

Jan. 18, 1944.

M. O. KUHN

2,339,554

CONTAINER

Filed Dec. 2, 1941

2 Sheets-Sheet 1

Fig. 1

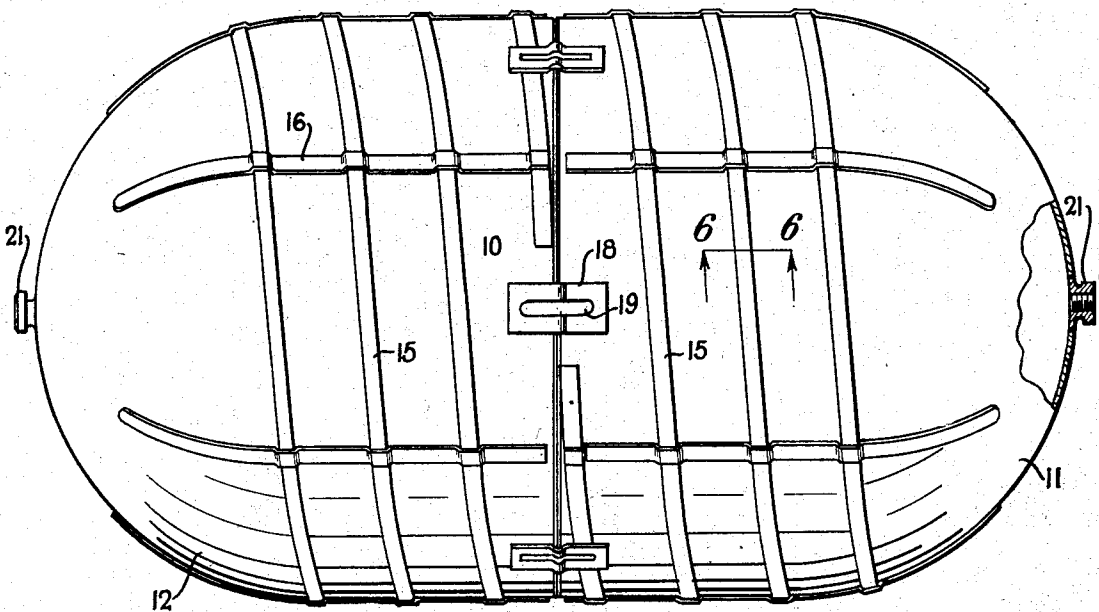


Fig. 2

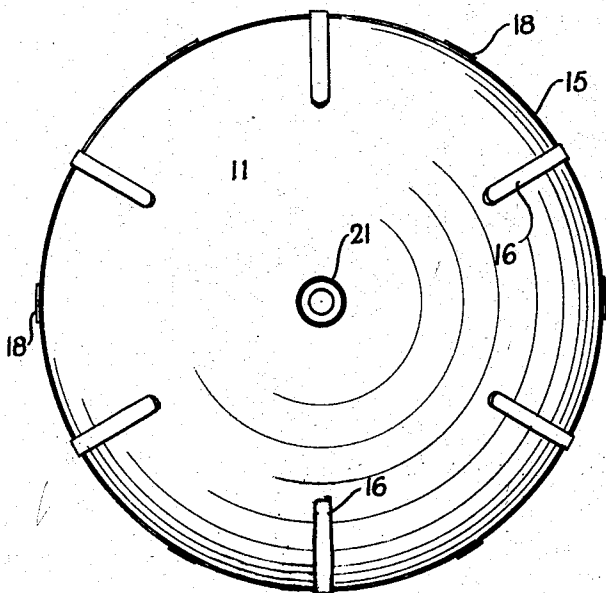


Fig. 3

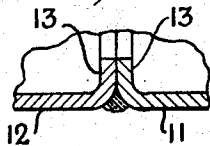


Fig. 4

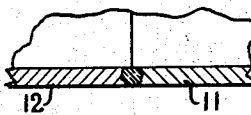


Fig. 5

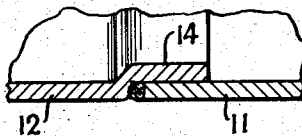
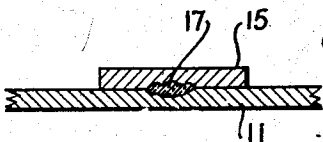


Fig. 6



BY

INVENTOR

Max O. Kuhn

Ely S. Faye

ATTORNEYS

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2 Sheets-Sheet 2

Fig. 7.

