Jan. 6, 1931. J. F. WERDER 1,788,261

SHEET METAL CAN AND METHOD OF MAKING THE SAME

Filed Oct. 29, 1927 2 Sheets-Sheet 1

Fig. 1.

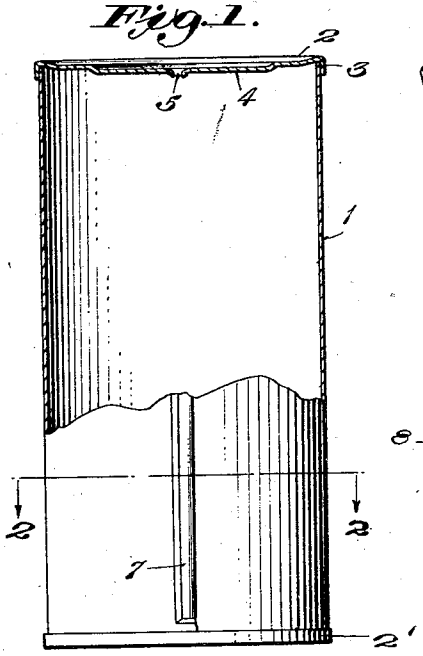


Fig. 3.

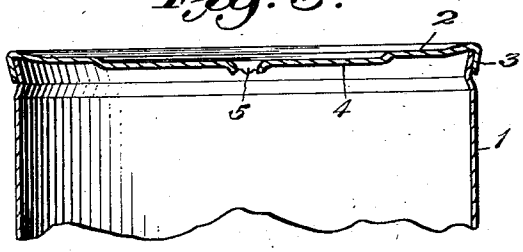


Fig. 4.

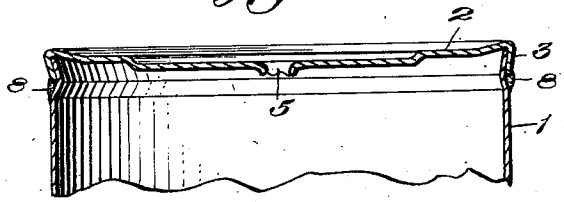


Fig. 5.

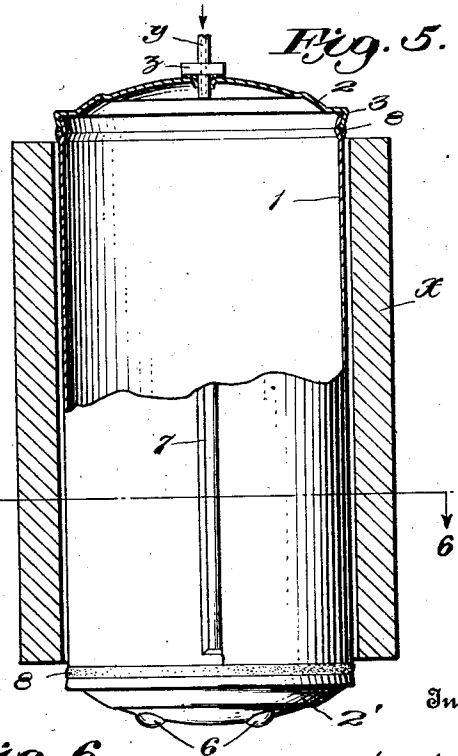


Fig. 2.

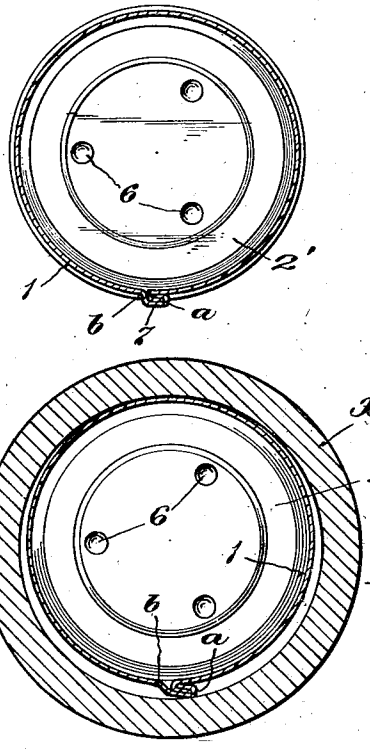


Fig. 6.

