Oct. 9, 1945. D. MAPES 2,386,246

METHOD OF MAKING CONTAINERS

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Fig. 1

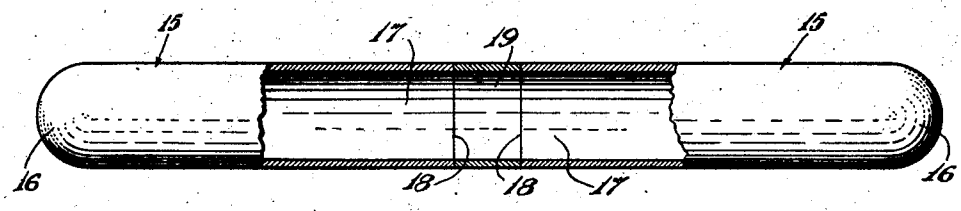


Fig. 2

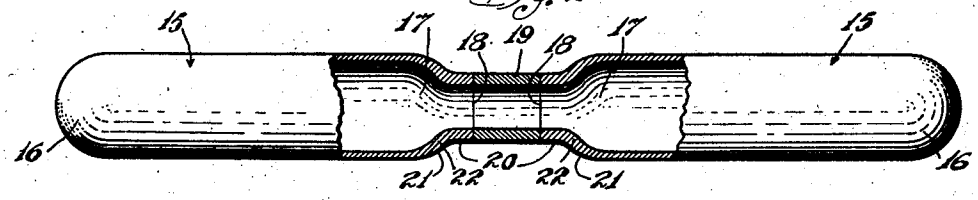


Fig. 3

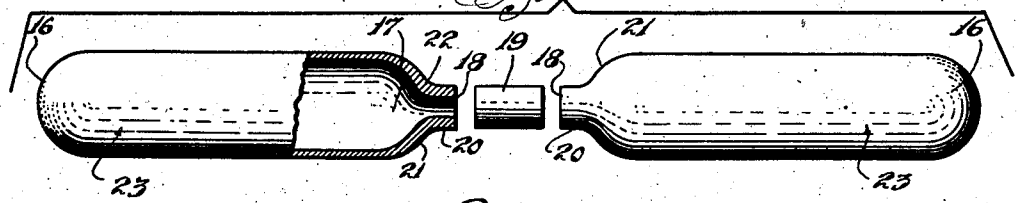


Fig. 4

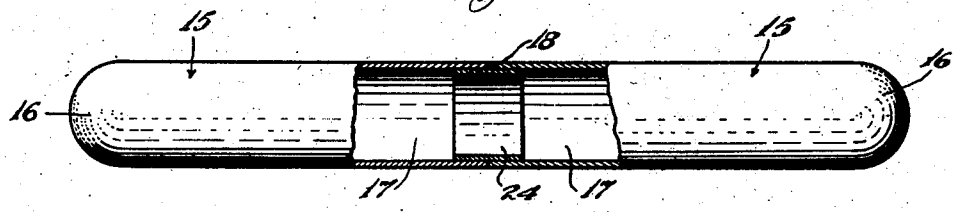
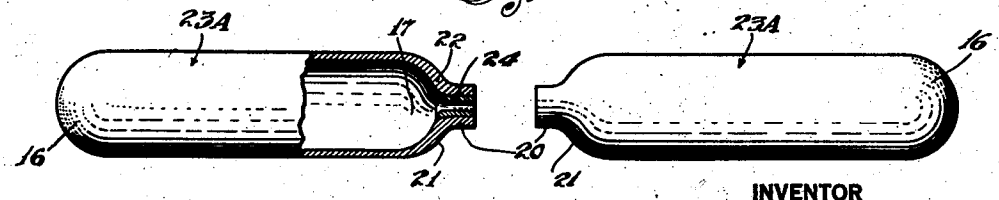