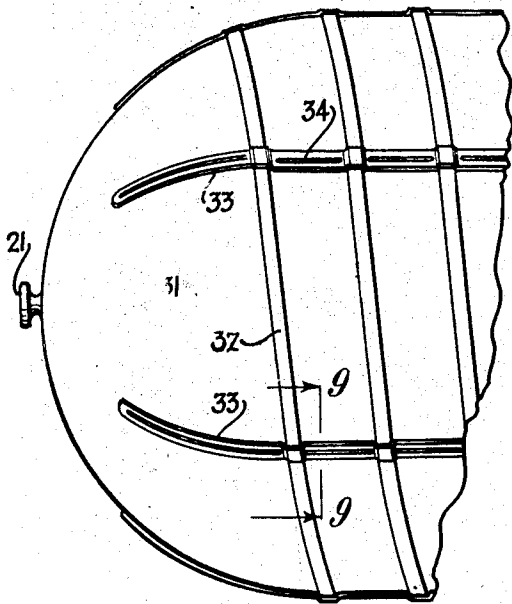


Fig. 8.

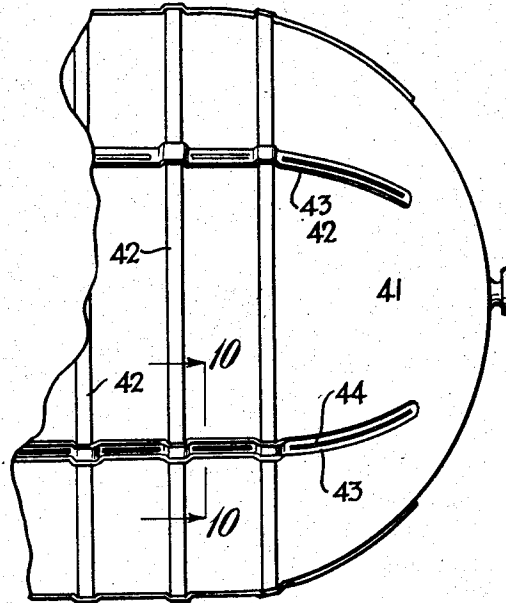


Fig. 9

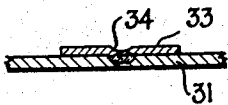


Fig. 10

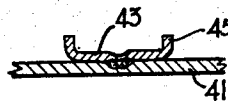


Fig. 11

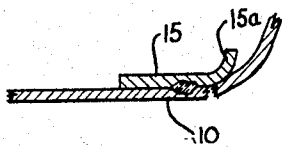
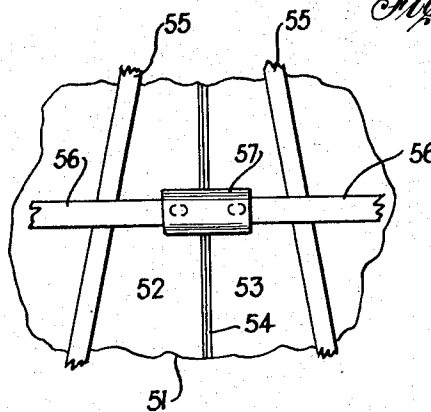


Fig. 12



Inventor
Max O. Kuhn

Ely T. Frye

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Attorneys

UNITED STATES PATENT OFFICE

2,339,554

CONTAINER

Max O. Kuhn, Cuyahoga Falls, Ohio, assignor
to The Firestone Tire & Rubber Company,
Akron, Ohio, a corporation of Ohio

Application December 2, 1941, Serial No. 421,307

7 Claims. (Cl. 220-3)

This invention relates to containers, especially to lightweight containers adapted to hold gases and other fluids under pressure and not explode or be completely demolished when a bullet pierces the container.

In containers of the class identified above, it is very difficult to combine lightweight with desirable characteristics for protecting the container against explosion when struck by a bullet even though the bullet's force is increased by escaping gases. Attempts have been made to reinforce the containers, so that they resist tearing or exploding when a bullet passes therethrough, but such attempts have either been failures or else have resulted in containers that weigh too much to be suitable for use, such as for an oxygen tank in an airplane.

The general object of the present invention is to provide a lightweight, well reinforced container, which is adapted to retain a gas or fluid under high pressure and not be exploded or completely demolished when a bullet pierces the container.

Another object of the invention is to provide a container which is easily manufactured from standard materials, which container is especially resistant to a tearing action.

The foregoing and other objects will be manifest as the specification proceeds, which specification is described with particular reference to the accompanying drawings:

Figure 1 is an elevation, partly in section, of a container embodying the invention;

Figure 2 is an end elevation of the container of Figure 1;

Figures 3, 4 and 5 are fragmentary sections of joints illustrating the manner in which the individual sections forming the container of Figure 1 may be secured together;

Figure 6 is an enlarged fragmentary section taken on line 6-6 of Figure 1, and shows the manner in which a reinforcing strap is secured to a container section;

Figures 7 and 8 are fragmentary elevations of modified containers of the invention;

Figures 9 and 10 are sections on lines 9-9 of Figure 7 and 10-10 of Figure 8, respectively;

Figure 11 is a fragmentary section of a container of the invention showing its action when subjected to a tearing force;

Figure 12 is a fragmentary plan of a further modification of the invention.