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Jan. 6, 1931. J. F. WERDER 1,788,261

SHEET METAL CAN AND METHOD OF MAKING THE SAME

Filed Oct. 29, 1927 2 Sheets-Sheet 2

Fig. 7.

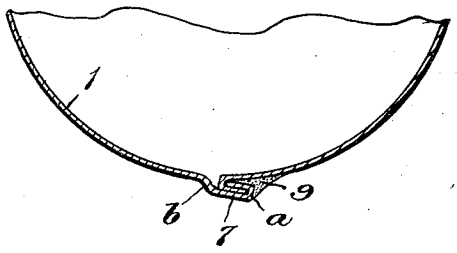


Fig. 8.

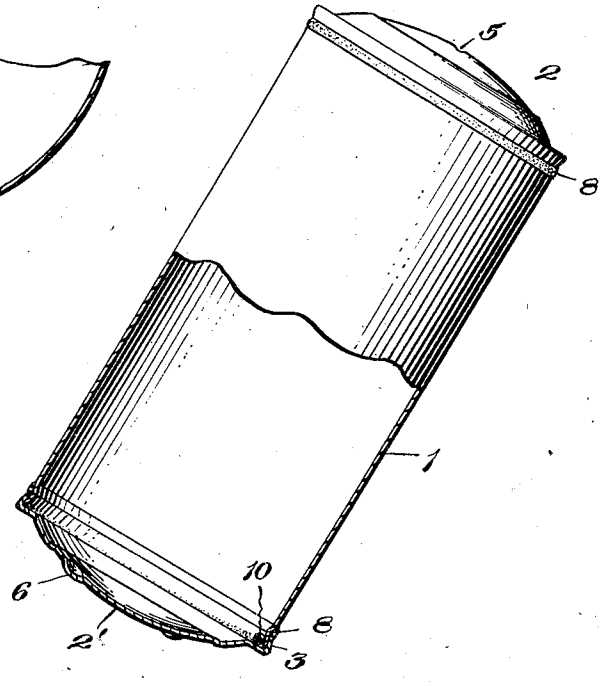


Fig. 9.

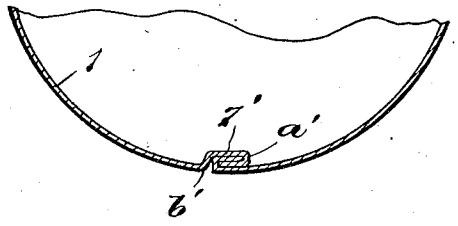
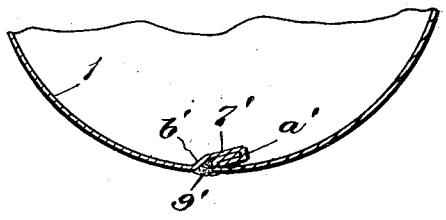


Fig. 10.



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UNITED STATES PATENT OFFICE

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SHEET-METAL CAN AND METHOD OF MAKING THE SAME

Application filed October 29, 1927. Serial No. 229,629.

This invention relates to containers or receptacles, and more particularly to sheet metal containers commonly known as cans.

The object of the invention is to provide a can or container capable of withstanding a relatively high fluid pressure, and which, at the same time, shall be relatively cheap to manufacture, so as to make possible commercial production on a large scale.

Heretofore, so far as I am aware, receptacles or containers designed to hold a fluid under pressure have been successfully constructed only by the use of welded or riveted joints, or by the employment of seamless drawn tubing. Such containers have therefore been more or less expensive to manufacture, the cost of production prohibiting their use for packages which are intended to be discarded after having been emptied of their contents.

