Nov. 12, 1968 W. E. THOMAS 3,410,440

CONTAINER

Filed May 12, 1966

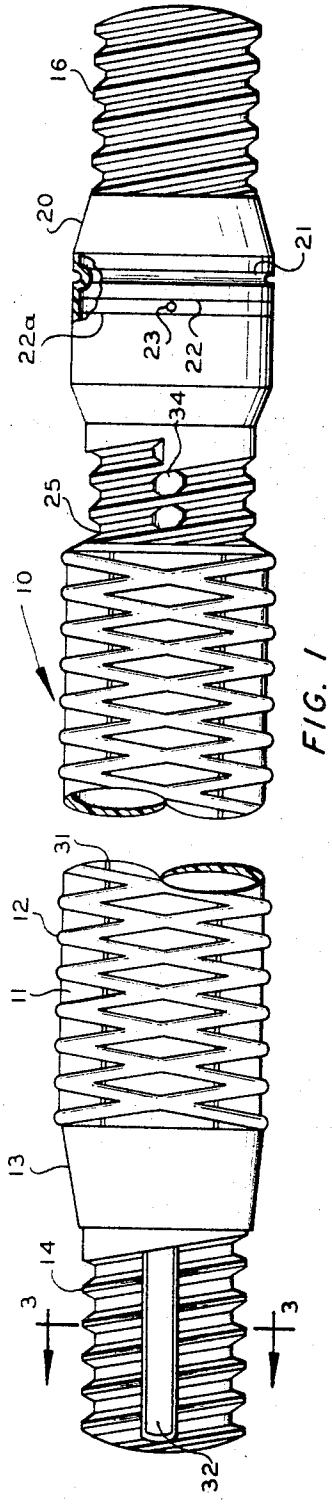


FIG. 1

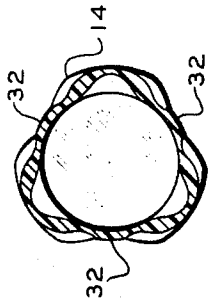


FIG. 3

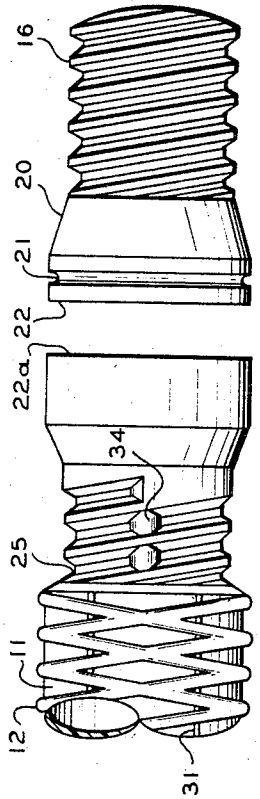


FIG. 2

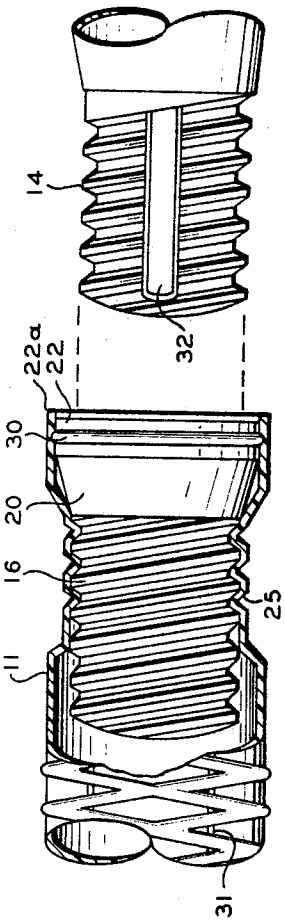


FIG. 4

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CONTAINER

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ABSTRACT OF THE DISCLOSURE

The invention relates to containers suitable for use in packaging of explosives which comprise a blow-molded tubular container having longitudinal reinforcing ribs associated with the threaded ends of said container, said ribs comprising interruptions of said threads and having substantially the same thickness as the valleys of said threads, and having longitudinal and helical or circular reinforcing ribs on the body of said container having substantially the same thickness as said container.

