Feb. 23, 1971 J. T. ROBERTS 3,564,663

CLIP

Filed Dec. 31, 1968

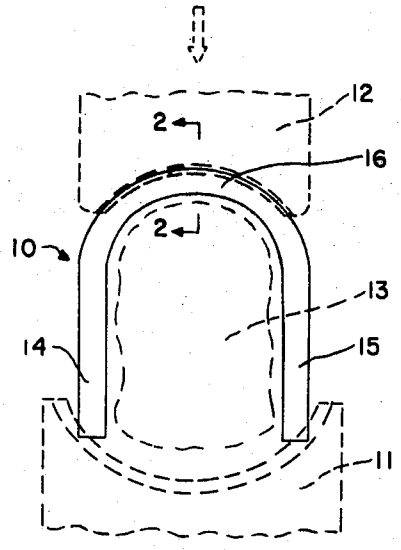

FIG. 1

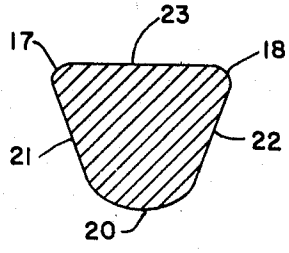

FIG. 2

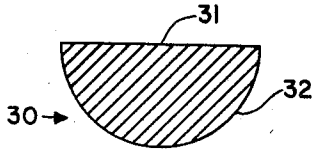

FIG. 3

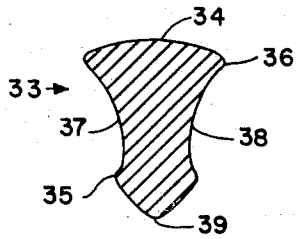

FIG. 4

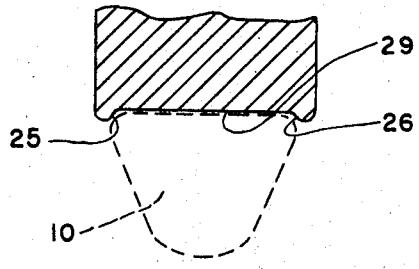

FIG. 5

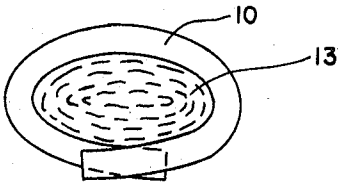

FIG. 6

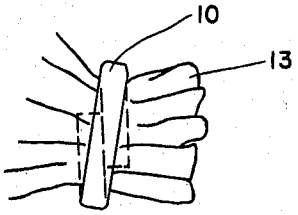

FIG. 7

INVENTOR

JOHN T. ROBERTS

BY: Edward J. Hanson Jr.

ATTORNEY

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CLIP

John T. Roberts, Simpsonville, S.C., assignor to W. R. Grace & Co., Duncan, S.C., a corporation of Connecticut

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U.S. Cl. 24—30.5 3 Claims

ABSTRACT OF THE DISCLOSURE

A clip that is a generally U shaped wire of uniform cross section with an inwardly directed face that has a curved inner edge that broadens out toward the face's outer edge. The clip has a groove on each side of its inner edge.

This invention relates to a generally U-shaped deformable sealing clip adapted to be applied around the neck of a flexible container such as a plastic bag to provide an air tight seal of the character required when the container is evacuated to maintain the product therein under a vacuum.

In packaging vacuum packed products, such as meat, cheese, poultry, and the like, it is essential that a perfect and long lasting seal be applied so as to prevent spoilage of the product by the leakage of air into the container. Heretofore numerous attempts have been made to improve clips to the end that optimum sealing effect is achieved. Such a clip is the so called "cross over" clip which comprises a U-shaped clip deformed around the mouth or neck of the container so that the opposed legs of the clip cross each other during the deforming step and are brought into side by side closely adjoining relationship, see for example U.S. Pat. No. 3,400,433 and the patents cited therein.

It is important in providing an air tight seal to apply extremely high radially inwardly directed compressive forces on the material of the container mouth in order to compress the material from which the package is made and produce a leak free seal. This is especially true in the case of bags and other containers made of the tough modern resilient plastics.

One of the common prior art clips had a round cross-section or, in other words, the wire from which the clip was made was cylindrical. The overall shape of the clip was a U, 2 legs and a connecting bight portion. Thus when the clip was applied to seal the neck of a plastic bag the innermost edge of the curved side of the cylindrical clip body would be most firmly engaged against the bag when the clip was crimped around the bag's neck. The greatest force applied against the plastic by the deformation of the clip was concentrated at this innermost curved edge.

