Nov. 11, 1947. D. W. ALLEN 2,430,698

SIGNAL DEVICE

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FIG. 1.

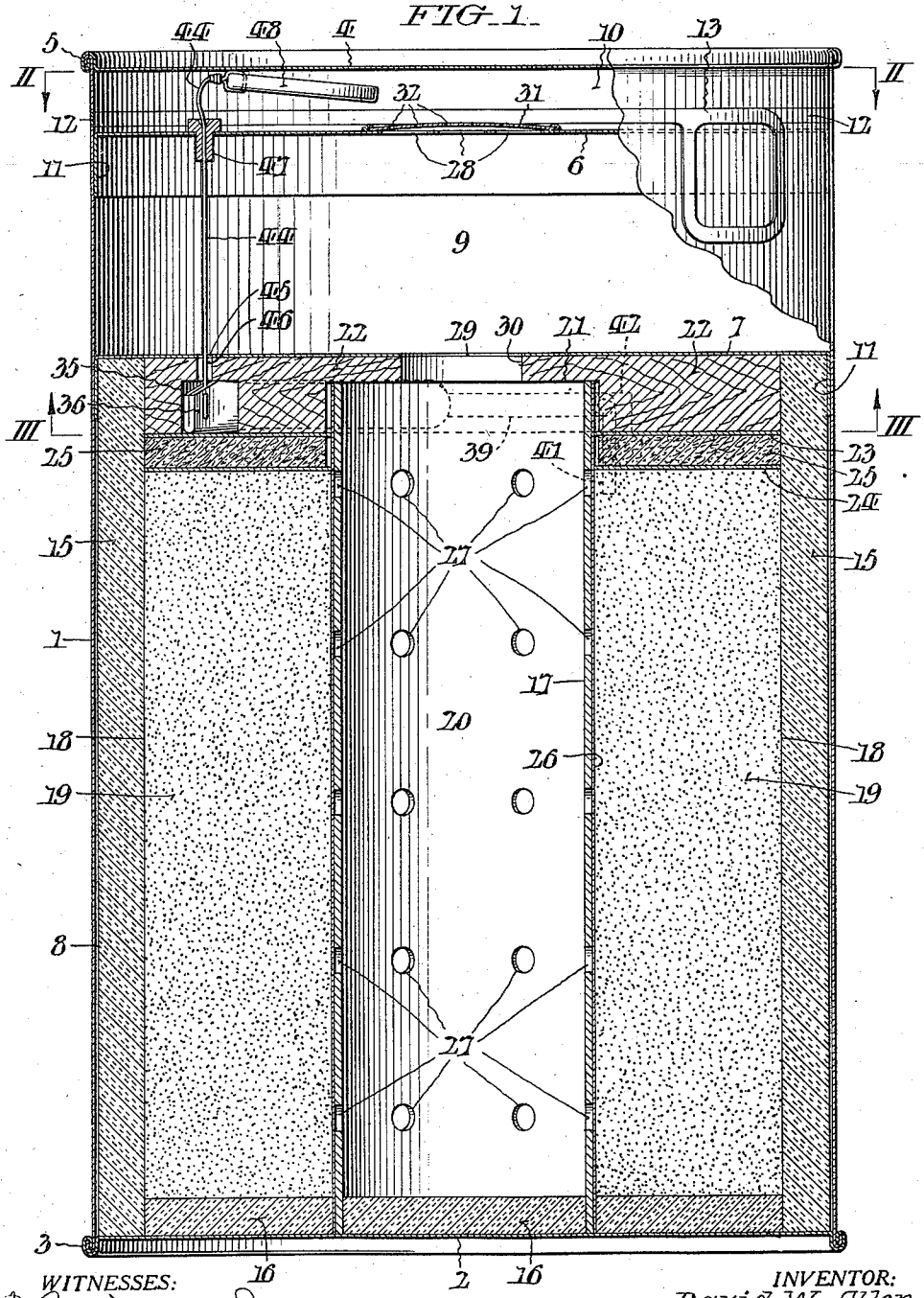

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FIG. 2.