This invention relates to containers. In one aspect, it relates to containers suitable for use in the packaging of explosives. In another aspect, it relates to a container initially formed as a single piece, but adapted to have one end separated and subsequently used as a closure for the container. In another aspect, it relates to a container being strengthened against bending by means of longitudinal reinforcing ribs. In another aspect, it relates to an explosives container having longitudinally reinforcing ribs associated with the threaded end of the container to prevent bending when a series of containers are screwed together. In still another aspect, it relates to a threaded end portion of a plastic container made resistant to distortion by means of reinforcing ribs which comprise interruptions of the threads.

The copending application of Branscum and Barnes, Ser. No. 412,811, filed Nov. 20, 1964, discloses and claims a container of flexible side wall material. This container is commonly used for the packaging of explosives which can be lowered into small-diameter drilled holes for blasting purposes. It is common practice to join together a number of such containers in end-to-end relationship to provide the desired amount of explosive charge in the hole. It has been discovered, however, that when several such containers are threaded together, the weight of the explosive causes the containers to become distorted at the threads when a gang of joined containers is picked up or moved. This distortion appears to be due to an accordion action of the threads. Thus, when one container is picked up, the threads which join it to an adjacent container will become compressed on the bottom side of the threads, and expanded on the top side. This will lead to tearing of the container.

Accordingly, it is an object of this invention to provide threaded containers having a stronger threaded portion. It is a further object of this invention to provide explosive containers having threads which are resistant to flexing when a plurality of containers are threaded together. It is a further object of this invention to provide a stronger explosive package.

Other aspects, objects and the several advantages of this invention are apparent to one skilled in the art from a study of this disclosure, the drawings, and the appended claims.

According to the invention, a container is provided with longitudinal reinforcing ribs at points of structural weakness, particularly at the threads.

Where reinforcing ribs are to be provided at a threaded portion of a container, the primary purpose of the ribs is

to prevent the accordion action of the threads. It is, thus, only necessary that the threads be interrupted along a longitudinal line. The wall thickness in this interrupted portion need not be any greater than the thickness of the material forming the threads themselves. At least three of such interrupted areas will be provided on the threads. Additional reinforcing ribs can be provided on the body of the container, aiding in preventing flexing of the body portion.

FIGURE 1 shows the container of my invention as prepared by a blow molding process. FIGURE 2 shows the container with one end severed. FIGURE 3 shows a cross section of the small threaded end of the tube. FIGURE 4 shows a portion of the container where the severed end has been inverted and screwed into position, and is ready to accept the closed end of another similar container.

Referring now to the drawings and to FIGURE 1 in particular, there is shown at **10** the container of my invention at an intermediate stage of manufacture. The container is preferably formed of a suitable thermoplastic material such as polyethylene, polypropylene, ethylene-butene copolymers, polyvinyl chloride, or in fact any other suitable thermoplastic. Desirably, the container is formed in one step by blow molding. In the blow molding operation, a tube or parison of molten thermoplastic material is extruded downwardly between an open pair of mold sections. The mold sections are contoured on their interior to conform to the desired finished article. After a sufficient length of the parison has been extruded, the mold sections close about the parison pinching it off at its top and bottom ends. According to a preferred method of blow molding, one of the mold sections is provided with a hollow needle which pierces the parison and air is admitted under pressure to inflate the parison within the mold sections causing it to conform to the interior contour of the mold. When the mold sections are opened, the tubular container which has cooled somewhat in the mold is removed from the mold sections. It is, of course, understood that a similar procedure could be used wherein vacuum is utilized and the vacuum is applied to the exterior of the parison or tube and air under atmospheric pressure is allowed to enter the interior of the parison by way of the hollow needle.

As shown in FIGURE 1, the container at the completion of blow molding has a cylindrical body portion **11** which can be provided with shallow ridges as indicated at **12**. Ridges **12** can be circular or helical or can have any other configuration. These ridges are intended to provide a somewhat roughened surface so that the ultimate container can be held in the hand without slipping. The cylindrical body portion **11** is also provided with a plurality of longitudinal ribs, one of which is illustrated at **31**. At least three of these ribs will be formed on the body portion, and serve to reinforce the body against flexing. These ribs need not be of any greater thickness than the wall thickness of the container itself.

