

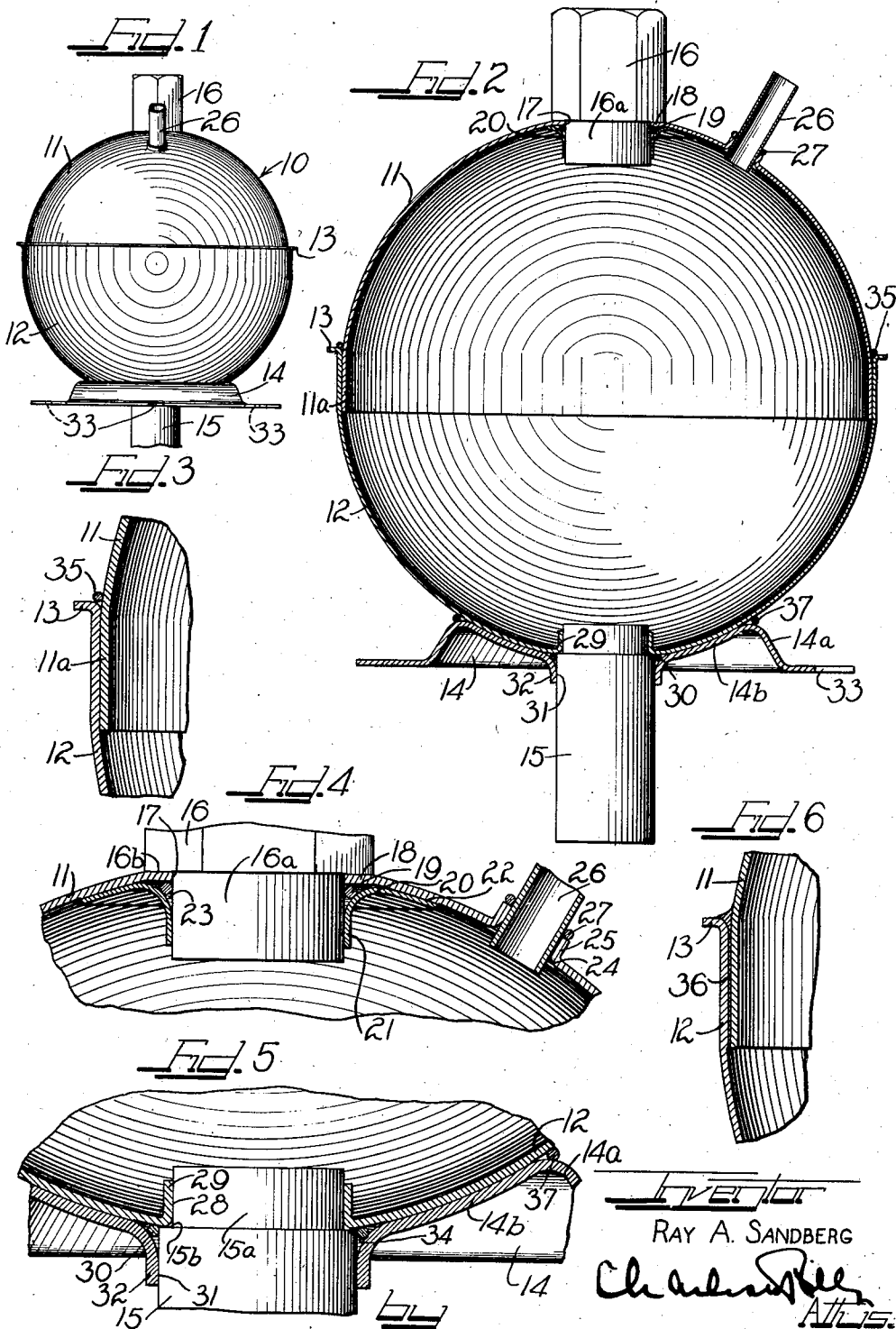
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SPHERICAL RECEIVER TANK AND METHOD OF MAKING SAME

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SPHERICAL RECEIVER TANK AND METHOD
OF MAKING SAME

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This invention relates to stamped metal spherical containers and includes the process of making the containers.