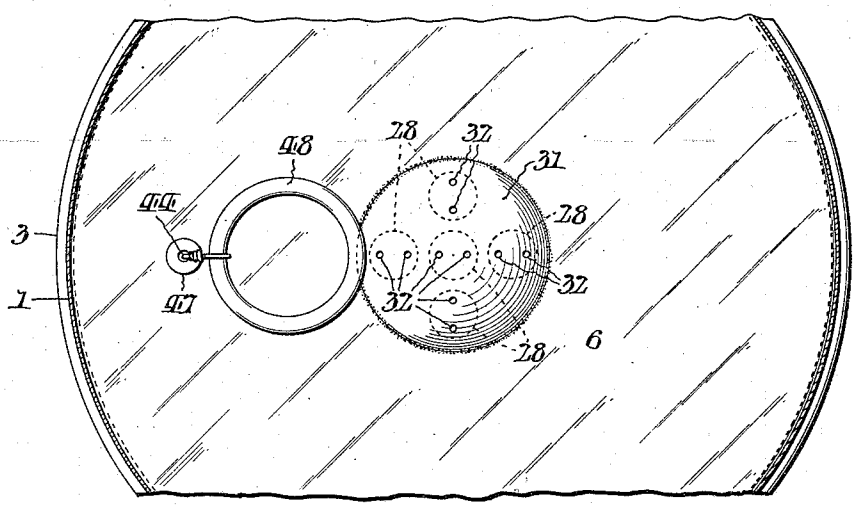
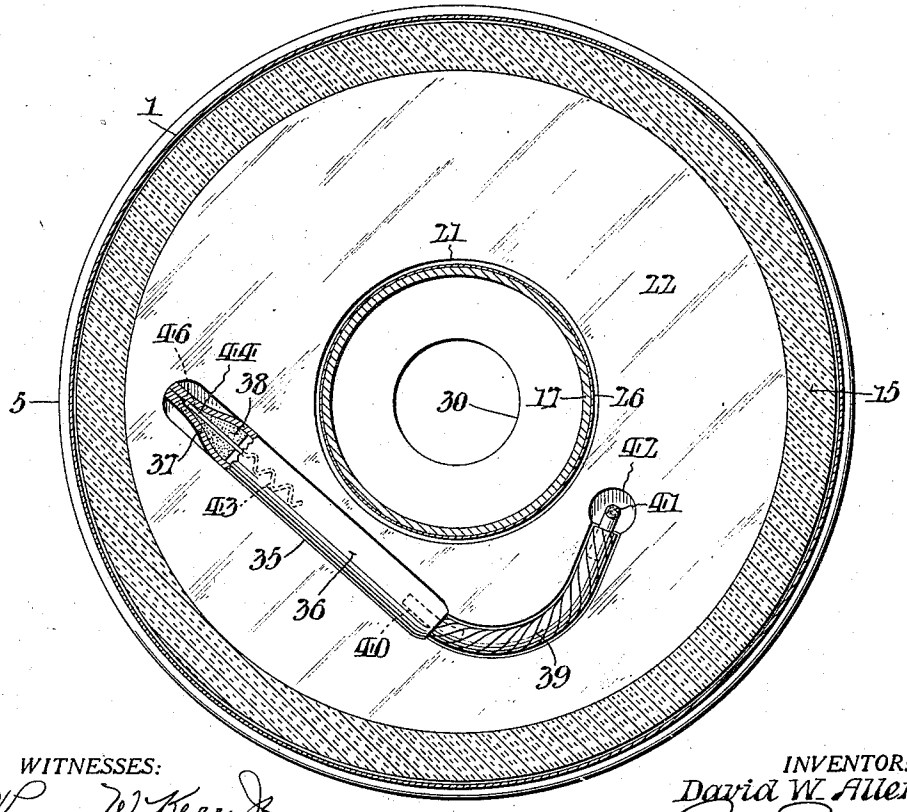


FIG. 3.



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SIGNAL DEVICE

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6 Claims. (Cl. 9—8)

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This invention relates to signal devices useful to aviators in emergencies when forced down either on land or sea by reason of engine trouble, fuel exhaustion, or for other reasons, and to mariners when cast adrift in life boats after ship sinkings. More specifically my invention is concerned with daytime signal devices which emit smoke of a definite color for the purpose of ready recognition by rescue or searching parties.

Amongst the objects of my invention are to enable quantity production of such signal devices expeditiously from relatively inexpensive materials, and at the same time render them safe against the possibility of accidental firing as well as immune against deterioration in storage.