At one end of the intermediate article, there is provided a taper section **13** and a threaded section **14**. Threads **14** are the smallest diameter of the three sets of threads provided. Associated with threads **14** is a reinforcing rib **32** which comprises an interruption of the threads. At least three such reinforcing ribs are provided around the circumference of the threads. It has been shown by experience that threads **14** are the point of maximum flexing when the filled containers are handled, and it is therefore most important to have the reinforcing ribs at this point on the container.

At the opposite end of the intermediate article are threads **16**, which are somewhat larger in diameter than threads **14**. Threaded section **16**, being of relatively thin-

walled material and formed by blow molding or vacuum forming, has both internal and external threads. The internal size of threads **16** is so designed to match the external diameter of threads **14**, so that the threads **14** can be screwed into threads **16** at a subsequent point of assembly of an explosives container. Adjacent threads **16** and joining them to the main body portion of the intermediate article is a tapered or conical section **20**. Near the end of the body section **11**, there is provided a groove or recess, which groove is adapted to receive an O-ring as will be described subsequently. Adjacent groove **21** there are seen lines **22** and **22***a* which may be imaginary lines or which may be slight ridges or depressions molded onto the surface of the body **11**. Between lines **22** and **22***a* is a small hole **23** representing the point at which the inflation needle pierced the parison.

Thread **25** is designed for use as an internal thread, as will be subsequently explained. This thread can also be provided with a plurality of reinforcing ribs **34** in the same manner that threads **14** are provided.

To form a container from the intermediate article just described, all that is necessary is to sever one end from the article along the lines **22** and **22***a* and discard this small annular ring containing the blow hole. If desired, an O-ring or other resilient sealing means may be installed in groove **21** and the thus severed end portion is reversed in direction and threaded into the interior of the open end of the article. There may be a very slight taper between the end of conical section **20** and severing line **22***a*. This taper can be adjusted to give the desired degree of interference fit between the severed section at the area adjacent to the O-ring groove and the main body of the article. It is seen that the exterior portion of threads **16** is so sized that these exterior threads mate with and engage the threads **25**. If an O-ring is installed (see **30**, FIGURE 4) the O-ring will make a water-tight seal between the threaded end portion and the body portion of the container. As just described, the threaded portion is now a closure for the assembled container.

FIGURE 2 shows one end of the intermediate article after the closure portion has been severed from the body portion.

FIGURE 3 shows a cross sectional view of the reinforced threads **14**, taken along the line **3—3** of FIGURE 1. In this embodiment, three reinforcing ribs **32**, which actually comprise mere interruptions of the threads **14**, are spaced at 120° around the circumference of the threaded area.

Referring now to FIGURE 4, there is shown one end of the container with the closure member inserted and an O-ring seal in place. FIGURE 4 shows clearly the relationship between threads **25** and the exterior of threads **16** which are here shown threaded together. Positioned to the right of the closure member there is shown one end of another container having threads **14**. A plurality of containers may be joined together by threading the portion **14** into the interior of the closure member to threadedly engage the interior of threads **16**. Any number of sections or containers can be joined together in this fashion. It is noted that threads **14** must have valleys and peaks of such a size as to properly engage the valleys and peaks of the interior portion of threads **16** and that the exterior portion of threads **16** must have valleys and peaks such as to properly engage the interior portion of threads **25**.

The container can be loaded with explosives at the site or it may be loaded with explosives at a manufacturing point and the loaded container shipped to the ultimate user. While the container could be used for some of the explosives which are not particularly sensitive to water such as dynamite, it finds greatest utility where the explosive is water sensitive. Thus, the container can be filled with mixture of ammonium nitrate and oil and the closure member with seal ring will not only exclude water and moisture but also will prevent leakage of any of the contents.

When used in connection with seismographic exploration, a small diameter hole is drilled into the surface of the earth for the desired distance, and one or more of the containers with explosives is lowered into the hole. Where it is necessary to join a plurality of the containers together to obtain the required charge, this is conveniently done as the containers are being lowered. A first section of container is positioned over the hole and the second one threaded into the closure member. The grooves on the surface of the body member provide a convenient hand grip and the sections can be lowered hand-over-hand into the hole. As additional sections are threaded into the topmost section, these too can be lowered by hand.

