platform, and additional operating means connected to said additional valve means for operating the latter and extending exteriorly of said vessel for remote operation from a suspending vehicle.

4. Apparatus according to claim 1, said vessel comprising an elongate tank, said platform extending from one end of said tank between opposite sides thereof toward and terminating short of the other tank end to define said transfer opening between the termination of said platform and said other tank end.

5. Apparatus according to claim 4, said valve means being located at the terminus of said platform and comprising a partition extending laterally across said vessel, said partition having an opening in its lower region, and

6

a gate shiftable vertically along said partition between closed and open positions with respect to said partition.

6. Apparatus according to claim 5, in combination with additional valve means mounted in said one tank end above said platform, said additional valve means being selectively openable to discharge fluid directly from the vessel space above said platform, and additional operating means connected to said additional valve means for operating the latter and extending exteriorly of said vessel for remote operation from a suspending vehicle.

7. Apparatus according to claim 6, said additional valve means comprising an additional gate shiftable vertically along said one tank end, said one tank end having an opening therethrough adapted to be selectively closed by said additional gate.

8. Apparatus according to claim 1, in combination with cable means extending about said vessel adjacent to opposite ends thereof, for reinforcing said vessel and connectable to suspension means of an air vehicle.

9. Apparatus according to claim 1, in combination with a top wall on said vessel, for effecting complete closure of the vessel when said valve means is closed.

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