With the rounded side of the clip engaging the bag, the bag was generally not damaged because it was deformed in a channel with a gradually increasing pressure and compressed along the curved clip surface. When such clips were used it was necessary to use clips made from a fairly heavy gauge cylindrical wire in order to provide sufficient deformed strength to prevent the resiliency of the sealed bag from forcing the clip to a partially open position and also to prevent dislodgment of the clip from

the neck of the bag, particularly when the neck was cut very closely adjacent to the clip. Clipped plastic bags are generally severed closely adjacent to the clip to provide a tight package that is both pleasing to the eye and requires no more space in the display counter or in the shipping cartons than absolutely necessary. These prior art clips necessarily required additional width in the feed track in order to accommodate the most outwardly extending dimension of their outer cylindrical edge. This cylindrical outer shape often caused the clips to individually angle irregularly in the feed track by cocking around thus causing the machine to jam. To prevent this, it is often necessary to provide elaborate inner connection of the clips so that individual clips cannot cock in the feed channel.

It has been found that the sealing effect of the clip is proportional to the inward deformation of the packaging material engaged by the inner surface of the clip and the clip's resistance to being sprung open by the resiliency of the packaging material or slipping from engagement with the packaging material. The section modulus or holding strength of the clip is a property of the shape of the cross section and its magnitude is an indication of the resistance the clip will offer to deformation, both primary and secondary or immediately and with time.

Accordingly, it is an object of my invention to provide a clip adapted for use in conventional clipping apparatus that will create and maintain an efficient seal around the neck of a flexible container such as a plastic bag.

Another object of this invention is the provision of a clip that is particularly efficient in producing an airtight seal.

A further object of this invention is to provide a clip that will have a lower incidence of jamming in the feed track of conventional clipping machines.

Other objects and advantages will be apparent from the following specifications and from the drawings.

Briefly stated in carrying out my invention, in one form thereof, I have provided a generally U-shaped clip made from a wire of generally uniform cross section throughout its length. The wire has an inwardly directed side that has a diminished width at its inner edge and an enlarged width at its outer edge. The wire's cross section is generally that of an isosceles triangle with rounded corners. In its preferred form, the base of the triangle is disposed outwardly and the two equal sides and the base have relatively flat planar dimensions between the rounded corners.

In another form of my invention, by another aspect thereof, the entire inwardly directed side is an even arc in cross section. In still another form, by another aspect of my invention the inwardly directed side has an eliptical point with a groove on each side of the point.

FIG. 1 is a semischematic side view showing a clip of the present invention with an associated punch and die at the point at which the legs of the clip are about to be deformed inwardly toward each other;

FIG. 2 is a greatly enlarged typical cross section along line 2—2 through the preferred form of the clip of the present invention;

FIG. 3 is a cross section similar to that of FIG. 2 but showing another form of my invention;

FIG. 4 is a cross section similar to FIG. 3 showing still another form of my invention;

FIG. 5 is a cross section through the punch **12** of FIG. 1 along line **2—2**;

FIG. 6 is a cross section through the mouth of a sealed container showing the clip deformed therearound; and,

FIG. 7 is a fragmentary side elevation of a plastic bag showing the clip of FIG. 2 applied thereto.

As in described in greater detail in U.S. Pat No. 3,383,-746 which is owned by the same assignee as the present application, the clip **10** is generally adapted to be urged against a die **11** by a punch **12** in order to deform the clip around the neck **13** of the container to be sealed, referring to FIG. 1. The undeformed clip **10** has a pair of opposed legs **14** and **15** which are joined together by a curved bight section **16**. The legs **14** and **15** are straight and may be considered parallel except that it is preferable that they flair outwardly slightly at their free ends to facilitate controlled feeding of the clip along the feed track (not shown) and over the gathered bag neck. The clip may be formed of various materials, including steel and aluminum, and it is preferably cold worked to the shape shown in FIG. 1.

The cross section of the clip **10** shown in FIG. 2 is generally that of an isosceles triangle with rounded corners at the base angles or corners **17** and **18** and a broadly rounded end or inner edge **20** at the apex angle. The inner edge as shown in FIG. 2 has a larger circumference than the outer edges. The sides **21** and **22** and the base side **23** of the triangle are relatively straight between their curving junctures. The cross-sectional contour of the clip is such that the broadly curving tip **20** is presented to the material to be compressed and sealed. The sides **21** and **22** diverge away from the inner tip **20**. The punch **12** engages against the side **23**. It is thus apparent that the inner surface of the punch that engages the flat side **23** of the clip **10** would preferably have the cross sectional shape shown in FIG. 5 which is taken substantially along line **2—2** of FIG. 1. It will be seen that this provides a wide engagement of the clip across its entire upper surface by the punch. The punch has the capability of shifting the clip slightly in position if necessary to attain proper engagement because of its curved shoulders **25** and **26** which engage the outer rounded corners **17** and **18** of the clip. The land **29** engages the side **23** of the clip. Thus the pressure applied to the clip by the punch **12** is distributed over a wide area of engagement.