In practice, it has been common to join together four of the containers which are then handled as a single unit. This gang of four containers was generally grasped at the mid-point as a convenient method of handling, thus putting a considerable amount of strain on the threads joining the units together. Prior to my invention, failure of the plastic sometimes occurred in the threads during such handling. As explained above, however, the reinforcing ribs of my invention prevent the accordion action of the threads under such flexural stress, and allow four or more of the containers joined together in a gang to be handled without failure of the thread material.

EXAMPLE

A test which is used to determine resistance to bending of a gang of filled containers is as follows: the four filled containers are threaded together end-to-end and are placed in a horizontal position with the center point only supported on a horizontal fixed pin. Vertical deflection of each end of the gang of containers must not exceed 18 inches below the top of the supporting pin. Measurement is made as soon as any oscillation of containers ceases.

Prior to my invention, threads on containers were distorted by the test to such an extent that vertical deflection of the outer ends of the gang of filled containers exceeded 18 inches. Thus, the containers failed to pass the test.

When the reinforcing ribs of my invention are used, distortion of the threads is reduced. Vertical deflection of the outer ends of the gang of filled containers under the test described is only 11 to 12 inches. Thus, containers of the invention readily pass the required test.

In the container illustrated in the drawing, a rubber O-ring sealing member **30** is shown. The O-ring which is used can be the common rubber ring having a round cross section, or can be a mechanical equivalent sealing ring having a square, rectangular, or other cross sectional area. An O-ring need not be used to effect a seal. Numerous commercial adhesives and cements are available, any of which could be used to effect a seal when the closure member is inserted into the body member. A low temperature melting point asphalt or sealing cements such as are commercially used with gaskets could be used. If some such resilient seal other than an O-ring is used, the groove **21** can also be omitted if desired.

Reasonable variation and modification are possible within the scope of the invention, the essence of which is that there is provided a hollow container and shipping package for explosives and method for making the same, which container comprises a tubular body portion, a threaded end portion, and internal thread, and a threaded closure member for cooperatively engaging the said internal thread and for receiving the threaded end portion of another container, and having reinforcing ribs provided for structural strengthening of the container.

I claim:

1. An article of manufacture comprising a tubular member having a central body portion, first and second threaded end portions and an intermediate threaded portion, said first threaded end portion having a diameter less than any of the other threaded portions, said second end portion having a diameter greater than said first end portion and said intermediate threaded portion having a diam-

eter greater than said second end portion, said threaded portions being of a nature such that if separated, the first threaded end portion would screw into and fit the interior of said second end portion, and said second end portion would screw into and fit said intermediate portion, and a plurality of reinforcing ribs on said first threaded end portion, said reinforcing ribs having substantially the same thickness as the valleys of said threads and comprising interruptions of the threads.

2. The article of claim **1** wherein said central body portion has a plurality of reinforcing ribs, said reinforcing ribs having substantially the same thickness as the body of said tubular member and comprising at least 3 longitudinal ribs equally circumferentially spaced about the tubular member and a plurality of helically spaced ribs.

3. The article of claim **1** wherein said intermediate threaded portion has a plurality of said reinforcing ribs.

4. A shipping and firing container for explosives comprising

(a) a tubular body having a closed end and an open end;

(b) external threads in said body at the closed end thereof having a plurality of reinforcing ribs associated therewith;

(c) internal threads in said body adjacent said open end; and

(d) a closure member comprising a short cylindrical section having external and internal threads, the external threads of said member adapted to engage the internal threads adjacent the open end of said body, and the internal threads of said member adapted to receive and engage the external threads on the closed end of the body of a similar container.

5. The container of claim **4** wherein said reinforcing ribs comprise interruptions of the external threads, said interruptions having substantially the same thickness as the valleys of said threads.

6. The container of claim **4** wherein the external threads on said body having three reinforcing ribs comprising interruptions of the threads equally spaced around the circumference of said body, said interruptions having substantially the same thickness as the valleys of said threads.

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JAMES B. MARBERT, *Primary Examiner.*