Aug. 15, 1944. E. E. GEISINGER ET AL 2,356,047

CONTAINER

Filed June 12, 1941

Fig. 1

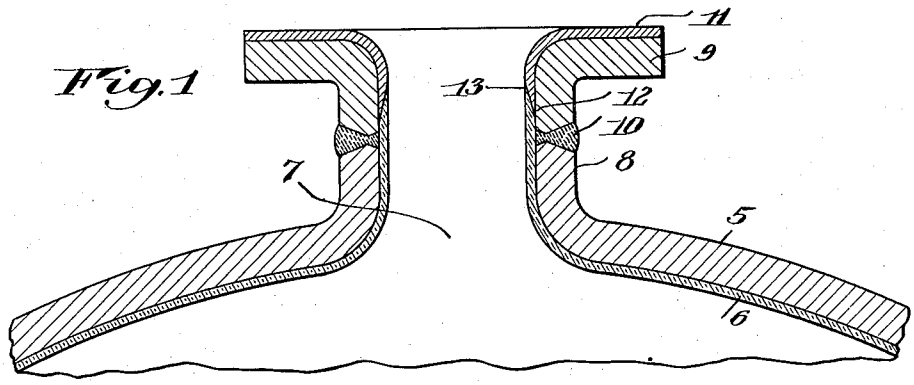


Fig. 2

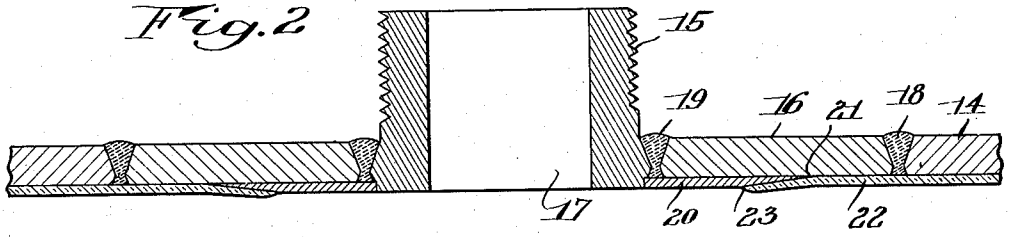


Fig. 3

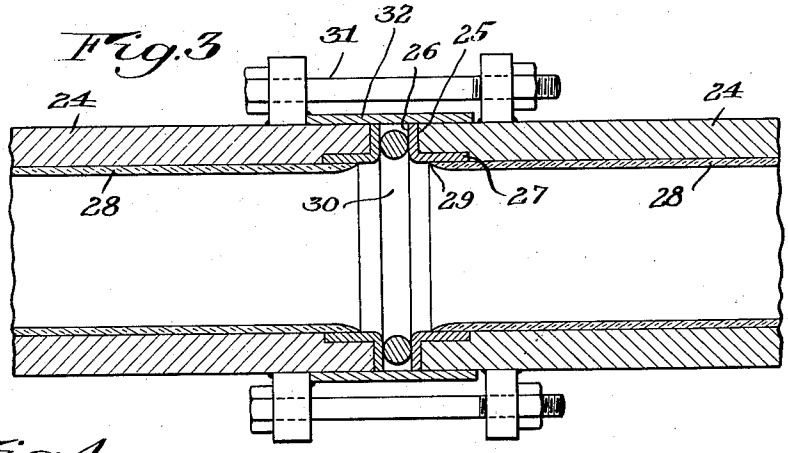
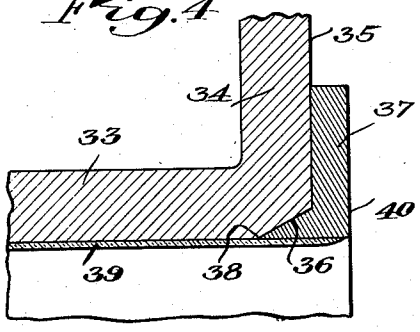


Fig. 4



INVENTORS
Elliott E. Geisinger
Rudolph F. Goecke
BY Crumpston & Shepard
their ATTORNEYS

Patented Aug. 15, 1944 2,356,047

UNITED STATES PATENT OFFICE

2,356,047

CONTAINER

Elliott E. Geisinger, Rochester, N. Y., and Rudolph F. Goecke, Elyria, Ohio, assignors to The Pfaudler Co., Rochester, N. Y., a corporation of New York

Application June 12, 1941, Serial No. 397,764

3 Claims. (Cl. 220—63)

This invention relates to metal containers such as tanks, vats, pipes and the like, of the variety having their containing surfaces formed of material capable of resisting corrosion and, more particularly, to containers of this character having a lining of glass enamel or other vitreous material capable of resisting chemical attack, as well as to methods of manufacturing the same.

