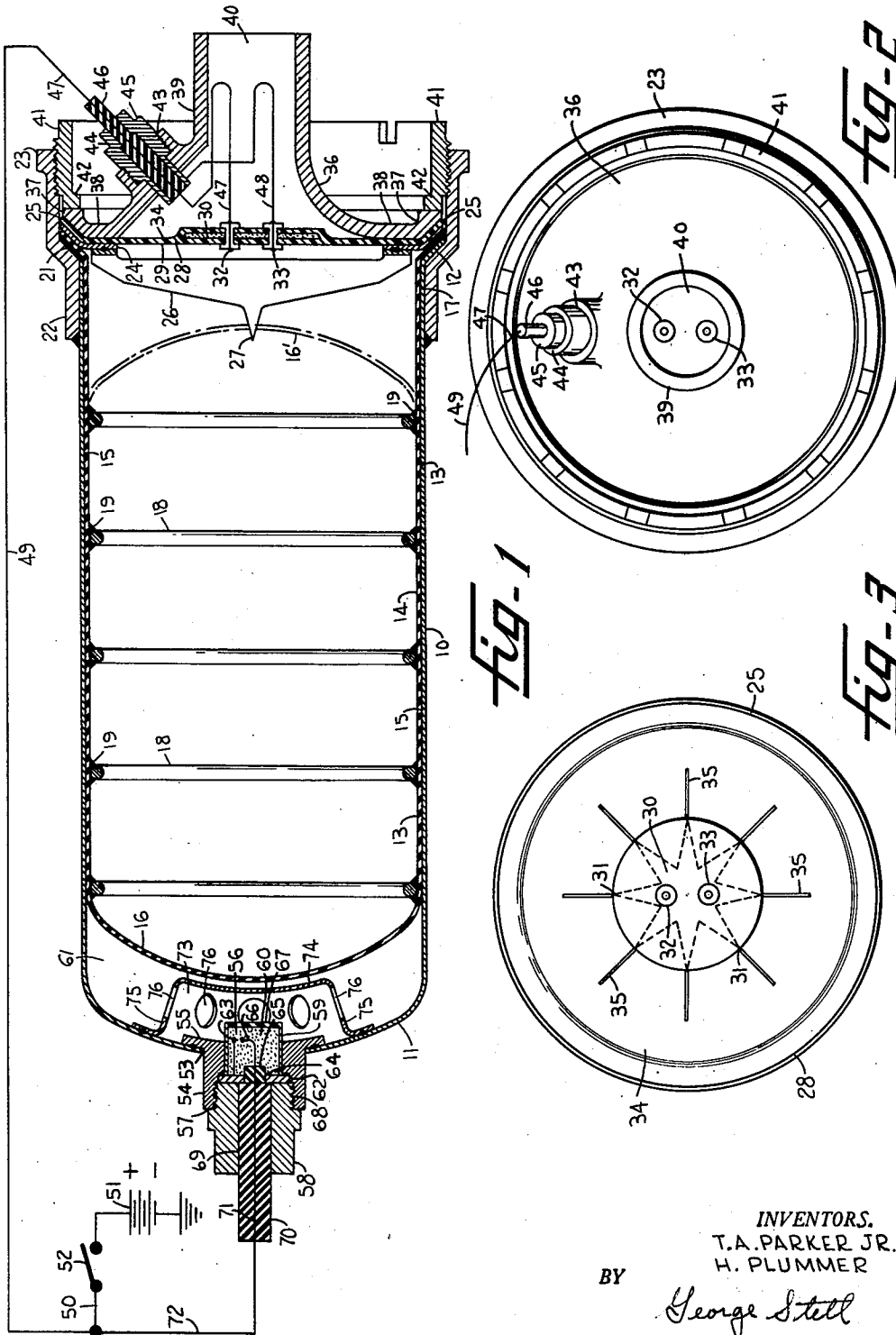


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T. A. PARKER, JR., ET AL
RAPID FLUID DISCHARGING MEANS

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INVENTORS.
T.A. PARKER JR.
H. PLUMMER
BY
George Stettin
AGENT

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RAPID FLUID DISCHARGING MEANS

Truman A. Parker, Jr., and Harold Plummer, La Jolla, Calif., assignors to Rohr Aircraft Corporation, Chula Vista, Calif., a corporation of California

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5 Claims. (Cl. 169-9)

This invention relates to a fluid reservoir and means for discharging fluid therefrom and more particularly to a reservoir containing a fire extinguishing fluid which may be connected to a fire extinguishing system and which has a discharge means actuated by a remote control.