More specifically the invention relates to spherical receiver tanks for mechanical refrigeration systems.

Mechanical refrigeration systems of the compressor-condenser-evaporator type usually have incorporated therein, between the condenser and the evaporator, a tank or closed receptacle for storing condensed refrigerant. The refrigerant is fed from the receiver tank to the evaporator unit.

Since the refrigerant in the receiver tank is usually under pressure it is highly desirable that these receiver tanks be made sufficiently strong to withstand high internal pressure. At the same time, however, it is desirable to form the receiver tanks from as thin gauge metal as possible in order to decrease the weight of the unit and also decrease the manufacturing cost.

According to this invention, a spherical or ball-shaped tank is formed from a very thin gauge metal and is so assembled as to be able to withstand high internal pressure. It is known that a spherical tank will withstand higher internal pressures without bursting than a tank of any other shape since the pressure is uniformly distributed in a spherical receptacle.

According to this invention, the tank is formed from hemispherical stamped metal male and female cups. The rim of the female cup member is provided with an outturned annular flange. The open mouth of the male cup member is then readily inserted into the female member since the flange on the female member facilitates a seating of the male member in the female member.

A support is provided for the spherical tank composed of a stamped metal disc formed with a concave cup-receiving portion.

Circular openings are formed in the top and bottom of the tank for receiving bosses or fittings therein. The support member for the tank receives the bottom fitting therethrough and reinforces the tank around the opening through the bottom thereof. The bottom fitting connects with the supply line to the evaporator unit in a refrigerator system.

The metal surrounding the opening in the top of the tank is reinforced by a washer member disposed on the inside of the tank around the top fitting thereof. The top fitting receives a purge valve for blowing entrapped air and other gases from the refrigerant in the tank.

A refrigerant inlet tube or fitting extends from the tank near the top thereof.

The entire assembly is brazed together by a single brazing operation.

It is then an object of this invention to provide strong spherical tanks formed from sheet metal.

Another object of this invention is to provide spherical receiver tanks for refrigerator systems.

A further object of this invention is to reinforce metal surrounding openings for fittings and the like in thin gauge metal receiver tanks.

A further object of this invention is to provide a method of making spherical tanks wherein all of the constituent parts of the tanks are integrally united by a single brazing operation.

A further object of this invention is to provide spherical tanks for refrigerator systems having fittings integrally secured thereto and extending through openings provided in the tanks together with reinforcing means for strengthening the tank metal around the openings receiving the fittings.

Other and further objects of this invention will become apparent to those skilled in the art from the following detail description of the annexed sheet of drawings which discloses a preferred embodiment of the invention.

While the invention will hereinafter be described in connection with a refrigerant receiver tank having special fittings secured thereto, it should be understood that the tanks of this invention are adapted to wide usage and that different types of fittings can be used without departing from the scope of the invention.

On the drawing:

Figure 1 is a side elevational view of a receiver tank according to this invention.

Figure 2 is an enlarged vertical cross-sectional view taken through a receiver tank assembly, with parts shown in elevation, illustrating the manner in which the parts of the tank are assembled prior to the brazing operation.

Figure 3 is an enlarged detail view shown in vertical cross-section illustrating the manner in which the male and female cup members forming the tank are assembled for the brazing operation.

Figure 4 is an enlarged fragmentary vertical cross-sectional view illustrating the manner in which the fittings for the tank are assembled in the male cup member, prior to the brazing operation.

Figure 5 is an enlarged vertical cross-sectional fragmentary view, with a part in elevation, illus-

trating the manner in which the support for the tank and the fittings are assembled to the female cup member prior to the brazing operation.

Figure 6 is an enlarged detail cross-sectional view of the joint between the male and female cup members after the brazing operation.

