June 10, 1958 F. F. LEHR 2,838,650

HOT CUP AND METHOD OF MAKING SAME

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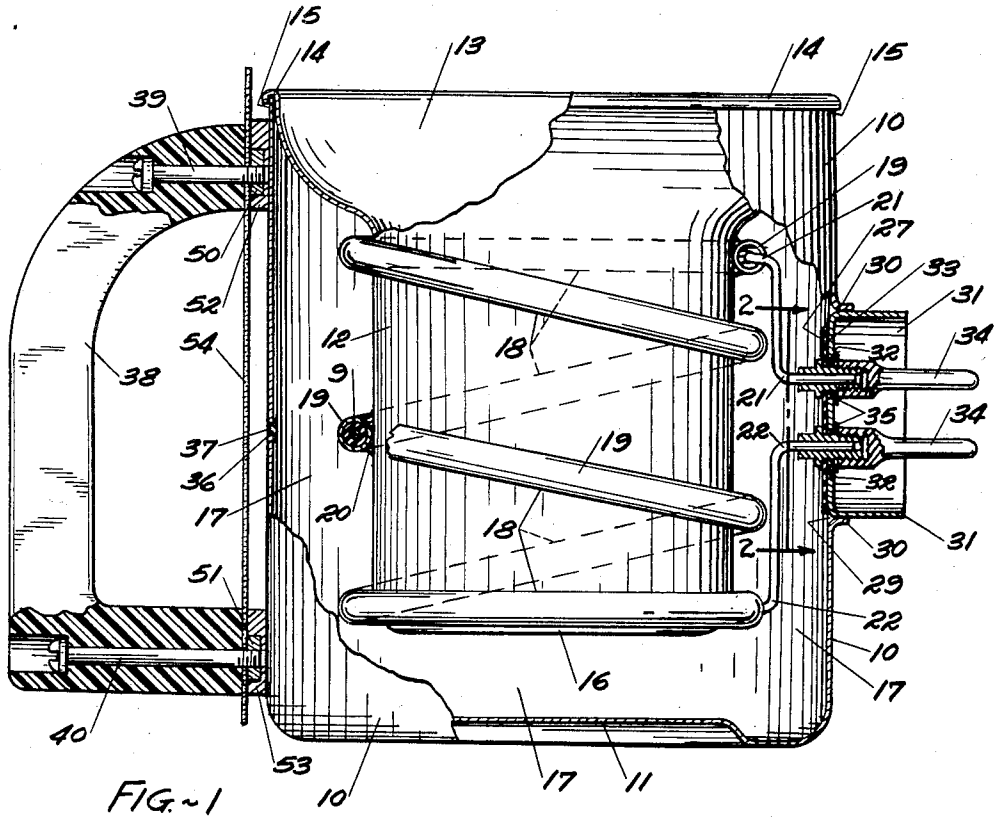


FIG. 1

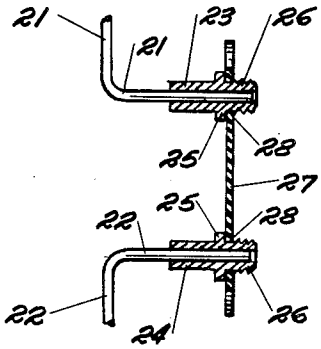


FIG. 3

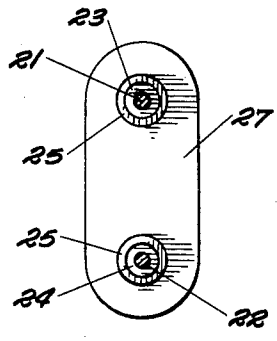


FIG. 2

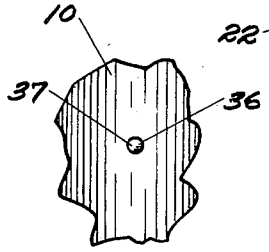


FIG. 4

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HOT CUP AND METHOD OF MAKING SAME

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1 Claim. (Cl. 219—44)

This invention relates to a cup and the method of making it wherein there is an external shell insulated from a liquid carrying cup supported by the shell, the cup generally being termed a "hot" cup. An electrical resistance unit is carried between the outer shell and the outside of the cup, and terminals of the resistance unit are presented on one side of the outer shell for convenience in interconnecting those terminals in an electric circuit.