Referring in detail to the accompanying drawings, a container 10 is shown therein, which container is shown as comprising two cup shaped container sections 11 and 12. These container

sections 11 and 12 each have a spherical end portion, with the other end of the container sections being open and secured together in order to form the container 10. It will be seen that the container can be made from three or more sections, if desired, by forming cup shaped end sections, which are coupled with cylindrical, or tubular members. The container sections 11 and 12 preferably are made from thin sheets of stainless steel, although in other instances other metals may be substituted therefor.

Figures 3, 4 and 5 illustrate typical joint constructions by which the container sections 11 and 12 may be secured together. For example, Figure 3 shows a construction wherein the ends of the container sections are bent inwardly to form inwardly extending flanges 13, which flanges are abutted and then welded together by metal deposited in the groove formed in the container surface by the inwardly turned flanges 13. Or, the container sections may be secured together by an ordinary atomic welded butt joint, as shown in Figure 4. In some cases, it may be desirable to secure the container sections 11 and 12 together by a lap joint, as shown in Figure 5. In this case, a reduced diameter section 14 is formed on the container section 12, and this reduced diameter section is telescoped into engagement with the other container section 11, as shown, and thereafter welded in place.

In order to reinforce the container sections 11 and 12 without greatly adding to the weight thereof, straps 15 are secured to the outer surfaces of the container sections 11 and 12. The straps 15 are flat in section and are formed into a plurality of relatively widely spaced helical convolutions which extend substantially the entire cylindrical length of the container sections to arrest longitudinal tears in the container sections. Each strap 15 starts adjacent the spherical end of the container section and extends to a point immediately adjacent the welded end of the section. The container sections are further reinforced, and lateral tearing of the container sections is prevented, by longitudinally extending straps 16 that are secured to the outer surfaces of the container sections and extend over the straps 15. The straps 16 may extend either one half the length of the container or the full length thereof, as desired, but usually terminate short of the joint between the container sections, as shown.

A distinct feature of the invention is that both the straps 15 and 16 are secured to the container sections 11 and 12 by either a continuous weld, or a weld that is substantially continuous, that

extends only along the axis of the straps. That is, the straps are secured to the container sections only intermediate the edges, or lateral margins of the straps, as most clearly shown at 17 in Figure 6. The welding conditions as to welding temperature and length of time that one welded zone is heated are so adjusted that only the portions of the container sections 11 and 12 and straps immediately adjacent the weld are annealed. This, it is believed, is an important feature of the invention especially when the container sections are of such nature that they are increased in tensile strength by cold drawing them to shape, which is the usual way of forming the sections, especially if they are made from stainless steel. Then the sections are weaker immediately adjacent the weld than they are in any other portions thereof. If the container sections are torn, such tear usually extends to the point where a reinforcing strap is integrally bonded to the container section by the welded joint, and the fact that the grain structure of the bonded materials or pieces of metal naturally or almost invariably will extend in different directions from the grain of the container section, and the increased thickness of the container wall at the weld, materially increases the resistance of the welded joint to the tearing action, whereby such tearing action is stopped at the welded joint. Or, the container section, usually being weaker immediately adjacent the weld than at any other point, will tear at that point. Such a tear in the container section must bend the marginal portion 15a of the strap 15 immediately adjacent the weld outwardly and this aids in stopping such tearing actions (see Figure 11).

The circumferential seam between the container sections 11 and 12 may be reinforced against circumferential tearing, when necessary, by means of longitudinally extending straps 18 that extend over the adjacent portions of the container sections. These straps 18 have slotted center portions 19, so that welding material may be deposited therein to secure the reinforcing straps 18 in position. Hence, a substantially similar construction results by use of the straps 18 as is obtained by welding the straps 15 and 16 in position in the manner hereinbefore described. The container is completed by fittings 21 butt welded to the ends of the sections 11 and 12.

Figures 7 and 8 show elevations of modified embodiments of the invention wherein special types of reinforcing straps are provided. A container 31, which has a helical reinforcing strap 32 therearound, is provided with longitudinally extending reinforcing straps 33 at spaced portions thereof. The straps 33, similar to the straps 16, extend over the helical strap so that they do not contact the container 31 for their entire length. The portion of the straps 33 bearing on the container initially have an inwardly projecting rib 34 formed thereon to facilitate welding the strap to the container by projection welding. This substantially insures getting a good weld in all instances whereby uniform containers can be produced. The rib is not completely shown in Figure 9 due to a portion of same being made integral with the container by the welding operation.

