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F. B. PFEIFFER
PACKAGING APPARATUS

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Fig. 1.

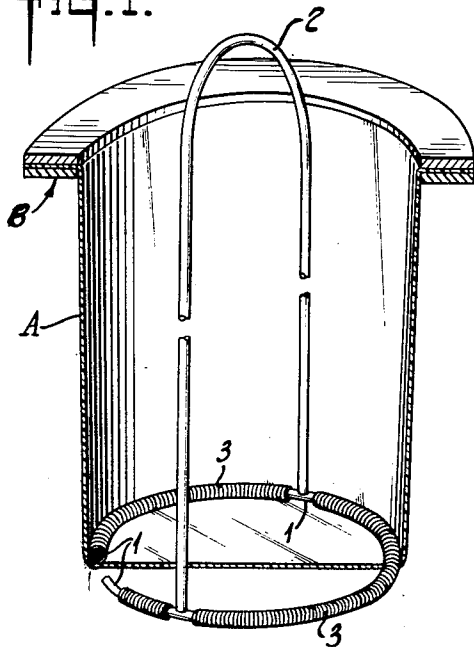


Fig. 2.

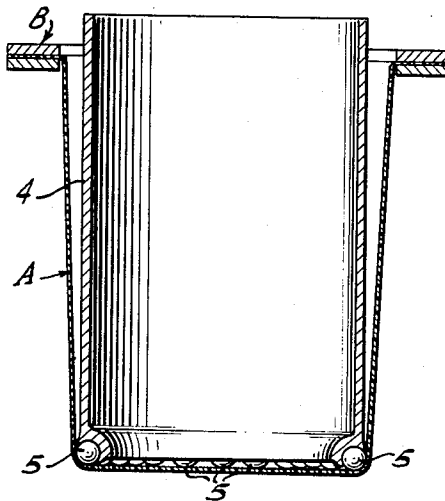


Fig. 3.

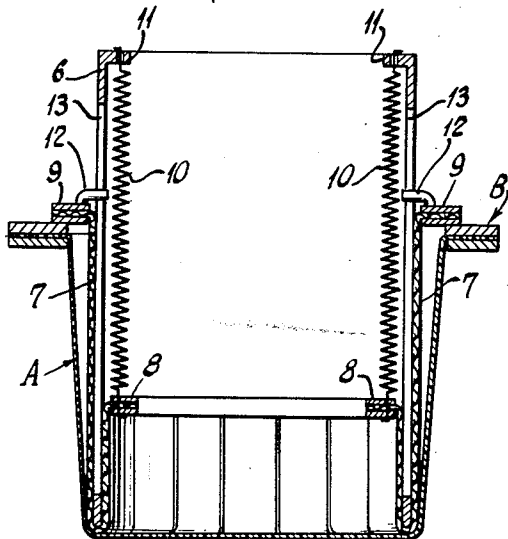
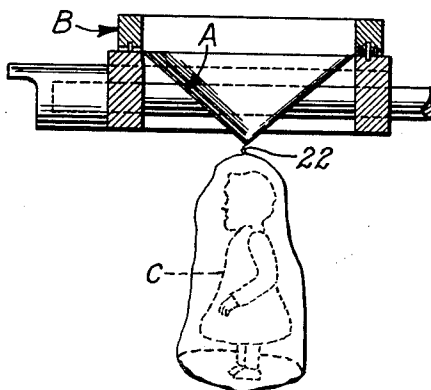


Fig. 4.



INVENTOR,
FRED B. PFEIFFER.

BY *W. O. Min*
Kennedy & Campbell
ATTORNEYS

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PACKAGING APPARATUS

Fred B. Pfeiffer, Akron, Ohio, assignor of one-half to
Jesse R. Crossan

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This invention is directed to a novel method of wrapping or packaging objects of various kinds and of various sizes and shapes, including both solid and fluid materials. A very satisfactory material, and one which will be discussed herein by way of example, is a rubber hydrochloride film such as is disclosed in the Calvert Patent No. 1,989,632 and which is known to the trade under the name "Pliofilm." This Pliofilm material is manufactured in sheets of various thicknesses, ranging from .0008" to .003", but even thinner or thicker sheets would be suitable. As is now well known, Pliofilm at room temperature is practically non-stretchable but when heated momentarily, i. e., for a few seconds only, becomes soft and plastic and is rendered both stretchable and sealable.