A primary purpose of this invention is to form a hot cup wherein the heat set up by the resistance element is transmitted to the contents of the cup in the shortest possible time and without loss of heat to the shell and thus to the atmosphere.

Other primary objects of the invention are to provide a construction wherein there is no organic matter exposed in the space between the shell and the cup proper, and where the construction is such that the shell may be sealed hermetically while it is warm from a brazing operation interconnecting the inner cup with the shell. At the same time, means exists to constitute a safety factor in case pressure of the air between the inner cup and the shell should for some reason rise above a safe amount, so that there will be no explosive effect tending to bulge out the shell or create damage of any kind thereby.

These and other objects and advantages of the invention will become apparent to those versed in the art in the following description of one particular form as now best known to me, and as illustrated in the accompanying drawing, wherein,

Fig. 1 is a view in outside elevation and section of a construction embodying the invention;

Fig. 2 is a detail in vertical section, line 2—2 in Fig. 1;

Fig. 3 is a detail in vertical section illustrating a step in the assembly operation; and

Fig. 4 is a detail in vertical elevation of a safety plug.

A shell 10 is formed to be generally cylindrical in shape, and integrally closed across its bottom to form the floor 11. This shell may be made out of any suitable material, such as steel which may be plated on the outside to give the desired finish.

A cup designated generally by the numeral 12 has a major cylindrical portion from which there flares outwardly and upwardly at the upper end, a bell-shaped portion 13 which is rolled over as at 14 on the top edge of the shell 10. The cup 12 is entirely suspended from the upper edge 15 of the shell 10, to have the under side 16 of the cup spaced above the floor 11 of the shell 10, and also to be spaced laterally from the shell 10, to leave an annular space 17 between the cup and the wall of the shell 10. The cup 12 prior to its being assembled on the shell 10 has an electric resistance unit 18 spirally formed to receive the cup 12 therethrough with a close fit.

This unit 18 is primarily of the rod type, comprising a coiled resistance wire 9 surrounded by cement and

completely enclosed within a metallic tube 19, preferably of high heat conductivity such as copper. This unit 18 bears compressibly against the cup 12, and is brazed thereto to become an integral part of the cup 12 by flowing a brazing mixture 20 increasing the contact between the unit 18 to substantially a width equal to the diameter of the tube or sheath 19.

The terminals 21 and 22, Figs. 1 and 3, of this unit 18 constitute rod shaped lead portions connected to the ends of the wire 9, and they are bent one toward the other and thence laterally outwardly in parallel relation. A sleeve 23 and 24 (identical in shape and size) is slipped over the lateral or horizontally disposed portions of the terminals 21 and 22 respectively and soldered or brazed thereto. Each of these sleeves 23 and 24 has an integral collar 25 extending externally therefrom and therearound, intermediate the ends of the sleeves, and an end portion of the sleeve 23 and 24 in each instance extending from the collar 25 is externally threaded as at 26.

A length of insulating material 27 is provided with holes 28 therethrough of such a diameter that the threaded portions 26 may be extended through these holes with a tight fit so that the shoulder 25 may abut the member 27 as indicated in Figs. 1 and 3. Thus the terminal end portions of the electric resistance unit 18 are supported and held in a fixed apart spacing.

The cup 12 thus assembled with the electric resistance unit 18 and the terminal portions of the resistance wire 9 supported to its end portions 21 and 22 by the member 27 is then dropped into the shell 10 and the threaded portions 26 of the sleeves 23 and 24 extend outwardly through a hole 29 provided through the shell 10, and around which there extends an outturned flange 30. The cup overturned portion 14 is then brazed to the shell 10 around the upper end 15 to make a permanent joint therebetween. A plug cup 31, cupped in nature and having two spaced apart holes 32 therethrough, is brought up and engaged within the flange 30 preferably by a tight friction fit, and the threaded portions 26 of the two sleeves 23 and 24 are carried through the holes 32 to extend outwardly from the back wall 33 of this member 31. A terminal prong 34 is screw-threaded over each of these exposed threaded portions 26, and revolved therearound to cause the shoulder 25 in each instance to carry the insulating member 27 compressibly against the back side of the wall 33, with insulating members 35 intervening between the end of the terminal prongs 34 and surrounding the sleeve in each instance, all as is well known to those versed in the art so that the terminal prong 34 in each instance firmly seats the sleeves 23 and 24 and the prongs 34 are rigidly held in an outwardly extending position.