Containers of this character with glass enameled surfaces have proven highly efficient in resisting corrosion, but the extension of such enamel to the container connection portions, such as fittings, flanges and collars for openings and the like, has presented the disadvantage that the enamel on the engaging and seating surfaces of such connections has tended to become cracked and chipped by the mechanical stresses and impacts to which such connection portions and surfaces are subjected.

Containers have been made also with surfaces formed of stainless steel, or other corrosion resisting metal alloys, but while such containers are not subject to cracking or chipping of the engaging and seating surfaces of the connections, such metal alloys are less desirable than enamel surfaces because less resistant to chemical attack.

One object of the present invention is to provide a container of the general class described, having the corrosion resisting advantages of glass enameled inner or containing surfaces, combined with the advantages of connection portions having engaging and seating surfaces formed of corrosion resisting metal not subject to cracking and chipping by mechanical stresses or impacts.

Another object is the provision of a container of the above character having a main body portion made of one metal, such as mild steel, and a connection portion made of a different, corrosion resisting metal, such as a stainless steel alloy, having a coefficient of thermal expansion the same as or different from that of said mild steel, with a fused joint between such different metals of such a character that a glass enamel lining can be extended over it into contact with the corrosion resisting alloy without danger of crazing, chipping, or other failure of the enamel at such joint.

A further object is to provide a method of making a container having the above described advantages.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a sectional view taken diametrically through a container and its flanged connection and showing one embodiment of the invention;

Fig. 2 is a similar view of a container fitting showing a modified embodiment;

Fig. 3 is a similar view through the adjacent ends of two pipe sections showing another embodiment, and

Fig. 4 is a similar view of a flanged connection showing a further embodiment.

The present invention is capable of embodiment in a variety of adaptations and forms, several of which are herein disclosed by way of illustration of the preferred construction and method of making the same.

There is shown in Fig. 1 of the drawing, for example, a part of the main, or body portion, 5, of a sheet metal container, or tank, of known or suitable shape. The part 5 may be a portion of one end of a tank of the known dished shape commonly employed in such tank ends, or it may form a part of a cylindrical tank side wall. Such container body portions have commonly been made of mild steel which is satisfactory for such construction, except that it is subject to chemical attack and is, therefore, commonly protected by a glass enamel lining, 6, as well understood in the art.

Such containers are commonly provided with openings, as at 7 (Fig. 1), for inlet, outlet, manway, or other connections, with the metal walls of the main body swaged outwardly as at 8 to form a collar for the attachment of a flange 9. In this embodiment of the invention, the flange 9 also is preferably made of mild steel welded to the collar 8 as at 10. Flange 9 has its engaging or seating surface 11 formed of a known stainless steel or similar alloy metal composition which is resistant to corrosion, this corrosion-resisting metal portion 11 being extended inwardly of the collar opening beyond the zone of mechanical engagement, but terminated at 12, preferably short of the fused joint 10, so as to lie wholly on the separately formed flange portion 9. The non-corrosive metal portion 11 may be applied to flange 9 in any one of the known ways, as by cladding, welding, or hot metal spraying, as well understood in the art, and may be applied as a surface lamination, as here shown.

We have further found, in accordance with our invention, that the enamel lining 6 may be extended, as shown, from the flange joint 10 and

continued over the inner edge of the non-corrosive metal 11, terminating on the surface of the latter as at 13. By this construction, the enamel lining entirely covers the mild steel portions which tend to corrode and is carried into overlapping relation with the edge of the non-corrosive metal 11 at a location within the collar 8, so that all the parts are protected against corrosion and the enamel lining against mechanical engagement and chipping.