As shown on the drawing:

In Figure 1 the reference numeral 10 designates generally a receiver tank according to this invention. The tank 10 comprises a hemispherical metal male cup member 11 having the open end thereof seated in a hemispherical female metal cup member 12. The female cup member 12 has an outturned flange 13 formed around the rim thereof for a purpose to be hereinafter more fully described.

The female member 12 has a support 14 for the tank 10 secured to the bottom portion thereof and a fitting 15 extending through the support 14 and through the bottom of the cup member 12.

The male cup member 11 has secured thereto a top fitting 16 extending through the top thereof and a tube or fitting 26 extending therethrough in spaced relation from the top thereof.

According to this invention the various constituent parts of the receiver tank 10 are assembled so as to be integrally united by a single brazing operation. For this purpose an assembly such as is shown in Figures 2 to 5 is made prior to the brazing operation.

The cup members 11 and 12 are formed by stamping or drawing thin gauge sheet metal of a type suitable for brazing. Brass sheets, copper plated steel sheets and the like metals are preferred.

As best shown in Figures 2 and 4, a circular opening 17 is punched through the top of the male cup member 11. During the stamping operation a flat portion 18 is formed around the opening 17.

The fitting 16 has a cylindrical shank portion 16a extending from the bottom thereof. A shoulder 16b is formed between the shank portion 16a and the main head portion of the fitting 16.

The shank 16a of the fitting 16 is inserted through the opening 17 of the metal cup member 11 until the shoulder 16b of the fitting rests snugly on top of the flat portion 18 surrounding the hole 17.

The fitting 16 has a bore extending therethrough (not shown) and may receive therein a plug member for closing the bore. The fitting 16 serves as a means for purging the interior of the tank from entrapped air and gases.

A wire 19 of a brazing metal such as brass or any other metal capable of alloying with the fitting 16 and the metal cup 11 is disposed around the shank portion 16a of the fitting 16.

A washer 20, somewhat U-shaped in cross-section, is slipped over the shank 16a of the fitting with the leg 21 thereof snugly disposed around the shank 16a. The other leg 22 of the washer abuts the inner surface of the male cup member 11 and is shaped to have an area contact with the cup member. The washer 20 has a large radius defining a cavity 23 in which the wire 19 is located.

The washer 20 can be staked into position as by means of a prick punch so that it will be held tightly against the metal cup member 11 at the time the assembly is brazed. The washer serves to reinforce the metal surrounding the opening 17 in the male member and makes possible the use of very light gauge metal for the

male member without danger of blowing out the fitting when the interior of the tank is under pressure.

The male member 11 is also punched to form an opening 24 therethrough in spaced relation from the opening 17. In forming the opening 24 the cup member 11 is preferably pierced from the inside so as to extrude an annular flange 25 around the opening 24.

The tubular fitting 26 is inserted into the opening 24 in contacting relation with the flange 25. The tube 26 serves as a fitting for introducing refrigerant from the condenser of a refrigerator system into the tank.

A brazing wire 27 is disposed around the tube 26 on top of the flange 25.

The bottom of the female cup member 12 is pierced from the outside to form a circular opening 28 therein defined by an inturned flange 29. The flange 29 is formed during the piercing operation.

A cylindrical shank portion 15a of the fitting 15 is inserted through the opening 28 and snugly engages the inner wall of the flange 29. A shoulder 15b is formed between the head of the fitting 15 and the shank of the fitting 15a. This shoulder 15b abuts the cup member 12.

A brazing wire 30 is disposed around the fitting 15 adjacent the shoulder 15b.

The support member 14 is then disposed around the fitting 15 and seated against the cup member 12.

The support 14 can be formed by stamping a circular metal disc to provide a raised portion 14a thereon having a concave face 14b for receiving female cup member 12. The central portion of the concave base 14b is pierced to provide a circular opening 31 therethrough defined by a downturned annular flange 32.

Slots or holes 33 are punched through the flat portion of the support member 14 near the outer periphery thereof so that the support can be bolted or screwed to the base plate of a refrigerator apparatus.

