Feb. 4, 1947. A. A. RICHARDS 2,415,260

CONTAINER

Filed Sept. 30, 1943

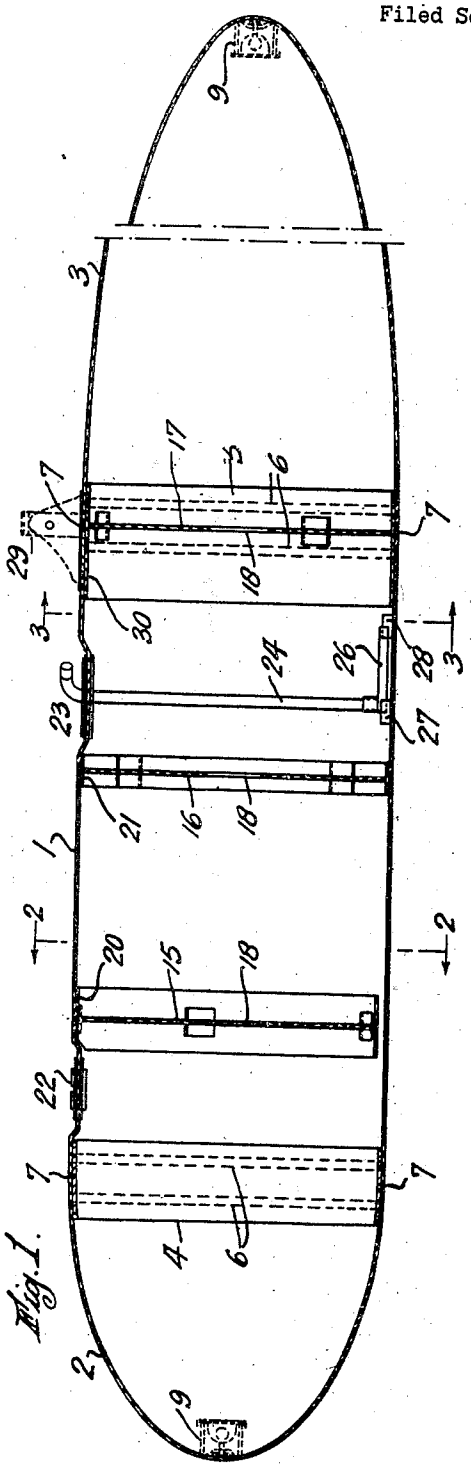

Fig. 1.

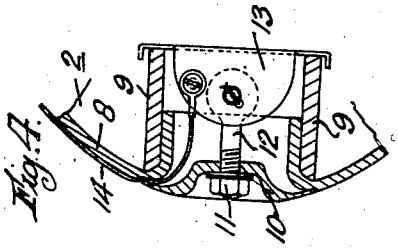

Fig. 4.

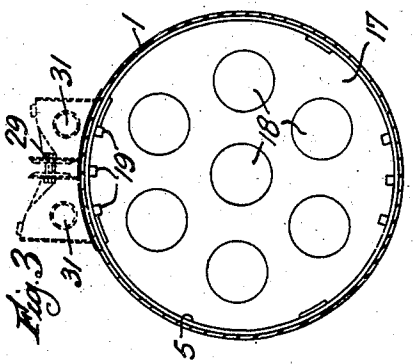

Fig. 3

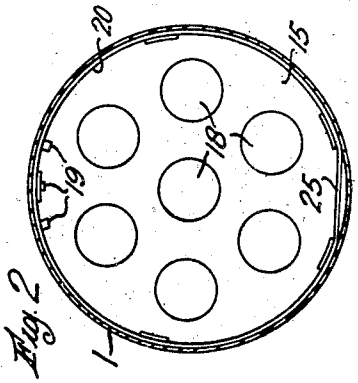

Fig. 2

Inventor:
Alfred A. Richards
By his attorneys
Baldwin & Wight

Patented Feb. 4, 1947

2,415,260

UNITED STATES PATENT OFFICE

2,415,260

CONTAINER

Alfred Augustus Richards, Bredgar, near Sittingbourne, England, assignor to Edward Lloyd Limited, London, England

Application September 30, 1943, Serial No. 504,473
In Great Britain July 20, 1943

10 Claims. (Cl. 229—43)

1

This invention relates to containers made substantially of paper material.