In signal devices designed more especially for smoke emission, it is a further aim of my invention to make possible the control of the burning of a signal producing material in them so that combustion will take place in the absence of flame.

Another object of my invention is to provide, in connection with signal devices having the above attributes, and designed more especially for marine use, against the entry of water and extinguishment of the signal producing material during the period of their submergence after being fired and thrown overboard.

Other objects and attendant advantages will appear from the following detailed description of the accompanying drawings, wherein

Fig. 1 is a view, partly in elevation and mainly in axial section, of a signal device conveniently embodying my invention.

Fig. 2 is a fragmentary view in horizontal section taken as indicated by the angled arrows II—II in Fig. 1; and

Fig. 3 is a horizontal section viewed as indicated by the angled arrows III—III in Fig. 1.

From these illustrations it will be observed that my improved signal device comprises a container preferably of sheet metal having a cylindric body 1 with a bottom 2 peripherally crimped to the lower edge thereof as at 3 for fluid-tightness, and with a top 4 which is similarly secured to the upper edge of said body as at 5. A pair of vertically-spaced diaphragms 6 and 7 subdivide the interior of the container to provide a relatively deep lower compartment 8, a smaller intermediate compartment 9, and a relatively shallow upper or auxiliary compartment 10, said diaphragms being formed with peripheral flanges 11 which are permanently secured to the body 1 by soldering or welding. At a level immediately above the upper diaphragm 6, the body 1 has a relatively narrow soft zone or band 12 with a terminal finger grasp 13 by which it can be rolled off when the upper or cover portion of the container is to be removed. The wall of the lower compartment 8 of the container is lined by a snug fitting tube 15 of light thermo-insulating material which may be of cardboard, and the bottom with heavy insulation 16 which may be of asbestos and which acts as a weight to maintain the device upright when afloat in water. A core tube 17 of smaller diameter and preferably of sheet metal, sets apart within the lower compartment 8, an annular subdivision 18 for a charge of combustible material which is conventionally indicated at 19, and an axial duct 20 which serves in a capacity later set forth. The upper end of the tube 17 engages an axial depression 21 in a reinforcing annulus 22 which may be of wood and which immediately underlies the lower diaphragm 7 with its peripheral edge fitting in the insulating lining 15; and interposed between two centrally apertured disks 23 and 24 of stiff cardboard, in turn directly below said reinforcing disk, is a packing layer 25 of insulating felt or the like. The core tube 17 is in practice sheathed as at 26 with paper or the like to prevent the combustible material from being forced out of lateral holes 27 at different levels in said tube during initial charging of the container with the material 19 under pressure. The upper diaphragm 6 is provided at the center with a group of five holes 28, see Fig. 2, of which the combined area aggregrates that of a central opening 29 in the lower diaphragm 7 and the registering opening 30 of the reinforcing annulus 22. During operation of the device, smoke emitted during burning of the material 19 in the bottom of the container passes into the central smoke accumulation duct 20 formed by the tube 17 and from thence through the axial openings 29 and 30 in the lower diaphragm 7 and the reinforcing annulus 22, into the intermediate compartment 9, and finally from thence escapes through the holes 28 in the upper diaphragm 6. Secured at its edge by soft solder over the holes 28 in the upper diaphragm 6 is an upwardly-concaved disk 31 having small perforations 32 in line with said holes. The purpose of this disk 31 will also be explained later.

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Lodged within a conformative recess 35 in the under side of the reinforcing annulus 22 is a conventional form of starter which is comprehensively designated by the numeral 36. As shown in Fig. 3, this starter has a jacket 37 with a plug 38 of phosphorus or the like in one end, and a tail fuse 39 with terminal quick matches 40 and 41 extending from its opposite ends, the latter of which matches reaches down into contact with the combustible material 19 as shown in dotted

lines in Fig. 1 through a hole 42 in the annulus 22. Within the front end of the shell 37 of the starter 36 is the spiralized end 43 of a wire 44 which is chemically treated to effect ignition when drawn through the phosphorus plug 38. The wire 44 is extended upwardly from the starter 36, passing through aligned clearance holes 45 and 46 in the lower diaphragm 7 and the reinforcing annulus 22, thence through the intermediate chamber 9, and finally through a non-metallic bushing 47 in the upper diaphragm 6 into the auxiliary or top compartment 10 where it is provided with a pull ring 48, also preferably formed from non-metallic material.