In nearly all types of airplanes, particularly multiple engine airplanes, each engine nacelle is provided with a fire extinguishing system with which fires accidentally occurring around the engines may be extinguished. The system generally consists of an arrangement of tubes having outlets at various locations and having one or more reservoirs connected thereto from which fire extinguishing fluids are discharged into the system. The reservoirs generally contain fluids under pressure and are provided with a means for releasing the fluid into the system which is actuated by a remote control located in the pilot's compartment of the airplane. The use of fluid reservoirs containing pressurized fluids provides a supply of fire extinguishing fluid which may be quickly discharged into the desired areas when necessary. However, since the fire extinguishing system is used very infrequently, the possibility of the reservoirs developing a leak and being rendered inoperative by the loss of pressure is very likely, due to the severe engine vibrations to which the entire fire extinguishing system is constantly subjected.

It is, therefore, an object of this invention to provide a fluid reservoir containing a non-pressurized fluid having means for ejecting the fluid which is actuated simultaneously with the actuating of a means for releasing the fluid from the reservoir.

A further object is to provide a fluid reservoir as above described in which the fluid ejecting means and the fluid release means are actuated by a single remote control.

Another object is to provide a fluid reservoir which may be attached to a fire extinguishing system in any desired position.

A still further object is to provide a fluid reservoir which is not readily damaged and which does not have its operation affected by the engine vibrations to which it is subjected.

Another object is to provide a fluid reservoir as above described which is of sturdy and relatively inexpensive construction having positive acting fluid release and fluid ejection means.

These and other objects and advantages will become apparent as the description of the invention proceeds.

For a better understanding of the invention reference is made to the accompanying drawing illustrating a preferred embodiment thereof and in which:

Fig. 1 is a longitudinal section of the reservoir,

Fig. 2 is an end view of the reservoir,

Fig. 3 is an end view of the sealing member used in the end of the reservoir.

With reference to the drawing the reservoir comprises a rigid outer container 10 which is preferably made of metal and cylindrical in shape, having a closed end 11 and an open end 12. Positioned within container 10 is a flexible container 13 preferably made of thin rubber

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or other flexible and liquid impervious material, the wall 14 of which fits smoothly in sliding contact with the inner surface of wall 15 of container 10. Flexible container 13 has a closed end 16 spaced away from closed end 11 of container 10 and an open end 17 coinciding with open end 12 of container 10. Wall 14 of flexible container 13 is provided with reinforcing rings 18 attached thereto in spaced apart positions by vulcanizing or similar means as indicated at 19, which hold wall 14 in sliding contact with the inner surface of container 10 as shown.