The member 31 is brazed to the shell 10 around the flange 30 so as to become a rigid and integral part of the shell 10.

While the shell 10 is still warm from the brazing operations which seal the member 31 to the shell 10 and also the upper edge portion 14 to the shell 10, a hole 36 which has previously been made in the side wall of the shell 10 is filled with a low-melting solder as a plug 37 and allowed to set. The melting point of this solder 37 is sufficiently low so that it will melt and be blown out in case undue pressure may arise between the cup 12 and the shell 10 due to an excessive temperature being reached in the annular space 17. However, due to the design of the structure thus far described, such a blow out is an extremely unlikely possibility. There is no organic matter of any kind carried within the annular space 17, and no organic matter employed as an in-

sulating medium between the wire 9 and the outer encircling and enclosing tube or sheath 19. Due to the fact that the heating element 18 is bonded to and made an integral part of the cup 12, and the area of contact between the heating element 18 throughout its length is substantially equal to the diameter of the tubular heating element itself, the heat produced by the current passing through the wire 9 is transmitted in the major portion directly to the cup 12 since the metal has a much higher conductivity than has the entrapped air within the annular space 17. Of course when the annular space 17 is referred to, that space also extends under the floor 16 of the cup 12 and above the floor 11 of the shell 10.

A handle 38 has upper and lower ends attached to the side of the shell 10 by means of the screws 39 and 40 passing through upper and lower portions of the handle 38 respectively, and screw-threadedly engaging nuts 50 and 51 imbedded in the handle mounting members 52 and 53 which have been brazed to the side of the shell 10. A length of heat insulating material 54 is inserted between the handle 38 and the members 52 and 53 to be secured accordingly, so as to prevent the fingers of the person picking up the unit from contacting the shell and becoming burned. Also this guard 54 covers over the plug 37 in spaced relation therefrom so that should the plug 37 blow out, it will not splatter against the fingers of the user.

The diameter of the hole 36 is extremely small, and in fact is produced by a number 56 drill. Air while heated by the brazing operations above indicated, will escape through the hole 36 before the plug 37 is made. This means that the annular space 17, after the shell 10 has cooled down to ordinary room temperature, has a slight degree of vacuum therein. Mention has been made of the avoidance of the use of organic materials. Organic materials employed for insulating purposes generally give off gases under heating, and usually have entrained moisture which develops steam under heating, and it is for these reasons that the material is avoided so that the gases including steam or vapor are not present to develop a potential pressure. The insulating member 27 is made out of an inorganic material such as fiber glass or the like. This, in the present construction, is the only major insulating material exposed between the cup 12 and the shell 10. The insulating material employed within the heating element 18 is likewise made of inorganic material so that gases or steam may not extend from the open ends thereof from which the terminal portions 21 and 22 lead to the sleeves 23 and 24.

This construction built by the method described gives an extremely fast heat transfer from the element 18 to the liquid content carried in the cup 12, and at the same time, while the heat transfer is taking place heating liquid within the cup 12, for an example, to a temperature of 170 degrees F., in about one minute and forty seconds, the cup may be held in the operator's hand during that heating process since there is so little heat transmitted to the shell 10 itself. This heating rate far exceeds a rate of heating in the usual construction heretofore employed.

Therefore while I have described my invention in the one particular form as now best known to me, it is obvious that structural changes may be employed particularly in the shapes of the shell 10 and the cup 12, all without departing from the spirit of the invention, and I do not desire to be limited to that precise form beyond the limitations which may be imposed by the following claim.

I claim:

A hot cup comprising an outer shell having an upper rim; an inner cup having an upper rim and carried within said shell and supported thereon by the rim of the cup bearing on the shell rim, forming an annular space between the cup and the shell; means bonding together said rims forming a pressure type seal therebetween, said seal being maintained at temperatures and pressures above which said shell and cup may be subjected; a heating element within the shell and about said cup; a handle fixed to and extending vertically of and spaced from said shell; an insulating member carried by and in spaced relation from shell between the shell and the handle; said shell having a pressure relief hole in size on the order of that produced by a number 56 drill through its wall, and across which hole said insulating member extends in spaced relation; a fusible plug normally sealing said hole and blowable therefrom upon build up of predetermined temperature and pressure within said space; said space being entirely free of exposure therein of organic material; and electrical conductors extending from said heating element insulated and pressure sealed through said shell wall in a zone removed from said hole.

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