Fig. 5



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Fig. 6

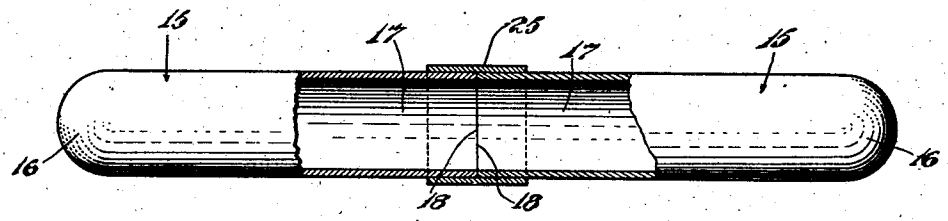


Fig. 7

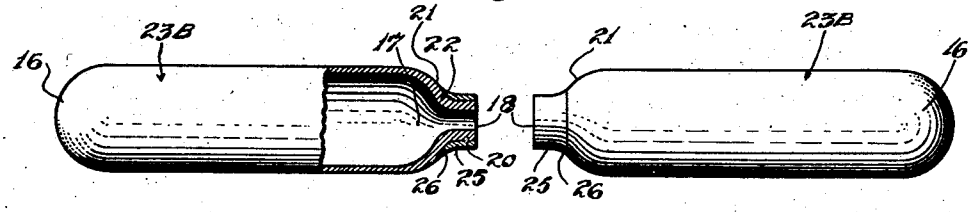


Fig. 8

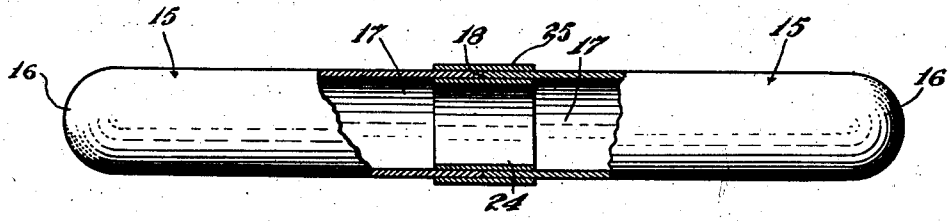
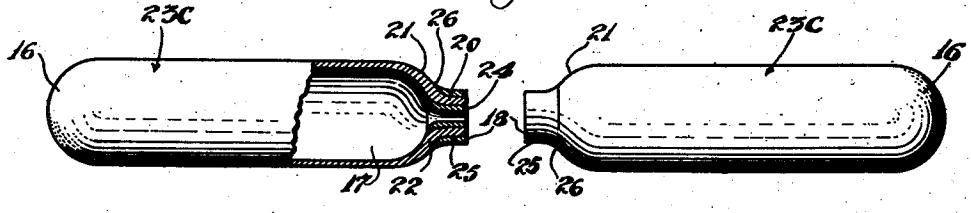


Fig. 9



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METHOD OF MAKING CONTAINERS

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Application April 4, 1942, Serial No. 437,635

6 Claims. (Cl. 29—148.2)

The present invention relates to metal containers, and more particularly to a method of making metal containers, such as cylinders, or the like, adapted for storing fluid media under relatively high pressures.

The containers with which the present invention is concerned, generally, comprise a substantially cylindrical or spherical body, closed at one end and provided with a neck portion or shoulder and neck at the other end. The neck usually has an opening for receiving a valve, a plug provided with a closure, or similar means adapted to normally confine the pressure media in the container, and adapted to be opened or otherwise rendered effective to release the pressure media from the container. Such containers are generally known and referred to as compressed gas tanks or cylinders, or high pressure containers.

An object of the present invention is to provide an improved method of making containers of the foregoing character.

Another object is to provide a rapid, inexpensive method for forming the necks and shoulders of the containers.

Another object is to provide a method of forming the necks and shoulders of the containers without inserting dies, roller or other tools into containers during the neck and shoulder forming operations.

Another object is to provide a method of thickening or reinforcing the necks and shoulders of the containers during the formation thereof.

A further object is to provide a method of simultaneously forming the necks and shoulders in a pair of containers.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Figure 1 is an elevational view, partly in section, illustrating a pair of cylindrical shells attached together by an intermediate tubular member having the open ends of the shells attached thereto.

Figure 2 is an elevational view, partly in section, illustrating the shells shown in Figure 1 partly formed into containers.

Figure 3 is an elevational view, partly in section, illustrating the shells shown in Figures 1 and 2 formed into a pair of containers detached from the intermediate member.

Figure 4 is an elevational view, partly in section, illustrating a pair of cylindrical shells attached together at their open ends by a tubular member telescoped into the shells.

Figure 5 is an elevational view, partly in section, illustrating the shells shown in Figure 4 formed into a pair of containers.

Figure 6 is an elevational view, partly in section, illustrating a pair of cylindrical shells attached together at their open ends by a tubular member telescoped about the shells.

Figure 7 is an elevational view, partly in section. illustrating the shells shown in Figure 6 formed into a pair of containers.

Figure 8 is an elevational view, partly in section, illustrating a pair of shells attached together at their open ends by a tubular member telescoped into the shells and by a second tubular member telescoped about the shells.

Figure 9 is an elevational view, partly in section, illustrating the shells shown in Figure 8 formed into a pair of containers.