Wall 15 of container 10 has an outwardly flared portion 21 at open end 12 around which a suitably shaped flange 22 is secured, the extending end 23 of which is internally threaded. A thin ring 24 having a portion 25 adjacent its outer edge disposed at an acute angle corresponding to the angle of flared portion 21 of wall 15, is positioned within the open ends of containers 10 and 13. A thin web 26 having its ends secured to ring 24 extends across ring 24 at the approximate center thereof, web 26 being provided with a sharp projecting portion 27 extending inwardly for a purpose to be explained. A flexible sealing member 28 is disposed within the open ends of containers 10 and 13 with its inner face 29 adjacent its edge in contact with portion 25 of ring 24. Sealing member 28 is preferably made of flexible combustible plastic such as Celluloid and has a double wall at its center to form a receptacle 30 shaped, as shown in Fig. 3, with outwardly projecting portions 31. Receptacle 30 is filled with an explosive material such as gunpowder and has two electrodes 32 and 33 extending thereinto for a purpose to be explained. The outer face 34 of sealing member 28 has narrow, shallow grooves 35 cut therein, each groove terminating at the end of one of projecting portions 31 of receptacle 30 for a purpose to be explained. A rigid end member 36 having a portion 37 of its wall 38 inclined at an angle corresponding to the angle of flared end portion 21 of container 10 and an outwardly projecting center portion 39 provided with an opening 40 passing therethrough, is positioned within the open ends of containers 10 and 13 with angular portion 37 in contact with sealing member 28. An externally threaded ring nut 41 surrounding end member 36 and in threaded engagement with the extending end 23 of flange 22 has a shoulder 42 arranged to press against the edge of angular portion 37 of wall 38 pressing portion 37 against sealing member 28 and thereby pressing sealing member 28 against portion 25 of ring 24 and a portion of wall 14 of container 13 against flared portion 21 of container 10 to provide a closure for the open ends of containers 10 and 13. End member 36 has a threaded opening 43 in which an electrical connecting terminal 44 is positioned which consists of a threaded metal shell 45 containing a dielectric core 46 through which an electrical connector 47 passes. Connector 47 is connected to electrode 32 in receptacle 30 and a ground wire 48 is connected to shell 45 and electrode 33 to provide a ground connection so that electrical current flowing through connector 47 to electrode 32 will arc across from electrode 32 to electrode 33 causing a spark which will ignite the explosive material in receptacle 30 for a purpose to be explained. Electrical current is supplied to connector 47 through a wire 49 connected thereto and to a lead 50 extending to a source of electrical current such as a battery 51 through a switch 52, preferably located within easy reach of the airplane pilot.

Closed end 11 of container 10 is provided with an opening 53 in which a rigid outwardly projecting collar 54 is secured. The lower end 55 of collar 54 is arranged to receive and support an explosive cartridge 56 and the upper portion 57 of collar 54 is internally threaded to receive a cartridge retainer 58. Cartridge 56 comprises a receptacle 59 which is filled with an explosive powder 60

and which extends inwardly from collar 54 into the area 61 between ends 11 and 16 of containers 10 and 13. The outer end wall of receptacle 59 within collar 54 consists of a rigid metallic plate 62 having a metallic electrode 63 attached thereto and extending into powder 60. Plate 62 is provided with a central opening 64 extending therethrough which contains a core 65 of electrical insulating material through which a metallic electrode 66 passes. Electrode 66 terminates at its outer end in a contact button of a known type (not shown) embedded in the outer end of core 65 and extends inwardly through core 65 into powder 60 sufficiently near to electrode 63 to establish a spark gap therebetween. The inner end wall 67 of receptacle 59 is composed of a thin easily ruptured material such as thin rubber.

Cartridge retainer 58 is preferably made of metal and has a threaded end 68 arranged to enter threaded end 57 of collar 54 and engage and press against plate 62. Retainer 58 is provided with a central opening 69 containing a core 70 of electrical insulating material through which an electrical connection 71 extends into contact with the outer end of electrode 66. Connector 71 is connected to lead 50 by means of a wire 72 to conduct electrical current to electrode 66 from battery 51. Electrical current passing through electrode 66 will arc across to electrode 63 connected to plate 62 thus producing a spark to ignite powder 60 for a purpose to be explained. To prevent end 16 of container 13 from being damaged by the heat of ignited powder 60 a flame and heat deflector is attached to the inner surface of container 10 over cartridge 56 near end wall 67 thereof. Deflector 73 has a solid end wall 74 and side walls 75 connected to container 10 which are provided with openings 76 extending therethrough.