Generally speaking, the contemplated wrapping or packaging method comprises the steps of providing a blank of stretchable film, anchoring said film at its marginal portions, and then thrusting a preforming device against the film while so anchored to stretch it into the desired shape, as for example into the form of an open-ended pocket or sack to receive the article or material to be wrapped. Thereafter, the open end of the pocket or sack, if desired, may be closed and sealed to provide an air-tight and liquid-tight package.

Such a method is fully disclosed in Patents Nos. 2,486,762 and 2,554,636, dated November 1, 1949, and May 29, 1951, respectively, but in the practice of said method, it has been found that the wrapping film (particularly heated Pliofilm) will cling or become anchored to the preforming device at all points of contact and fail to stretch sufficiently, if at all, in the area defined by such points of contact. Such clinging or anchoring of the film to the preforming device is due to excessive adhesion between the two, created in part by frictional contact, in part by elastic tension, and in part by the plasticity of the film when softened. In any event, it definitely occurs and results in overstretching the area which lies outside the area of contact. For example, in the case of a circular clamp with an opening 6" in diameter and of an open-ended preformer tube 4½" in diameter (which example is intended merely to give some indication of relative sizes), heat-softened Pliofilm will become anchored to the edges of the tube immediately upon contact therewith and there will be little or no stretch in that part of the film extending across the open end of the tube when the latter is thrust beyond the plane of the film to shape it; instead, practically all of the stretch will take place in the narrow circular strip of film bridging the gap between the tube and clamp. In these stretch-wrapping methods, it is of course desirable to use as small a blank of film as possible, for the sake of economy, and hence the more uniform the stretch is throughout the whole area of the film, the greater the degree of stretch permitted in shaping the film. A blank of heated Pliofilm of .001" gauge may be stretched as much as 300% without seriously weakening it, if such stretch is substantially uniform throughout the whole area of the blank.

The present invention provides for such uniform stretch of the wrapping film notwithstanding the use of a preforming device to shape the film. The preforming device may be formed for antifriction contact with the film during the stretching operation, as by being provided with rollers, balls or travelling belts at its film contacting edge or surface.

According to any of these different schemes, the film is caused to stretch both within and without the area of its contact with the preforming device. Thus, in the case of an open-ended preformer tube with film contacting balls, rollers or belts, it is evident that the film, as it is stretched, will be permitted to move freely

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over the edge of the tube, thereby eliminating practically all frictional contact between the film and tube, distributing the elastic tension substantially uniformly throughout the whole area of the film, and overcoming any tendency of the film, even when plastic, to adhere to the edge of the tube.

Any suitable apparatus, manual or automatic, may be employed in the practice of the method, but by way of illustration reference may be had to the apparatus disclosed in the aforementioned patents, which comprises a clamping device for holding the marginal portions of a blank of film with free access to the unclamped portion of the film. The clamping device is adapted alternately to engage and disengage the film and to function in conjunction with means for presenting the film to the wrapping station in either strip or blank form. The clamping device also serves as a feeding means for the film, although obviously it may be otherwise supplied to the wrapping station. When the film is used in strip form, it may be severed at appropriate intervals in its length, either before or after the wrapping operation, and this severing may be performed either manually or automatically.

In the accompanying drawings:

Figs. 1, 2 and 3 are sectional, diagrammatic, views showing a blank of film as stretched into the form of a pocket or sack by the use of three different forms of hollow preforming devices, all equipped with antifriction elements for contact with the film during the stretching operation;

Fig. 4 is a sectional, diagrammatic, view showing the pocket or sack closed and sealed at its upper end after the object or material to be wrapped has been placed therein.