I have found that by following my improved method of construction, cans or containers can be made cheaply of sheet metal having seams formed by crimping in the usual way, and will be capable of withstanding relatively high internal pressure, such, for example, as fifty to seventy-five pounds to the square inch.

While my improved can or container is adapted for a large number of uses, it is especially designed as a package for liquids containing a dissolved gas, such as carbon dioxide, and held under pressure. Packages of this kind are usually provided with a manually controlled discharge valve by means of which the contents may be dispensed as desired, as shown in my co-pending application, Serial No. 112,584, filed May 29, 1926. The present invention, however, relates only to a special form of joint or seam and the method of making the same.

In order that the invention may be readily understood, reference is had to the accompanying drawings, forming part of this specification, and in which:—

Figure 1 is a view partially in side elevation and partially in longitudinal section, showing a can as made and assembled at an ordinary can factory;

Figure 2 is a transverse section thereof, on the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary longitudinal section, showing my improved method of crimping on the heads;

Figure 4 is a similar view, showing the further step of soldering the heads;

Figure 5 is a view similar to Figure 1, but showing a mold or die for holding the can, and illustrating my improved method of expanding the can by fluid pressure;

Figure 6 is a transverse section on the line 6—6 of Figure 5;

Figure 7 is a fragmentary transverse section on an enlarged scale, showing the final appearance of the longitudinal seam after being soldered;

Figure 8 is a view partially in side elevation and partially in longitudinal section, showing the step of soldering the head seam on the inside; and

Figures 9 and 10 are views similar to Figure 7, the first showing a modified form of crimped seam and the second showing such a seam after having been stretched and soldered, in accordance with my improved method.

Referring to the drawings in detail, and more particularly first to Figures 1 and 2, the initial step of my method consists in forming a cylindrical can having a body 1 and heads 2 and 2′. Each of these heads is provided at its periphery with a flange 3 adapted to fit over and embrace the end of the body in the usual manner. The heads are substantially flat, that is, they have no portion projecting beyond the plane of their edge, this being desirable in order to facilitate the handling of the heads in the can making machine. The heads, however, preferably have an inner depressed portion 4, joined to the outer portion by an annular corrugation 4^a and the upper head is provided at its center with a perforation 5 formed by punching through the metal from the outside with a sharp pointed punch, thus forming a curled inner edge, as illustrated in Figures 3 and 4, and as shown and described in detail in my above mentioned co-pending application.

The lower head 2′ is preferably formed with a plurality of knobs or projections 6, which, in the final form of the can, constitute feet to cause the same to stand upright, all as described in my said co-pending application.

The body 1 of the can, as shown in Figures 1 and 2, is provided with the usual longitudinal crimped seam 7, such seam comprising a portion *a* which is bent over and engaged with the outturned edge of the underlying portion, the metal adjacent the seam being bent rather sharply, as indicated at *b* in Figure 2. This is commonly known as an outside seam.

A can constructed as above described, even with the heads soldered on, is wholly incapable of successfully withstanding relatively high internal pressures such as I propose to employ, and in order to render such can capable of withstanding these pressures, I proceed as follows.

I first bend or crimp inwardly the flanges 3 of the heads, as shown in Figure 3, such flanges being pressed in until they form an acute angle with the plane of the head and until the diameter of their extreme edge is less than their diameter in the plane of the head itself. The adjacent edges of the body 1, over which the flanges 3 fit, is also bent during this crimping operation so as to conform substantially with the inside of the flanges, and thus produce a kind of interlocking joint which tends to prevent the removal of the head. In order to effectively secure the heads in position, however, I apply solder around the edges of the flanges 3, as indicated at 8 in Figure 4. This forms a strong and permanent joint and produces an absolutely fluid tight seal.

After having soldered on the heads, as above described, I apply fluid pressure to the inside of the can to expand the same. The fluid used for this purpose is preferably compressed air, and this is introduced through the opening 5 by means of a pipe *y*, having a collar *z*, which is preferably secured to the head 2 by means of a readily fusible solder, as described in my above mentioned application. Prior to the blowing operation, however, the body of the can is preferably enclosed within a mold or die X, which is slightly larger in diameter than such body, thus permitting a certain amount of expansion, while at the same time serving to limit the expansion to the proper amount.