A container 41, as shown in Figure 8, has reinforcing straps 42 and 43 welded thereto. The straps 42 are similar to the straps 15 except that they form separate circular bands around the container 41. The straps 43 extend longitudinally of the container and have ribs 44, sim-

ilar to the ribs 34, formed thereon. The container is even further reinforced by forming outwardly directed flanges 45 on the edges of the straps 43, as shown in Figure 10. Obviously, if desired, any of the features of the straps 33, or 43 may be used in forming the straps 15, 16, 32 or 42. It will be noted that the containers 31 and 41 are generally similar to the container 10.

Figure 12 shows a container 51 which is formed from sections 52 and 53 that are secured together by a welded seam 54. The container sections have reinforcing straps 55 and 56 similar to the straps 15 and 16, respectively, welded thereto as hereinbefore described. In this instance, the seam 54 and the portion of the container thereadjacent are reinforced against circumferential tearing by reinforcing plates 57 that are welded to the ends of the straps 56 and bridge the portion of the container therebetween. Note that the helically disposed convolutions of the straps 55 extend in opposite directions. Both the straps 55 and 56 are secured to the container sections before the sections are secured together, as are the straps used in forming the other embodiments of the invention.

Containers in accordance with the invention have been constructed and tested on several occasions, which constructions all have proven quite satisfactory. The containers have not sacrificed their light weight produced by their thin walled construction, but have been sturdy, tear resistant constructions, which, even though containing gases under high pressure, do not explode or tear excessively when punctured by a bullet.

The detailed description of the particular embodiments of the invention illustrated herein is not to be construed as limiting the invention thereto. The invention includes all features of patentable novelty residing in the foregoing description and shown in the accompanying drawings.

What is claimed is:

1. A lightweight substantially cylindrical metallic container comprising two substantially cup shaped, thin walled metal members each of which has a spherical end portion, said members having their open ends abutted and secured together, a helical reinforcing strap positioned around the outer surface of each of said cup shaped members adjacent the abutted ends thereof, longitudinally extending straps extending substantially the length of said container and at least partially over the spherical ends thereof, said straps all being welded to said members only intermediate the lateral margins of the straps, and reinforcing plates having slotted center portions extending over the joint between said members at circumferentially spaced points, said plates being welded to said members only adjacent the slotted centers thereof.

2. A lightweight substantially cylindrical metallic container comprising two substantially cup shaped members the open ends of which are secured together, a helical tear-resisting strap positioned around a portion of the outer surface of each of said cup shaped members, and longitudinally extending straps extending substantially the length of said container and at least partially over the spherical ends thereof, said straps all being welded to said members only intermediate the edges of said straps.

3. A substantially cylindrical metallic container comprising two substantially cup shaped members each of which has a spherical end portion, said members being secured together, a

helical reinforcing strap positioned around at least a portion of the outer surface of each of said cup shaped members, said straps being welded to said members only intermediate the edges of said straps, and reinforcing plates having slotted center portions extending over the joint between said members at circumferentially spaced points, said plates being welded to said members only adjacent the slotted centers thereof.

4. A lightweight container that is resistant to tearing, said container including a thin wall metal cylinder, a plurality of longitudinally spaced circumferentially extending convolutions of a reinforcing strap extending around said cylinder, and a plurality of longitudinally extending laterally spaced reinforcing straps secured to said container, said spacing between said straps being at least four times the width of the straps, said straps being welded to said container adjacent the central portion of one of their faces.

5. A lightweight tubular metallic container having closed end portions of substantially spherical shape, a ribbon-like reinforcing element helically applied to said container with spaced convolutions and extending intermediate the spherical ends thereof, said element being welded to the container walls along a line intermediate the element margins, and a plurality of longitudinally disposed ribbon-like metallic strips extending from one end portion to the other end portion, said strips being in spaced relation about the container and welded thereto along a line intermediate the strip margins, said spacing between said convolutions being at least four times the width of said elements.

6. A light weight substantially cylindrical metal container comprising a plurality of body sections each of which has at least one open end and two of which have one open and one spherically shaped closed end, said sections having their open ends abutted and secured together, external tear-resisting members in contact with portions of the outside surface of said container, said tear-resistant members being formed into a plurality of helical convolutions which extend substantially the entire container length, said tear-resisting members being in the form of metal straps and being permanently attached directly to said container at the central portion only of the container contacting face of said straps, whereby a substantial width of the said straps will extend on each side of said attachment and in contact with but unattached to the container, the surface area of the reinforced container being substantially greater between said straps than its surface area under the straps.

7. A substantially cylindrical metallic container comprising two substantially cup-shaped members each of which has a spherical end portion, said members being secured together, a helical reinforcing strap positioned around at least a portion of the outer surface of each of said cup-shaped members, said straps being welded to said members only intermediate the edges of said straps, and reinforcing plates extending over the joint between said members at circumferentially spaced points, said plates being welded to said members.

MAX O. KUHN.