In those constructions in which the metal of the container body and the non-corrosive metal of the connection portion have sufficiently different coefficients of thermal expansion, there is a tendency to produce crazing or chipping in the glass lining over the joint between the two metals. We have further found that this tendency may be eliminated by employing a special type of used joint in which one of the metals overlies the other for an appreciable distance in the direction of extent of their main surfaces or walls, as distinguished from a butt joint in which the abutting surfaces lie substantially in a transverse plane. This may be accomplished in various ways, one of which is shown in the above modification of Fig. 1, where the non-corrosive metal is employed as a relatively thin lamination on the mild steel flange 9. We further prefer to bevel the inner edge of the non-corrosive metal 11 where it is overlapped by the enamel, as shown at 12—13. This adaptation is consistent with good economy, as it requires a relatively small quantity of non-corrosive metal. Other ways of accomplishing this construction will be described below in connection with other modifications.

The reasons underlying the effectiveness of this type of joint may not be fully understood at the present time but we believe that the employment at the enameled surface of the joint of a body of one metal which is thin in relation to the other metal, may tend to conform the thermal expansivity of the thinner metal to that of the thicker metal, or at least extend the zone of any difference in expansion, so as to distribute it and avoid subjecting the enamel to any sharp differences in expansivity of the underlying metal. But we do not desire our invention to be restricted in any way to this theory of operation, as it has been found to be effective in use, whatever the reasons for this effectiveness.

In Fig. 2 of the drawing is shown a somewhat different embodiment of the invention, as applied to the combination with a tank wall, 14, of the usual mild steel, of a threaded fitting 15 made entirely of a known or suitable non-corrosive alloy. The collar 16 for the opening 17 is preferably made of the same mild steel as the tank and welded to the opening in the tank wall, as at the butt joint 18. The fitting 15 is welded in the collar 16 as at 19. But this welded junction is covered on the interior of the tank with a relatively thin lamination or surfacing 20 of non-corrosive alloy metal of known or suitable composition which forms a junction with the fitting 15 and extends outwardly over a portion of the surface of the collar 16. This surfacing 20 may be applied in any of the known ways as by cladding, welding, or hot metal spraying, as well understood in the art. It may be initially applied to a portion only of the surface of the collar 16, as shown, or may initially cover the surface and be subsequently partially removed at the outer periphery of the collar, as shown.

The periphery of the surfacing 20 preferably terminates in a beveled edge 21, as shown, and the glass enamel lining 22 is carried over this edge and onto the surface 20, as at 23, so that here also all of the surfaces are protected against corrosion, with the enamel lining protected by termination short of the connection surfaces which are subject to mechanical wear, so as to accomplish the purposes of the invention.

In Fig. 3 of the drawing there is shown a further adaptation of the invention, in this case to the ends of glass enameled pipe sections 24. The sections, in this instance, are of the type having adjacent ends brought together in a butt joint, although it will be understood that other known types of joints may be employed. The seating surfaces 25 of the pipe ends are protected by a covering body 26 of any known or suitable non-corrosive metal alloy which, as in the above modifications, may be applied by any known or suitable method, such as cladding, welding, or hot metal spraying. The non-corrosive body 26, preferably, is thin in relation to the main wall of the pipe section, covers its end 25 and extends a small way into the pipe section and overlaps its inner surface, as shown at 27. The known glass enamel lining 28 of the pipe section is exturned so as to overlap the non-corrosive metal 26, but terminates short of the end 25, as shown at 29.

Here again, while the enamel overlaps the non-corrosive surfacing of the connection, so that all surfaces are protected, it does not extend to the seating surfaces and, therefore, avoids any subjection to mechanical impacts or wear which might otherwise tend to chip or crack it. A suitable gasket means 30 is interposed between the pipe ends which are drawn and held together by any known and suitable arrangement of coupling bolts 31 and the joint is externally protected by any suitable sheathing indicated at 32, as well understood in the art.

In Fig. 4 of the drawing there is shown a further adaptation to a pipe end or container connection indicated in a fragmentary way at 33, and having a flange 34. The junction of the surface 35 of the flange with the inner surface of the container 33 is beveled, in this instance, as at 36. The body and flange of the container may be constructed, as above, of mild steel and the surface 35 of the flange is protected by a body 37 of any known or suitable corrosion resisting metal, which is extended somewhat inwardly of the container, in overlapping relation with the beveled surface 36 and terminating in a thin beveled edge 38. The glass enamel lining 39 is continued over the joint formed at 38, so as to somewhat overlap the metal body 37 without extending, however, as far as its seating surface 40. In this instance the non-corrosive metal body 37 has substantial thickness which is reduced by beveling the edge 38 which overlies the inner surface of container 33. By changing the angle of the bevel surfaces, the change from one metal to another, under the enamel lining, may be made as gradual as desired. It will be seen that this modification embodies the functions and advantages described above in connection with the above modifications.