The can being enclosed in the die, as shown in Figure 5, compressed air is admitted through the tube *y*. This produces two results. In the first place, it causes the heads 2 and 2′ to bulge out into convex shape, as shown in Figure 5, and also as illustrated and described in my said co-pending application. In the second place, it subjects the crimped seam 7 to a transverse stretching which results in somewhat deforming this seam from its original condition. The relative appearance of the seam before and after this stretching operation is illustrated in Figures 2 and 6, the expanded form being also more clearly shown in Figure 7, it being understood, of course, that Figures 6 and 7 are somewhat exaggerated in order to make the action clear. It will be seen that the bend *b* in the metal is somewhat straightened out, or at least the angle is rendered much more obtuse, and it will be noted that the folded over portion *a* has been caused to slightly separate from the underlying portion. In other words, the crimped seam has been partially disrupted, and if the action had not been limited by the die, complete rupture of this seam would have occurred. However, as will be obvious, the size of the die is so chosen that further expansion is stopped, after the seam has been stretched, and slightly deformed, as shown in Figures 6 and 7. It would be possible, perhaps, for the operator, by exercising great skill and care, to shut off the pressure and stop the expansion at the proper point, without the use of the die X. It has been found, however, that the use of such a die greatly facilitates the work and renders the results accurate and certain.

Referring again to Figs. 2, 6 and 7, it will be seen that, in its original condition, the angle *b* is relatively sharp, and circumferential stress exerts its disrupting action on the seam through a comparatively long lever arm, namely the distance from the bend *b* to the outside of the seam. When, however, the can has been deformed as shown in Figs. 6 and 7, and the bend *b* somewhat straightened out, the lever arm through which stress is exerted upon the seam is obviously reduced, and the seam will therefore hold better.

After the expanding operation, above described, the stretched and partially deformed longitudinal seam is permanently and tightly sealed by applying solder along the outside of the seam, adjacent the folded portion *a*, as clearly shown in Figure 7. It will be seen that after this solder is applied, no further stretching or deformation of the parts, under internal pressure, is possible.

The next and final step in the manufacture of my improved can consists in removing the air pipe *y*, and in dropping into the can through the opening 5, a small lump of solder, as shown at 10 in Figure 8. The can is heated to the proper degree and is rotated while in an inclined position, thus causing the solder to be spread around the inside seam of the lower head or bottom of the can. This serves to still more securely hold this head in position. A discharge tube carrying a dispensing valve may now be inserted through the opening 5 and soldered in position, as described in my said co-pending application, and the

can may then be filled with the desired liquid in any suitable manner.

Instead of making an outside seam, as shown in Figures 1 and 2, I may form the can with what is known as an inside seam, as illustrated at 7′ in Figure 9. In this case, the folded over portion *a′* lies on the inside of the can and the metal is sharply bent, as indicated at *b*. Figure 10 shows the appearance of this form of seam after having been subjected to the blowing or expanding operation. It will be seen that the folded over portion *a′* has tended to slightly separate from the adjacent wall of the can, and that the bend *b* has tended to straighten out. In this case, the solder is applied along the seam in the crack adjacent to the bend *b′*. As described in connection with the outside seam, the straightening of the bend *b* reduces the lever arm through which the stress acts upon the seam, and, as in the former case also, reduces the tearing effect produced on the solder, thereby making the joint stronger.

While either outside or inside seams may be employed, in carrying out my improved method, I prefer to use the outside seam, as shown in Figures 2, 6 and 7, as this gives superior results.