The support member 14 is slipped over the fitting member 15 with the flange 32 thereof snugly engaging the fitting 15. This provides a chamber 34 in which the brazing wire 30 is disposed.

As pointed out above, the rim of the female member 12 has an outturned flange 13 formed thereon preferably at right angles to the mouth of the member 12.

The male member 11 then has the open end thereof seated into the mouth of the female member 12 as shown at 11a in Figures 2 and 3.

The flange 13 forms a support for a brazing wire 35.

The entire assembly as shown in Figure 2 is then placed in a brazing furnace and heated to brazing temperature.

If brass brazing wires are used the assembly is heated to temperatures around 1800° F. Obviously other temperatures for different types of brazing wires can be used without departing from the scope of the invention.

The brazing wires 17, 27, 30, and 35, when the assembly is heated to the brazing temperatures, alloy with the fittings and the cup members to integrally unite the adjacent surfaces of these members and thus form an integral unit. If the brazing wires are heated above their melting points the brazing metal will flow by capillary action between the contiguous surfaces of the cup members and fittings to form, upon solidifying, a solid solution or alloy 36 as shown

in Figure 6. Even though the parts are snugly fitted together the brazing metal will flow between the parts due to its tenacious capillary affinity for the metal. It will, of course, be appreciated that the accompanying illustrations are somewhat diagrammatic in so far as they illustrate the brazing wire and the flow of the same under heat. It is understood, however, that the brazing wire should be so positioned in close proximity to the outer extremities of the surfaces to be brazed as to enable the desired flow of the brazing wire.

If desired, as when making the larger size receiver tanks, a second brazing wire 37 (Figure 2) can be disposed in the space between the female cup member 12 and the upturned portion 14a of the support member 14. Usually, however, the brazing wire 30, as shown in Figure 2, is sufficient to unite the support 14 with the female cup member 12 and also to integrally braze the fitting 15 with the cup member.

The flange 13 on the male cup member 12 serves a three-fold purpose of facilitating the insertion of the portion 11a of the male member 11 into the mouth of the female member 12, of forming a support for the brazing wire 35, and of rigidifying and strengthening the final assembly against distortion.

The washer 20 serves a dual function of providing a seat for the brazing wire 19 and of reinforcing the metal of the cup member 11 surrounding the opening 17 for the fitting 16.

Likewise the support 14 serves a three-fold function of providing a support for the tank, of defining a cavity for the brazing wire 30 and of reinforcing the metal of the cup 12 around the opening 28 for the fitting 15.

The provision of reinforcing members around the large openings in the tanks of this invention has made it possible to use very light gauge metal for forming the tanks. For example, the cup members 11 and 12 have been made of metal around .037 inch in thickness and the tank assembly will withstand hydrostatic internal pressures between 1,000 to 1,200 lbs. per square inch. When the reinforcing members, such as a washer 20 was not used, the area of the cup member 11 around the fitting 16 is distorted and even torn loose at much lower pressures with such light gauge stock metal.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. The method of making a spherical container which comprises providing male and female hemispherical metal cup members, forming an outturned flange on the rim of the female cup member, piercing a relatively large hole through the base of the female cup member to form an inturned annular flange around the hole, providing a support member having a concave seat portion for receiving the bottom of the female cup member, piercing a hole through the center of the support member, inserting a fitting through the hole of said support member and into the hole at the base of the cup member, disposing a brazing wire around the fitting between the support and the cup member, inserting the open mouth of the male member into the female member, disposing a brazing wire on the flange of

the female member around the male member, and heating the parts to brazing temperature for alloying the brazing metal with the parts to integrally unite the same.

2. In the method of making metal containers having fittings integrally united therewith, the steps which comprise providing a segmental spherical metal cup member, forming a hole through the cup member, inserting a fitting having a cylindrical shank portion through said hole, disposing a brazing metal around the cylindrical shank portion in the cup member, seating a washer having an outturned flange around the cylindrical shank portion of the fitting with the flange of the washer contacting the cup member, said brazing metal being between the cup member and washer, and heating the assembly to brazing temperature and thereby alloying the brazing metal with the washer, the fitting and the cup member.