A container according to the invention is suitable for use as a supplementary fuel tank for aircraft. Such fuel tanks have hitherto been made of metal but there is the advantage of a saving of metal in making the tanks of paper, especially in the case where it is intended that the tanks may be jettisoned from the aircraft when in flight. There is, however, a further advantage of the paper container according to the invention that it is more robust than, and at the same time as light as, a metal tank of the same capacity.

Although a primary use of containers according to the invention is as a supplementary fuel tank for aircraft, it is to be understood that the construction is such as to render the container suitable for many other purposes and not necessarily for holding fuel or other liquids.

A feature of the construction of container according to the invention is that the container has a tapering or rounded end portion joined to a body portion by means of an internal ring overlapped by the adjoining parts of the end portion and body portion and secured to these parts by adhesive.

The ring is advantageously provided in its outer surface with circumferential recesses filled with adhesive or sealing medium in order to strengthen the joint and adequately seal it. The adhesive or sealing medium is preferably forced into the recesses under high pressure.

The adjoining parts of the end portion and body portion may be connected by staples across their abutting edges.

The end portion may comprise strips of paper material which have been laid lengthwise and are tapered in accordance with a rounded or bulbous form of the end portion so that their edges abut and whose forward narrow ends are folded back and anchored to a tube. The anchoring is suitably effected by folding back the narrow ends of the strips inside the tube and securing them to the tube by adhesive. The end portion is built up to the desired thickness with a plurality of layers of strips adhesively bonded together. A layer or plurality of strips may be part of a sheet of paper which has been cut out accordingly, leaving an uncut portion at the base of the strips which corresponds to a cylindrical or non-rounded part of the end portion adjacent to its joint with the body portion.

The hole at the front or nose of the container where the ends of the strips are folded back and anchored to the tube may be covered by a cap

2

secured in position by a tie connecting it to a member held by the tube. The securing of the cap may be effected by a nut and bolt, the latter being carried by a dog or bracket held by the inner end of the tube.

The rim of the cap when secured in position may be embedded in the front or nose of the container at or about the point where the strips are folded back so that the cap makes a substantially flush contour therewith.

It will be understood that the container may have two tapering or rounded end portions each joined to a body portion as hereinbefore described and being otherwise characterised as indicated.

When the container is for use as a supplementary fuel tank for aircraft or vehicles where it is in the slip stream the end portions will be respectively shaped so as to give a streamline to the whole container.

When intended to contain liquid, e. g. fuel for internal combustion engines, the paper material is made or is proofed so as to resist permeation of or attack by the liquid concerned. A suitable proofing for coating the internal surface of the paper material when the container is required to hold liquid fuel is a plasticised shellac composition.

A liquid container according to the invention may be internally fitted with transverse baffles serving to break fore and aft wash of the liquid but allowing the liquid and air to pass from one side of the baffle to the other side. A baffle for this purpose is preferably secured within a ring fitted inside the container and the baffle may be made of wood, e. g. plywood, whilst the ring is of paper material.

An appropriate number of rings may be secured inside the container for mounting the transverse baffles and there may be used for the purpose a ring which is employed for the joining of an end portion of the container to a body portion.

Passage for liquid from one side of a baffle to the other side is provided by apertures in the baffle.

A passage for liquid at the bottom of the container may also be provided by forming the baffle and ring with a flat or other deformation so as to leave a space between that part of the ring and the container. This form of passage is particularly applicable in the case where there are openings in the top of the body of the container provided for liquid intake and take-off where the body is flattened at the places where the openings are made, so that the flat or otherwise

deformed part of the ring enables the latter, with the said part uppermost, to be inserted in position past the flattened place of the body of the container and then turned round until the said part is lowermost.

The container when used as a supplementary fuel tank on aircraft will comprise means for connecting it to a part of the aircraft structure. Such connecting means is preferably secured to a part of the container where the latter is reinforced by an internal ring so as to distribute the stresses transmitted by the connecting means.

The connecting means may be a bracket secured to the top of the container and adapted to receive a suspension connection which is readily detachable so that the container may be jettisoned from the aircraft at will.

Means may be provided in the container for holding against displacement the end of a liquid take-off pipe extending into the interior of the container. Such means may comprise blocks secured to the bottom of the container and adapted to bear against the sides of a filter box on the end of the take-off pipe.

A supplementary fuel tank for aircraft is illustrated by way of example in the accompanying drawing, in which Figure 1 is a longitudinal section, Figure 2 is a transverse section on the line 2—2 of Figure 1, Figure 3 is a transverse section on the line 3—3 of Figure 1 and Figure 4 is a section of the detail at the nose of the container.