It will be obvious that the invention is applicable to substantially any container having an inner, glass lined, metal surface to be protected against corrosion, and an external connection which is subject to mechanical engagement or stresses likely to injure a protective lining such as an enamel coating. It is to be un-

derstood, therefore, that terms such as "enamel" and "glass enamel," as herein employed, are intended to include a lining of any vitreous material, or such as is subject to injury by mechanical engagement or impact. And while we have referred particularly to connections made of non-corrosive metal alloys, it is to be understood that our invention includes connections made of any metal sufficiently resistive to chemical attack to obviate protection by a chemically inert coating. The term "fused" as herein applied to the joint between the body and connection portions of the container, is intended to include any kind of welding or other integral union of such portions.

It will be apparent from the above description, in connection with the drawing, that the invention accomplishes its objects. Such a construction provides a glass enameled container with all of its known efficiency and advantages in resisting chemical attack, in combination with connections having their seating surfaces, or other wear receiving parts, made of metal which is resistant to chemical attack, with the efficiency and advantages which such metal possesses, in resisting mechanical wear, over connection surfaces protected by an enamel coating. The invention thus provides a method of manufacture and a construction combining the advantages of both types of container construction.

While we have hereinabove illustrated and described the best forms of embodiment now known to us, it is contemplated that other modifications and variations will readily occur to those skilled in the art within the spirit of our invention and within the scope of the appended claims.

We claim:

1. A glass lined container comprising a body portion and a portion providing a conducting connection for connecting said body portion with conducting means to be associated therewith, said portions being formed of a metal subject to corrosion, the surface of said connection having thereon a coating of non-corrosive metal having a coefficient of thermal expansion different from that of said corrodible metal and terminating inwardly of points of contact with said associated conducting means, said inward termination of the coating being gradually tapered to a thin edge forming a substantially smooth surface joint with said corrodible metal whereby the rate of thermal expansion of said corrodible metal is imposed on said thin edge of the coating to effect adjacent said edge a gradual transition from the rate of thermal expansion of said corrodible metal to that of said coating to prevent injury to a lining applied across said joint, and a glass enamel lining on said body portion extending across said joint onto said coating, to provide a durable, fused-in continuity of said lining with said coating.

2. A glass lined container comprising a body portion and a portion providing a conducting connection for connecting said body portion with conducting means to be associated therewith, said portions being formed of mild steel subject to corrosion, the surface of said connection having thereon a coating of a non-corrosive alloy metal having a coefficient of thermal expansion different from that of said mild steel and terminating inwardly of points of contact with said associated conducting means, said inward termination of said alloy coating being gradually tapered to a thin edge forming a substantially smooth surface joint with said mild steel whereby the rate of thermal expansion of said mild steel is imposed on said thin edge of alloy metal to effect adjacent said edge a gradual transition from the rate of thermal expansion of said mild steel to that of said alloy metal to prevent injury to a lining applied across said joint, and a glass enamel lining on said body portion extending across said joint onto said alloy metal, to provide a durable, fused-in continuity of said lining with said non-corrosive alloy metal coating.

3. A glass lined container comprising a body portion and a portion forming a conducting connection having at its outer end an attaching flange for connecting said body portion with conducting means to be attached thereto, said portions being formed of mild steel subject to corrosion, the outer surface of said flange having thereon a coating of a non-corrosive alloy metal having a coefficient of thermal expansion different from that of said mild steel and terminating inwardly of said outer flange surface, said inward termination of said alloy metal being gradually tapered to a thin edge forming a substantially smooth surface joint with said mild steel whereby the rate of thermal expansion of said mild steel is imposed on said thin edge of alloy metal to effect adjacent said edge a gradual transition from the rate of thermal expansion of said mild steel to that of said alloy metal to prevent injury to a lining applied across said joint, and a glass enamel lining on said body portion extending across said joint onto said alloy metal, to provide a durable, fused-in continuity of said lining with said alloy metal coating.

ELLIOTT R. GEISINGER.
RUDOLPH F. GOECKE.