In Patent No. 2,486,762, the preforming device is hollow or in the form of an open-ended tube to permit the insertion of the article or material to be wrapped into the shaped film while the latter is maintained in its stretched condition by the preforming device. In Patent No. 2,554,636, on the other hand, the preforming device is solid or closed at its film contacting end (although it need not be) and is manipulated so as first to form a pocket or sack in the film and then to turn the pocket or sack inside out and leave it open at the top for the insertion of the article or material to be wrapped. It is to be understood that the present invention applies to a preforming device of either type or of any other type which gives rise to a non-uniform stretching of the film in the formation of the pocket or sack.

In all figures, the blank of film is designated by the letter A and the clamp, which anchors the film at its marginal portions, is designated by the letter B. As will be understood, the clamp may be of any suitable form or shape, although it may be assumed, for purposes of description, that the clamp is of circular form to accommodate the article or material to be wrapped.

In the case of Pliofilm, the heating of the film, to impart to it the requisite stretchable and sealable properties, may be effected in any desired manner, as by means of an electrically heated plate such as shown in the two patents above identified.

In Figs. 1 to 3, the film is shown in its stretched condition and, by way of example, substantially in the form of a cylindrical open-ended tube or sack to receive the article or material to be wrapped. And in all cases, such stretching of the film is effected by thrusting a preforming device against the film while anchored at its marginal portions, it being noted that, due to the uniform stretching of the film, the diameter of the preforming device may closely approach the diameter of the opening as defined by the clamp or, in other words, the diameter of the unclamped portion of the film before it is stretched.

In Fig. 1, the preforming device is in the form of a circular ring 1 equipped with a long U-shaped handle 2. The ring 1 is round or circular in cross section and has mounted thereon, at opposite sides of the handle 2, two light coiled springs 3. By regulating the spacing of the coils of the two springs and by mounting them with sufficient clearance on the ring 1, the springs, notwithstanding their curved form, will be free to rotate on the ring by contact with the film during the stretching operation, thus

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functioning as rollers. Due to the open nature of the ring 1 and handle 2, the article or material to be wrapped may be inserted readily into the shaped film while the latter is maintained in its stretched condition by the ring. Thereafter, the ring may be withdrawn without any clinging tendency of the film; the two coiled spring rollers providing for antifriction contact with the film during the ring withdrawing operation.

In Fig. 2, the preforming device is in the form of a cylindrical tube 4 open at both ends and provided at its lower corner edge with a series of small balls 5 confined in an annular groove with overhanging walls. As will be evident, these balls 5 rotate freely by contact with the film, both during the stretching operation and the withdrawing operation. Being hollow, the tube 4 will permit the ready insertion of the article or the material to be wrapped into the shaped film while the latter is maintained in its stretched condition by the tube.

In Fig. 3, the preforming device is in the form of a cylindrical tube 6 open at both ends, like the tube 4 of Fig. 2. In this instance, the balls 5 have been replaced by a series of narrow flexible bands 7 (composed of fabric for example) which are caused to move over the lower edge of the tube during the film stretching operation. While these bands might be made endless and caused to move or travel by contact with the film (which arrangement has been found to be very efficient), they are here shown, by way of further example, as anchored at their opposite ends to two relatively movable and positively operated rings 8 and 9. The inside ring 8 is attached to the lower ends of a series of long tension springs 10 anchored at their upper ends to a corresponding series of lugs 11 formed at the upper end of the tube 6. The outside ring 9 is formed with guide pins 12 running in longitudinal slots 13 formed in the tube 6 and which limit the movements of the rings in opposite directions. Normally, or when the preforming device is out of use, the relative positions of the two rings will be substantially reverse of those shown in the drawing due to the action of the springs 10, which exert a constant upward pull on the inner ring 8 and, through the bands 7, a constant downward pull on the outer ring 9. In the use of the preforming device, however, the outer ring 9 is caused to bank upon the upper face of the clamp B, as shown; and hence when the tube 6 is thrust downwardly against the then taut film A to stretch it into the form of a pocket or sack, the inner ring 8, due to its connection with the outer ring 9 through the bands 7, is drawn downwardly against the action of the springs 10 (all as shown in Fig. 3), thereby imparting a positive movement to the bands 7 around the lower edge of the tube 6. This positive movement of the bands will of course be imparted to the film A by their mutual contact and thus effect a positive stretching of the film in that part which extends across the lower end of the tube. That part of the film not contacted by the bands will also be stretched in the usual way by the downward thrust of the tube 6. In this particular embodiment, as in that of Fig. 2, the preforming tube is hollow and will permit the ready insertion of the article or material to be wrapped into the shaped film while the latter is maintained in its stretched condition by the tube.