In accordance with the invention, these objects may be accomplished by attaching the open ends of a pair of metal shells, which are closed at the other end; forming a neck portion in each of the shells adjacent the point the shells are attached; and thereafter detaching the shells to provide a pair of containers.

The open ends of the shells may be attached by welding or otherwise securing them to an intermediate member. The intermediate member may have the open end of one of the shells welded to each end thereof or may be telescoped into or about the shells and positioned adjacent their open ends. If desired, a member may be telescoped into shells and a second member may be telescoped about the shells. In cases where the intermediate or attaching members are in telescoping relation with the shells, the free ends of the shells may be welded together.

During the neck portion forming operations, or the neck and shoulder forming operations, the portions of the shells adjacent the open ends thereof may be heated in any suitable manner, to facilitate the forming operations. The neck portions may be formed simultaneously in a pair of shells by rotating the shells and applying pressure radially inwardly by means of suitable rollers, spinning tools, or the like. The shells may be urged towards each other to prevent

elongation thereof, and the rollers or spinning tools may be manipulated to thicken the metal shells at the portions of the neck adjacent to and merging with the shoulder.

After the forming operations have been completed, the shells may be detached by severing the weld at the open ends of the shells or by cutting through the middle of the shell connecting members in a plane substantially perpendicular to the longitudinal axis of the shells and the members.

Referring to the drawings, and more particularly to Figures 1, 4, 6 and 8 thereof, there is shown a pair of substantially cylindrical shells or blanks 15, adapted to be formed into containers or cylinders for storing fluid media under pressure. One end 16 of each shell is closed and preferably is hemispherical in shape, and the other end 17 of each shell is open and is provided with an annular rim 18.

The shells may be formed by drawing or forging operations, or other suitable operations which may be employed in the manufacture of shells adapted to be used for the purposes described herein. The shells may be formed of any suitable metal, such as iron or aluminum or their alloys, and are designed to be formed into containers adapted to withstand relatively high internal pressure.

In Figure 1, a pair of shells 15 is shown having their rims 18 attached or secured to the respective ends of a substantially cylindrical tubular member 19 having a desired length. The shells may be connected to the intermediate member 19 by welding, brazing or other suitable operations. If desired, the connections between the shells and the member 19 may form a hermetic seal, whereby the air in the shells is sealed therein. The pair of shells, joined in the foregoing manner, is then placed in a lathe or similar machine for rotating the shells about their longitudinal axis. Each of the closed ends 16 of the shells is placed in a suitable chuck (not shown), and one of the chucks may be rotated by suitable drive means and the other chuck may rotate idly to serve as a support. In addition, the shells may be supported at spaced points along their length by rollers or the like.

After a pair of shells (Figure 1) has been placed in the lathe or the like, the shells are rotated at a desired speed and heat is applied thereto at the portions adjacent the previously open ends 17 to render the metal more readily workable. Suitable rollers or other spinning or swaging tools are then applied to the heated portions to work the metal radially inwardly and begin the formation of a neck portion comprising a neck 20 and a shoulder 21, as shown in Figure 2. During the neck and shoulder forming operation, pressure may be applied in an axial direction to the closed ends of the shells to prevent elongation of the shells. The axial pressure may be suitably controlled and the effect thereof may be utilized in conjunction with the action of the rollers or spinning tools to slightly thicken the metal at the shoulders of the shells, for example, as shown at 22. The air trapped in the shells provides a cushioning effect during the formation of the necks and shoulders and prevents the pressure applied by the roller or spinning tools from collapsing the shells at their neck portions.

Preferably, the neck and shoulder are formed simultaneously in each of the shells to save time and produce two containers in substantially the same time which would be required to shape a single container by other methods. By spacing the shells apart by means of a tubular member or collar 19 spinning tools or rollers may be more readily applied to both of the shells at the same time to form necks and shoulders therein.

After a neck and shoulder of a predetermined size and shape are formed in each of the shells, the shells are detached from the tubular member to provide a pair of containers or cylinders 23, as shown in Figure 3. The shells may be severed at the weld or brazed junction by cutting or other operations which will effect separation of the shells. Thereafter the containers may be subjected to other desired finishing operations.

Another method of forming a pair of containers 23 is illustrated in Figures 4 and 5. As shown in Figure 4, one end of a substantially cylindrical tubular member 24 is telescoped a desired distance into the open end of one of the shells 15 and the other end of the member 24 is telescoped the same distance into the open end of the other shell 15. The tubular member 24 may be secured to the shells by welding or in any other suitable manner. The rims 18 of the shells may abut each other, and, if desired, may be secured by welding.