Referring to the drawing, the container shown is made up of three pre-formed sections, the central body portion 1 and two bulbous or rounded end portions 2 and 3, each made of paper material. The end portion 2 is at the front of the container and the end portion 3 at the rear, and the shapes are such that the container is of streamlined form rendering it suitable for its intended purpose of being carried by an aircraft by being suspended either underneath the wing or the fuselage of the aircraft where it will serve as a supplementary fuel tank which can be jettisoned if and when desired. The paper stock used for making the portions of the container may be substantially the same as that which is now commonly used in the manufacture of fibre containers, shell cases and the like.

The end portions 2 and 3 are joined to the body portion 1 by means of the rings or tubes 4 and 5 respectively which are overlapped by the adjoining parts of the end portion and body portion and secured to these parts by adhesive. To improve the adhesion and sealing of the joint the rings 4 and 5 are each provided with circumferential recesses 6 which are filled with adhesive, e. g. glue, under high pressure.

The adjoining parts of the end portion and body portion are connected by metal staples which bridge the actual joint which is indicated by the numeral 7, the staples being inserted at suitable angular spacing around the joint. These staples are not shown in the drawing.

The end portions 2 and 3 of the container are built up of a number of layers of thin paper strips, say about twelve layers, to the desired thickness which may be of the order of one fifth of an inch which is a suitable thickness for the container shown, which is intended to hold ninety gallons of liquid fuel.

The strips of paper material used for making the end portions of the container are laid lengthwise over a former and are suitably tapered in width so that when they have been laid their edges abut. The several layers of strips are adhesively bonded together with glue.

The forward narrow ends of the strips, shown in Figure 4 in their bonded composite state 8, are folded back inside a paper tube 9 as shown in Figure 4 and are secured to the tube 9 by glue.

The hole at the front or nose, and likewise at the rear of the container, where the end of the strips are folded back and secured to the tube 9, is covered by a cap 10 which is secured in position by the nut 11 and bolt 12. The bolt 12 is carried by the dog or bracket 13 held by the inner end of the tube 9. In Figure 4 it will be noted that there is a part marked 14 and this is a wire which is provided for the purpose of connecting all metal accessories to the container so as to equalize their electric potential.

It will be noted in Figure 4 that the rim of the cap is embedded in the end of the container at or about the point where the paper is folded back into the tube so that the cap makes a substantially flush contour with the adjacent part of the end of the container.

The container is internally fitted with transverse baffles 15, 16 and 17, for the purpose of breaking the fore and aft wash of the liquid contents. The baffles are provided with large circular apertures 18 shown in Figures 2 and 3 for the purpose of allowing the liquid to pass from one side of the baffle to the other side. The holes 19 at the top of the baffles shown in Figures 2 and 3 permit the passage of air through the baffles when the liquid contents are being taken off.

The baffles, which are made of plywood, are secured as shown in rings of paper material 20, 21, and also in the ring 5 previously referred to, these rings being secured in the container by adhesive. The rings are made of paper material but the actual baffles are preferably made of plywood.

On the top of the container openings are formed which provide for liquid intake at 22 and liquid take-off at 23. At 22 a metal flange bush and removable stopper are fitted whilst at 23 a metal fitment is incorporated which carries the take-off pipe which extends as indicated at 24 into the interior of the container and an air inlet pipe not shown. At both the points 22 and 23 the body of the container is flattened as shown.

In order to enable the baffle 15 and the ring 20 to be inserted past the flattened part of the body of the container at 23 the baffle is cut away to a flat at 25 (see Figure 2) and the ring is correspondingly flattened. Accordingly the baffle 15 is inserted past the flattened part 23 with its flat 25 uppermost and is then turned round to bring the flat 25 to the lowermost position as shown in Figure 2. It will be noted that a further passage for liquid flow past the baffle is provided by the space between the flattened part of the ring and the bottom of the container.

The fuel take-off pipe 24 carries at its lower end a filter box 26 and this bears against blocks 27 and 28 secured to the bottom of the container whereby the liquid take-off pipe is held against displacement when the container is in use.

The means for connecting the container to the aircraft structure consists of the bracket indicated in dotted lines at 29 (see Figures 1 and 3). The bracket base plate is secured to the top of the container by rivets, and the ring 5 which is extended as shown at 30 to underlap the bracket, serves to distribute around the body of the container the stresses which are transmitted through the bracket. The holes 31 in the bracket

serve to receive detachable suspension connections from the aircraft structure.