In all three embodiments thus far discussed, the preforming device is provided with a series of antifriction elements for contact with the film during the stretching operation and will thus provide for a substantially uniform stretch of the film. While three different types of antifriction elements have been shown and described, it will be obvious that there are various other types which could be employed to equal advantage.

Referring now to all the different embodiments, it is pointed out that, once the pocket or sack has been formed, it may or may not be filled at once. If not filled at once, the film, if of the thermoplastic type, should be maintained in its stretched condition by the preforming device until the film has become cooled and set in its stretched condition. If desired, a blast of cool air may be employed to hasten this cooling and setting operation. If, however, the filling operation is to be performed immediately, no cooling period is necessary, unless indeed the original form of the pocket or sack is to be preserved.

In most cases, and as preferred, after the removal of the preforming device, the object or material to be wrapped is instantly inserted into the pocket or sack and the marginal portions of the film then secured together or heat-

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sealed to close the package. Thus, as shown in Fig. 4, the pocket or sack may be closed by grasping the sack with the object or material inside (as for example a doll C—the illustration given in the two copending applications above referred to) and rotating the two as a unit to produce a contracting twist, such as 22, or in any other desired manner.

It should be understood that the invention is not limited to the use of Pliofilm as the wrapping material but extends to any stretchable film which exhibits excessive adhesion to the preforming device during the stretching operation. There are many such other wrapping films currently on the market, some (like Pliofilm) of the thermoplastic variety and requiring the application of heat to render them stretchable, others becoming stretchable or elastic when sprayed with water or other liquid, and still others inherently stretchable or elastic and requiring no external treatment to render them so.

What I claim is:

1. A preforming device for stretching a blank of stretchable film, said device being provided with antifriction means for contact with the film during the stretching operation.

2. A preforming device for stretching a blank of stretchable film, said device being provided with a series of antifriction elements for contact with the film during the stretching operation.

3. A preforming device for stretching a blank of stretchable film, said device being provided with a series of positively operable antifriction elements for contact with the film during the stretching operation.

4. A hollow preforming device for stretching a blank of stretchable film, said device being open at both ends and formed at one end for antifriction contact with the film during the stretching operation.

5. A hollow preforming device for stretching a blank of stretchable film, said device being open at both ends and provided at one end with a series of antifriction elements for contact with the film during the stretching operation.

6. A hollow preforming device for stretching a blank of stretchable film, said device being open at both ends and provided at one end with a series of positively operable antifriction elements for contact with the film during the stretching operation.

7. Apparatus for forming in elastic sheet material a pocket, all portions of which are of substantially uniform thickness, including a ring, means for securing over the ring a strip of elastic sheet material, and a plunger adapted to extend said sheet material through said ring in pocket-like form, said plunger having freely rotatable elements mounted around its edges to contact said sheet material and substantially eliminate friction between them.

8. Apparatus for forming in elastic sheet material a pocket, all portions of which are of substantially uniform thickness, including a ring, means for securing over the ring a strip of elastic sheet material, a plunger adapted to extend said sheet material through said ring in pocket-like form, and an element associated with the plunger and movable relative thereto for substantially eliminating friction between said sheet material and the front of said plunger.

9. Apparatus for forming a pocket in non-fibrous sheet material, including a ring, means for securing over the ring a strip of elastic sheet material, a plunger adapted to extend said sheet material through said ring in pocket-like form, and means carried by the plunger at its leading end having a surface movable with respect to the plunger for engaging the sheet material and moving with the sheet material relative to the plunger.

10. A preforming device for stretching a blank of stretchable film, said device carrying at its leading end means having a surface movable with respect thereto for engaging the film and moving with the film relative to the preforming device during the stretching operation.

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