When the device is to be used, the soft band 12 is rolled off by pull upon the finger grasp 13, with consequent detachment of the cover portion of the container and exposure of the ring 48. With this preparation, the ring 48 is pulled to set off the phosphorus 38 in the starter 36, and the device thereupon thrown overboard. In the interim, the fuse 39 of the starter 36 is consumed and the combustible composition 19 in the bottom of the container ignited by the time the device strikes the water. Sufficient smoke pressure is thus generated to preclude entry of water through the small orifices 32 of the shield disk 31 during the brief period of submergence of the device which will immediately right itself by reason of being weighted at the bottom, and which will thereafter float under the buoyant effect of the air trapped within the intermediate compartment 9. As the burning of the material 19 intensifies, the heat and pressure generated will soon cause softening of the solder around the protective disk 31 and displacement of the latter, so that the desired full amount of smoke is permitted to escape through the holes 28 in the upper diaphragm 6. As previously pointed out herein, the holes 28 are so proportioned as to control the rate of smoke emission so that the burning material is maintained in a smoldering condition and flame thus prevented from issuing from the device with the smoke. Obviously, however, if flame is desired with smoke discharge, the holes 28 in the diaphragm 6 may be made relatively larger. Combustion will of course commence at the top of the charge 19 and continue downwardly incident to which the paper sheathing 26 around the core tube 17 will be burned away to expose the lateral holes 27 in said tube.

The combustible material may be of any of the well known chemical compounds ordinarily employed in signal devices of the kind to which my invention pertains, wherefrom may be selected one which will emit smoke of the particular color desired for any particular service.

Due to being hermetically sealed, the signal device of my invention will be safe as regards the possibility of accidental firing with assurance against deterioration of the combustible material within it during storage or ordinary handling. On the other hand, when the device is in use, the insulation 15, 16 and 25 will act to prevent any internal moisture condensation formed as a result of contact of the container with the cold water from reaching and contaminating the combustible charge 19.

It will moreover be apparent from the foregoing that my improved signal device lends itself to quick and easy assembling, and, by virtue of being constructed from parts formed from cheap material, can be expeditiously produced in quantity at comparatively low cost.

Having thus described my invention, I claim:

1. A smoke signal device, operable by a fuse and capable of being set afloat in water, comprising a container with a removable cover and subdivided by spaced diaphragms to provide upper, intermediate and lower compartments; tubular means defining an annular subdivision for reception of suitable combustible material and an axial duct in the lower compartment with communication into the intermediate compartment; means in the upper compartment whereby the fuse is started; a finely perforated element in the upper compartment releasably attached over holes of larger diameter in the upper diaphragm which finely perforated element, when the cover is removed and the combustible material ignited, permits only limited initial escape of the products of combustion, whereby sufficient pressure is maintained in the intermediate compartment to preclude entry of water during a brief interval of submergence when the device is thrown overboard, the holes in the uppermost diaphragm aggregating a greater area than that of the holes in the perforated element so that, when said element is displaced, a greater quantity of the combustion products, but still restricted in amount to prevent flame formation, is liberated.

2. The invention of claim 1, wherein the combined area of the holes in the upper diaphragm aggregates that of the outlet opening from the axial duct in the lower compartment; and wherein the perforations through the releasable element are located over the holes in said upper diaphragm.

3. The invention of claim 1, wherein the perforated element is in the form of an upwardly-concaved disk having a small perforation or perforations located above and respectively within the confines of the holes in the upper diaphragm; and wherein fusible means attach the concaved disk to the outer face of said upper diaphragm with capacity for yielding to subsequent displacement, under pressure and heat, by the smoke confined in the intermediate compartment incidental to burning of the combustible.

4. The invention according to claim 1, in which the lower compartment is lined at the top, bottom and sides with thermo-insulating material to prevent deterioration of the contained combustible.

5. The invention of claim 1 wherein a layer of cushioning material, with associated centrally apertured disks, is interposed between the lower diaphragm and the top of the combustible.

6. The invention of claim 1 wherein the starter is recessed into the underside of a relative thick-non-metallic reinforcing disk, and said disk is mounted in the signal device container immediately beneath the lower diaphragm.

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