3. The method of making spherical generally closed light metal containers adapted for use as receiver tanks in refrigeration systems which comprises providing two hollow hemispherical metal cup members, forming an outturned flange around the rim of one of the cup members, forming holes through the closed ends of the cup members, inserting fittings having cylindrical shank portions in said holes, disposing a stamped metal support member having a concave face around the fitting on the flanged cup member, interposing a brazing wire between the support member and the cup member, said support member receiving the cup member on the concave face thereof, said fitting in the hole of the other cup member having a cylindrical shank portion extending into said cup member, disposing a flanged washer around the cylindrical shank portion of said fitting in said cup member, said washer having a flange adapted to contact an area of said cup member surrounding said hole, interposing a brazing wire between the washer and the cup member, seating the open end of said cup member in the flanged cup member, disposing a brazing wire on the flange adjacent the seated cup member and heating the assembly to brazing temperature for alloying all of the brazing wires with the adjoining parts to integrally unite the parts.

4. A container comprising integrally united male and female cup members, said female cup member having an outturned flange thereon to rigidify the structure, inlet and outlet fittings secured to said cup members and a support surrounding one of said fittings and united to said female cup member.

5. A spherical receiver tank comprising male and female hollow hemispherical cup members, said female cup member having an outturned flange formed around the rim thereof and said male member having the open end thereof seated in said female member and integrally united therewith, a fitting extending into the male cup member and having a cylindrical shank portion therein, a flanged washer disposed around said shank portion in said male cup member and having a flange integrally united with the metal of the cup member surrounding the opening in which the fitting is seated, a fitting extending through the bottom of the female cup member having a shank portion extending from the cup member, an annular metal base portion disposed around said shank of the fitting and having a concave face integrally united with the female cup member.

6. A spherical receiver tank for refrigerator assemblies comprising opposed hollow hemispherical cup members in interfitted relation and integrally joined together along the overlapping margins thereof, fittings extending through the top and bottom of said cup members and reinforcing metal members including flanges snugly surrounding the fittings and other flanges extending outwardly from the fittings, said flanges being respectively united to the fittings and cup members to reinforce the metal of the cup members surrounding the fittings.

7. A light gauge metal spherical refrigerant receiver tank comprising opposed top and bottom metal hemispherical cups, said bottom cup having an outturned flange around the mouth thereof and said top cup having the open end thereof seated in the mouth of the bottom cup and brazed thereto to form a closed spherical tank, said tank having circular openings in the top and bottom thereof, metal fittings secured to said tank and having cylindrical shank portions extending through said openings, a metal washer in the tank brazed around the top fitting and having a face thereof brazed to the inner face of the top cup around the opening therein, and a metal disc on the bottom of the tank brazed around the bottom fitting and having a concave face

brazed to the outer face of the bottom cup around the opening therein.

8. A spherical pressure retaining tank comprising stamped metal hemispherical male and female cups, and an integral outturned permanent flange around the mouth of the female cup only, the mouth of said male cup being inserted into the mouth of the female cup and extending therein in telescoped relation thereto, the inserted portion of the male cup being integrally brazed to the female cup and said flange on the female cup remaining as a permanent rigidifying means for the tank.

9. A pressure retaining vessel comprising opposed hollow male and female cup members, an integral outturned flange around the mouth of the female cup member only, the mouth of the male member being inserted in the mouth of the female cup member and extending therein in spaced relation from the flange thereof, a fitting extending through one of said cup members, a support for said vessel surrounding said fitting, the inserted portion of the male cup member being integrally brazed to the female cup member, the fitting and support surrounding the fitting being integrally brazed together and to the adjacent cup member and said flange on the female cup member rigidifying the vessel.

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