It will be appreciated that substantially the whole of the container is made from paper material excepting the accessory metal parts such as the nose cap securing devices, the filler bush and plug, the fuel take-off fitment including the take-off pipe, the filter box and air inlet tube, and the connecting bracket for receiving the suspension connection from the aircraft. These metal parts are connected together as previously indicated by the metal wire 14 which is shown in Figure 4 but not otherwise indicated in the drawing. The baffles 15, 16 and 17, as has already been mentioned, are preferably made of plywood.

The construction is such as to provide a fuel tank which is comparatively light in weight and yet is nevertheless of a robust character and which is not readily dented or damaged as is a corresponding metal tank. Moreover, it is completely pressure tight and is suitable for the use of compressed air or gas to ensure discharge of the contents.

The interior of the container and the parts fitted therein are coated with proofing material such as plasticised shellac. The outer part of the container is coated with any suitable weatherproof varnish.

What I claim is:

1. A container comprising a body portion, a tapering end portion of paper material, a tube, the said end portion being composed of bonded layers of tapering strips of paper material laid lengthwise with their edges abutting, and the forward narrow ends of the strips being folded back and anchored to said tube, and an internal ring of paper material overlapped by and secured by adhesive to adjoining parts of said body portion and said tapering end portion.

2. A container comprising a body portion, a tapering end portion of paper material, a tube, the said end portion being composed of bonded layers of tapering strips of paper material laid lengthwise with their edges abutting, and the forward narrow ends of the strips being folded back and anchored to said tube, and an internal ring of paper material overlapped by and secured by adhesive to adjoining parts of said body portion and said tapering end portion, the said ring having circumferential recesses, filled with said adhesive.

3. A container comprising a body portion, a tapering end portion of paper material, a tube, the said end portion being composed of bonded layers of tapering strips of paper material laid lengthwise with their edges abutting, and the forward narrow ends of the strips being folded back and anchored to said tube, and an internal ring of paper material overlapped by and secured by adhesive to adjoining parts of said body portion and said tapering end portion, the said paper material being proofed so as to resist permeation and attack by liquid contents.

4. A container comprising a body portion, a tapering end portion of paper material, a tube, the said end portion being composed of bonded layers of tapering strips of paper material laid

lengthwise with their edges abutting, and the forward narrow ends of the strips being folded back and anchored to said tube, and an internal ring of paper material overlapped by and secured by adhesive to adjoining parts of said body portion and said tapering end portion, the said paper material being proofed so as to resist permeation and attack by liquid fuel.

5. A container comprising a body portion, a tapering end portion of paper material, a tube, the said end portion being composed of bonded layers of tapering strips of paper material laid lengthwise with their edges abutting, and the forward narrow ends of the strips being folded back and anchored to said tube, and means securing together the adjoining parts of said body portion and said end portion.

6. A container as claimed in claim 1 in which a plurality of said tapering strips are integrally combined in a cut sheet of paper having an uncut portion at the base of the strips which corresponds to a substantially cylindrical portion of the said end portion adjacent to its joint with the said body portion.

7. A container according to claim 1 in which a cap is secured in position so as to cover the end of said tube in the front of the said end portion.

8. A container according to claim 1 in which a cap covering the end of said tube in the front of the said end portion is secured in position by a tie connecting it to a member held by the said tube.

9. A container according to claim 1 in which a cap covering the end of said tube in the front of the said end portion is secured in position by a nut and bolt, the latter being carried by a bracket held by the inner end of the said tube.

10. A container according to claim 1 in which a cap covering the end of said tube in the front of the said end portion is secured in position by a nut and bolt, the latter being carried by a bracket held by the inner end of the said tube, the arrangement being such that the rim of the cap is embedded in the front of the container about the place where the said paper strips are folded back so that the cap makes a substantially flush contour therewith.

ALFRED AUGUSTUS RICHARDS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,310,818	Tomphins	Feb. 9, 1943
2,172,504	Fish	Sept. 12, 1939
2,201,332	Bensel	May 21, 1940
2,284,499	Van Saun	May 26, 1942
1,716,907	Staley	June 11, 1929
1,713,170	Davis	May 14, 1929
1,146,206	Quinlan	July 13, 1915
948,951	Busby	Feb. 9, 1910
170,377	Johnson	Nov. 23, 1876
2,134,678	Billig et al.	Oct. 25, 1938
2,365,080	Humphreys	Dec. 12, 1944