By crimping on and soldering the heads, as shown, and by expanding and soldering the longitudinal seam, I am enabled to produce, at a very low cost of manufacture, a sheet metal can or package capable of successfully holding internal fluid pressure strong enough to effectively discharge the contents of the can through the dispensing valve referred to, and to project a stream of liquid form such valve to relatively great distances, and when my improved can is employed for containing lubricating oil, paints, fire extinguishing compounds and the like, it is thought that the many advantages thereof will be apparent without further discussion.

What I claim is:

1. A sheet metal can comprising body and heads, the ends of the body flaring outwardly, said heads having peripheral flanges lying wholly outside the body and bent over the outwardly flaring ends of the body into an inwardly inclined position forming an acute angle with the planes of the heads and soldered to the edge portions of the body.

2. A sheet metal can comprising body and heads, said heads having peripheral flanges bent over the ends of the body into an inwardly inclined position forming an acute angle with the planes of the heads, one of said heads being soldered to the end of the body both inside and outside, the completed joint comprising only two thicknesses of metal.

3. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam, expanding the body so as to stretch and partially open said crimped seam, thus decreasing the leverage with which stresses act upon said seam, and then applying solder along said partially opened seam to securely seal the same.

4. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam, securing heads to such body, introducing pressure fluid into the can to expand the same and thus stretch said crimped seam transversely, and then applying solder along said stretched seam to securely seal the same.

5. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam, applying flat heads to such body and soldering on said heads, introducing pressure fluid into the can to expand the same and thus cause both the heads to bulge out into convex shape and the longitudinal crimped seam to be stretched transversely, and then applying solder along said stretched seam to securely seal the same.

6. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam, applying flat heads to such body and soldering on said heads, introducing pressure fluid into the can to expand the same and thus cause both the heads to bulge out into convex shape and the longitudinal crimped seam to be stretched transversely, and then applying solder along said stretched seam and around the inside of the seam joining one of said heads to the body.

7. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam having the folded over portion on the outside of the can, expanding the body so as to stretch or deform said crimped seam, partially separating the parts thereof, and decreasing the leverage with which stresses act upon said seam, and then applying solder on the outside along the seam so as to secure the partially separated parts together and produce a fluid tight joint.

8. The method of making a sheet metal can having seams capable of withstanding fluid pressure which comprises forming a can body with the usual crimped longitudinal seam having the metal sharply bent adjacent thereto, expanding the body so as to stretch said seam transversely and thus partially straighten out the bend in the metal, and then applying solder along the outside of the seam, said straightening of the metal serving to reduce the tearing action on the solder, whereby the parts are securely held against further yielding.

9. The method of producing sheet metal cans capable of resisting high internal pressures which comprises forming a cylindrical can body, soldering flat heads to the ends of said body, and thereafter subjecting the assembly to an internal fluid pressure sufficient to cause a bulging and permanent deformation of said heads.

10. The method of producing sheet metal cans capable of resisting high internal pressures which comprises forming a cylindrical can body, soldering flat heads to the ends of said body, and thereafter introducing into the can through a pipe fluid under pressure sufficiently strong to cause a bulging and permanent deformation of said heads.

11. The method of producing cans capable of resisting high internal pressures which consists in forming a cylindrical can body, soldering to said body heads with central depressions whereby the assembly has recessed ends, and thereafter subjecting the assembly to an internal pressure sufficient to cause a bulging and permanent deformation of the ends of the can.

12. The method of forming a can, capable of resisting high internal pressures which consists in forming a cylindrical can body, securing to said body flat sealing heads with annular corrugations or depressions, whereby the assembly has recessed ends and can be passed through the guides of the usual can making machines, and thereafter subjecting the assembly to an internal pressure sufficient to cause a bulging and permanent deformation of the ends of the can by the yielding of the corrugations.

13. The method of making sheet metal cans comprising applying to the end of a cylindrical body a head having a peripheral flange extending at substantial right angles to the plane thereof and embracing said body, pressing or crimping inwardly the edge of said flange and the adjacent portion of said body so as to cause said flange to extend in a direction forming an acute angle with the plane of the head, and then soldering said flange to the body.

In testimony whereof I affix my signature.

JOHN F. WERDER.