Necks 20 and shoulders 21 may be formed in the shells by rotating the shells, heating them and applying rolling or spinning tools in substantially the same manner described in connection with Figures 1, 2 and 3. After the formation of the necks and shoulders the shells are separated or severed at their rims and the tubular member 24 is cut in a plane perpendicular to the longitudinal axis of the shells, and at its midpoint, to provide a pair of containers 23A (Figure 5). The portion of the tubular member in the neck portion of each of the containers is integrally secured to the containers and serves to reinforce the necks and shoulders of the containers.

In Figures 6 and 7, a method of forming a pair of containers or cylinders 23B is illustrated, which differs from the method shown in Figures 4 and 5 in that a tubular member 25 is telescoped about each of the shells adjacent their open ends. The tubular member 25 may be thinned out at 26 during the formation of the necks and shoulders of the container 23B so that it merges into the shoulders 21.

In Figures 8 and 9, a method of forming a pair of containers or cylinders 23C is illustrated, which combines the features of the method shown in Figures 4 and 5 and the method shown in Figures 6 and 7. A tubular member 24 is telescoped into the open ends of the shells and a tubular member 25 is telescoped about the shells adjacent the open ends thereof.

From the foregoing description it will be seen, that the present invention provides an improved method of making containers or cylinders for storing fluid media under pressure. By forming the necks and shoulders in a pair of containers simultaneously, two containers are produced in about the same time in which one container can be provided with a neck and shoulder by other methods. Furthermore, the necks and shoulders can be accurately formed without creating strains in the metal or weakening the metal in some other way.

In cases where connecting members are placed in telescoping relation with respect to the shells, the shells are reinforced during the heating and rolling or spinning operations to prevent the containers from collapsing or being crushed ad-

jacent the open ends thereof by the pressure of the radially inwardly applied rollers or the pressure at the closed ends of the shells in an axial direction. The telescoping tubular members also serve to reinforce the finished containers and provide a collar adapted to be threaded to receive a threaded plug or closure. The containers made in accordance with the invention are rugged in construction and can readily withstand any rough usage to which they may be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. The method of making high pressure metal containers from cylindrical shells each having at least one open end, which comprises initially fastening tubular means to the open ends of an opposed axially aligned pair of shells, subjecting the open end zones of said pair to a necking operation to provide said pair with necks, and subjecting the necks and tubular means to a severing operation to provide a pair of separated necked containers.

2. The method of making high pressure metal containers from cylindrical shells having open and closed ends respectively, which comprises initially fastening tubular means to the open end zones of an opposed axially aligned pair of shells, subjecting said tubular means and zones to a diameter reducing operation to provide said pair with necks, and subjecting said necks and tubular means to a severing operation to provide a pair of separated necked containers.

3. The method of making high pressure metal containers from cylindrical shells having open and closed ends respectively, which comprises initially fastening a tubular member in telescopic relation to the open end zones of an opposed axially aligned pair of shells to provide reinforced open end zones, subjecting said open end zones and said member to a diameter reducing operation to provide said pair with reinforced necks, and subjecting said reinforced necks to a severing operation to provide a pair of separated containers having reinforced necks.

4. The method of making high pressure metal containers from cylindrical shells having open and closed ends respectively, which comprises initially fastening a pair of tubular members in telescopic relation about and within the open end zones of an opposed axially aligned pair of shells to provide reinforced open end zones, subjecting said open end zones and said members to a diameter reducing operation to provide said pair of shells with reinforced necks, and subjecting said reinforced necks to a severing operation to provide a pair of separated containers having reinforced necks.

5. The method of making high pressure metal containers from cylindrical shells each having at least one open end, which comprises fastening tubular means to the open ends of an opposed axially aligned pair of shells, subjecting the open end zones of said pair and said tubular means to a diameter reducing operation to provide said pair with necks, maintaining the other ends of said pair against movement away from each other during the diameter reducing operation to increase the thickness of the walls defining the necks, and subjecting the necks and tubular means to a severing operation to provide a pair of separated containers having necks of a greater wall thickness than the body of the containers.

6. The method of making high pressure metal containers from cylindrical shells each having at least one open end, which comprises fastening tubular means to the open ends of an opposed axially aligned pair of shells, subjecting the open end zones of said pair and said tubular means to a diameter reducing operation while heated to provide said pair with necks, maintaining the other ends of said pair against movement away from each other during the diameter reducing operation and while heated to increase the thickness of the walls defining the necks, and subjecting the necks and tubular means to a severing operation to provide a pair of separated containers having necks of a greater wall thickness than the body of the containers.

DANIEL MAPES.