The inside face of the clip diminishes at its inner edge **20** thus providing a high force at the strongest point of engagement against the plastic bag about which the clip is crimped. Because of the rubbery properties of the plastic from which bags are typically made the plastic is squeezed out from under the point **20** and bulges up along the sloping sides of the clip **21** and **22**. This has the desirable characteristic of extending the area of the closure by squeezing the plastic together along each side of the point **20** and also reduces any tendency of the inner edge of the clip to penetrate or sever the plastic walls of the bag at relatively high engagement pressures. The large mass of the clip is most distant from the inner point of the clip which is the clip area against which the bag pushes most strongly as a result of its natural resiliency which continuously pushes outwardly against the clip tending to spring the clip open. This structural design in the clip provides a strong holding characteristic in the clip for the particular mass of material in the clip's total cross section. All of this works to provide a superior and long-lasting seal and to reduce the likelihood that the container will leak. This cross sectional distribution of the mass enables clips of a given closing and holding capacity to be made from a smaller quantity of metal, saving material cost and shipping cost. This new clip structure also enables an easier deformation of the clip into its sealing position.

Another form of the clip of this invention is shown in FIG. 3. This form of the clip is made by either splitting

a piece of wire in half circles or by forming the wire originally in this shape. In cross section, if taken along line **2—2** of FIG. 1, the clip **30** would have a flat outer surface **31** and a curved inner surface **32**. The operation of this clip would be substantially the same as that described with respect to the clip shown in FIG. 2, the primary disadvantage being that it requires slightly more material to manufacture a clip that will provide a given effective closing and holding job.

The clip cross section shown in FIG. 4 would have the highest economy of materials but, if made of a soft material such as aluminum, the clip **33** might collapse under the considerable closing pressure supplied by the punch's operation thus reducing the resistance of the clip to being opened outwardly. In some instances the clip could so collapse that it would assume the shape of a wide band and reduce the depth to which the clip would go as it deformed the plastic bag neck. This clip cross section would also be represented by a cross section taken through a clip as shown at line **2—2** of FIG. 1. The clip would have a somewhat rounded upper surface **34**, which might aid in centering the clip if it were to be used in a clipping device having a punch that would have a continuous arc if viewed in a cross section similar to the cross section of FIG. 5.

Sides **35** and **36** have grooves **37** and **38**, respectively, formed in them to reduce the quantity of material required to manufacture the clip. Of course, the raising of the upper surface **34** into a slight curve consumes some of the material saved in the formation of the grooves **37** and **38**. The point **39** is curved as previously described so that it will not pierce the surface of the bag. The curve in this particular instance is sharper than the curves of clips **10** and **30**. In certain instances, where plastic materials that are very easily deformed are used the materials may actually come up into the grooves **37** and **38** locking this clip even more securely in position against slippage. Obviously some features of these various cross sectional structures can be combined, for example, there could be instances when the rounded side **34** would be advantageous with the uniform arc **32**.

The use of the above described clip for sealing a vacuumized container has been emphasized because prior art clips, which this clip is intended to replace, are widely used for this purpose. However, the clip of this invention is obviously equally applicable to other uses, such as for example, sealing containers that are subjected to internal pressure rather than a vacuum. Of course, the clip gives a superior closure any time a clip closure is desired. When the clip is used on a bag that is to be hung up with the product pushing down against the clipped neck the resistance of the clip to slipping along the length of the container neck is especially important. The individual clips need not be formed from wire but could be individually shaped in any way, their length still having the general characteristic of a strand of wire and thus called a wire in this application.

I claim:

1. A generally U-shaped clip for forming a tight seal around an article such as the mouth of a flexible container comprising a pair of opposed legs and a bight section connecting the corresponding ends of said legs, said legs being adapted to be deformed toward each other into encircling relation with such article, said clip being formed of a wire of generally uniform cross section throughout its length, said wire having an inwardly directed side that has a diminished width at its inner edge and an enlarged width at its outer edge and a functional groove formed in said clip on each side of the inner edge between said inner edge and said outer edge, said grooves extending the length of said wire.

2. The clip of claim **1** wherein said grooves are formed to cause the clip to collapse under pressure and form a widened band.

3. The clip of claim 1 wherein said grooves are formed to receive materials to which the clip is applied to lock said clip securely in position against slippage.

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DONALD A. GRIFFIN, Primary Examiner

U.S. Cl. X.R.

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