To use the reservoir, container 13 is filled with fluid and ring 24, sealing member 28 and end member 36 are assembled and secured in the open ends of containers 10 and 13 as previously described, and projecting portion 39 of end member 36 is connected to the inlet of a fire extinguishing system (not shown). To eject the fluid into the fire extinguishing system, switch 52 is closed permitting electrical current from battery 51 to flow through lead 50 to wires 49 and 72. Current flowing through wire 49 passes through connector 47 to electrode 32 in sealing member 28 and arcs across to electrode 33 producing a spark which ignites the explosive material contained in receptacle 30. Ignition of the explosive material will rupture sealing member 28 particularly along grooves 35 in face 34 and will also ignite and burn a portion of sealing member 28 so that the fluid contained in container 13 will be permitted to pass freely through the sealing member and out through opening 40 in end member 36. Current flowing through wire 72 to electrical connector 71 flows through electrode 66 and arcs across to electrode 63 producing a spark which ignites powder 60. The rapid burning or explosion of powder 60 within receptacle 59 ruptures end wall 67 so that the pressure created by the expansion of gases from the explosion of powder 60 is directed into area 61 through openings 76 by shield 73. The pressure directed into area 61 presses against end 16 of container 13 causing end 16 to move toward open end 12 of container 10 thereby forcing the fluid contained in container 13 out through ruptured sealing member 28 and opening 40. As end 16 of container 13 moves toward open end 12 of container 10 rings 18 move along the inner surface of container 10 until end 16 is in the position indicated by phantom line 16'. The force with which end 16 is pressed against projecting portion 27 of web 26 causes portion 27 to pierce end 16 and release the pressurized gases created by the explosion of powder 60 in cartridge 56 from area 61. The pressurized gases pass out through sealing member 28 and opening 40 into the fire extinguishing system to rapidly urge the fluid ejected thereinto out through the outlets of the system.

In the above described action the electrical current being supplied from a single source 51 and controlled through a single switch 52, reaches cartridge 56 and sealing member 28 practically simultaneously so that cartridge 56 is ignited to produce the force needed to eject the fluid from container 13 at the same time that the explosive material in receptacle 30 is ignited to rupture sealing member 28 and permit the fluid to pass therethrough. The action takes place very rapidly and is almost instantaneous with the closing of switch 52 so that the fluid is discharged from the outlets of the fire extinguishing system into the desired area very quickly.

The sturdy construction of the reservoir and its positive fluid ejection action provides a reliable source of fire extinguishing fluid which is adaptable for use in fire extinguishing systems on nearly all types of airplanes.

This invention may be embodied in other forms or carried out in other ways without departing from the spirit or essential characteristics thereof. The present embodiment of the invention is therefore to be considered as in all respects illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A fluid reservoir and means for discharging fluid therefrom, comprising: a rigid metallic container having a closed end and an open end; a flexible container disposed within said rigid container and adapted to contain a fluid, said flexible container having an open end coinciding with the open end of said rigid container and a closed end spaced from the closed end of said rigid container; a sealing member disposed within the open ends of said containers, said sealing member being composed of flexible combustible material; an explosive contained within said sealing member; a rigid end member secured to the open end of said rigid container and arranged to press the open end of said flexible container against the open end of said rigid container and the peripheral portion of said sealing member against the end of said flexible container, said end member being provided with a passage communicating with said sealing member; means for igniting said explosive to thereby rupture said sealing member and permit the passage of fluid therethrough; and means for simultaneously applying pressure against the closed end of said flexible container to force the fluid from said flexible container and out through said passage.

2. A fluid reservoir as claimed in claim 1; in which a piercing means is disposed within said containers and arranged to pierce the closed end of said flexible container after the fluid is forced out of said flexible container.

3. A fluid reservoir and means for discharging fluid therefrom, comprising: a rigid container having a closed end and an open end; a flexible container disposed within said rigid container and adapted to contain a fluid, said flexible container having an open end coinciding with the open end of said rigid container and a closed end spaced from the closed end of said rigid container; an explosive cartridge disposed within the closed end of said rigid container and arranged upon ignition thereof to direct an explosive pressure into the area between the closed ends of said containers; a sealing member disposed within the open ends of said containers, said sealing member being composed of a flexible combustible material; an explosive material contained within said sealing member arranged upon ignition thereof to rupture said sealing member; a rigid end member in engagement with the open end of said rigid container and arranged to press the open end of said flexible container against the open end of said rigid container and the peripheral portion of said sealing member against the end of said flexible container, said end member being provided with a passage communi-

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cating with said sealing member; means for simultaneously igniting said explosive material and cartridge; and means for piercing the closed end of said flexible container.

4. A fluid reservoir as claimed in claim 3; in which a heat deflector is interposed between the closed end of said flexible container and said explosive cartridge. **5**

5. A fluid reservoir as claimed in claim 3; in which a plurality of thin supporting ribs are attached to the wall of said flexible container in spaced apart positions, said **10**

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ribs being arranged and constructed to hold portions of the wall of said flexible container in sliding engagement with the wall of said rigid container.

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