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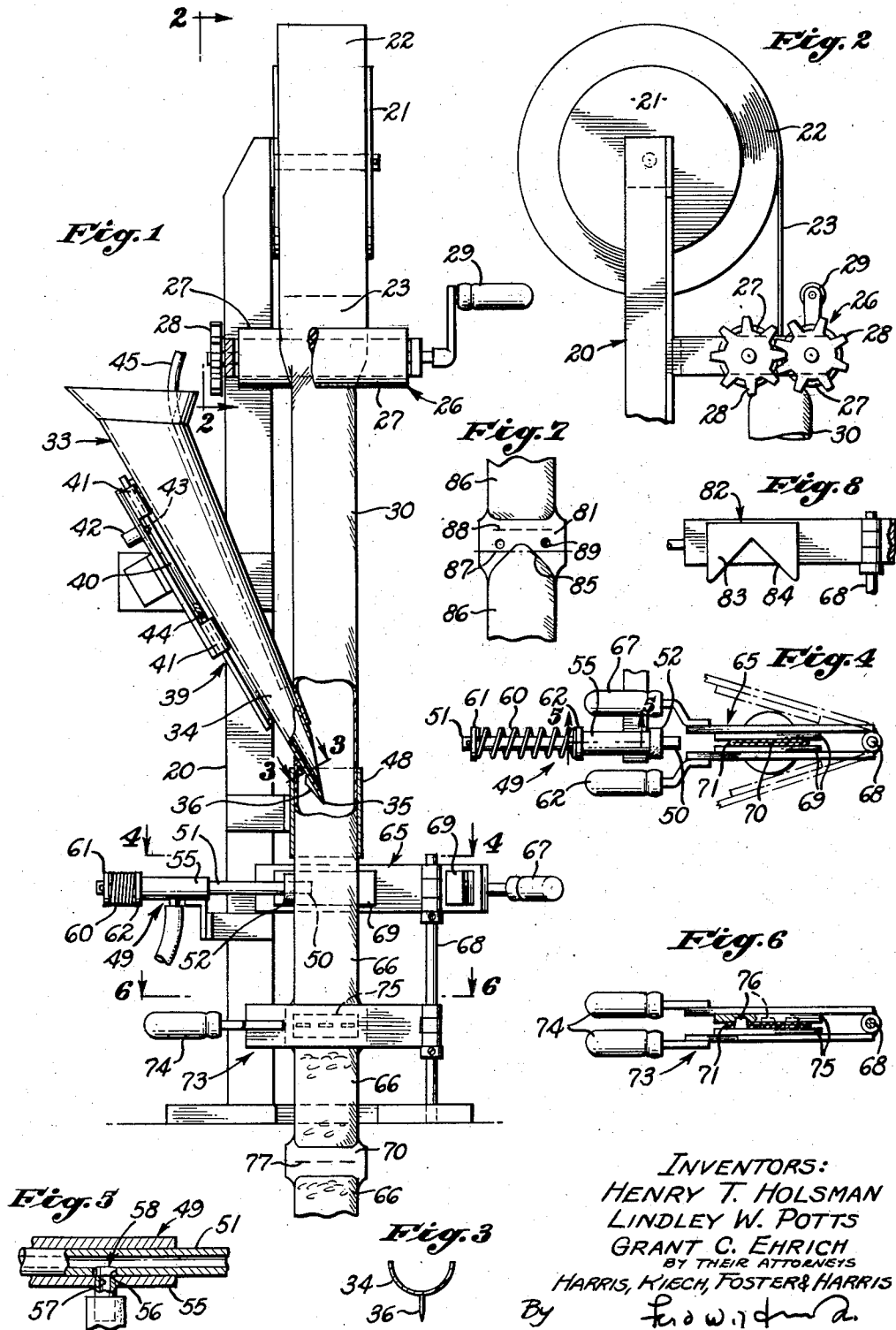
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2,861,406

PACKAGING METHOD AND APPARATUS

Filed Jan. 2, 1953

2 Sheets-Sheet 1



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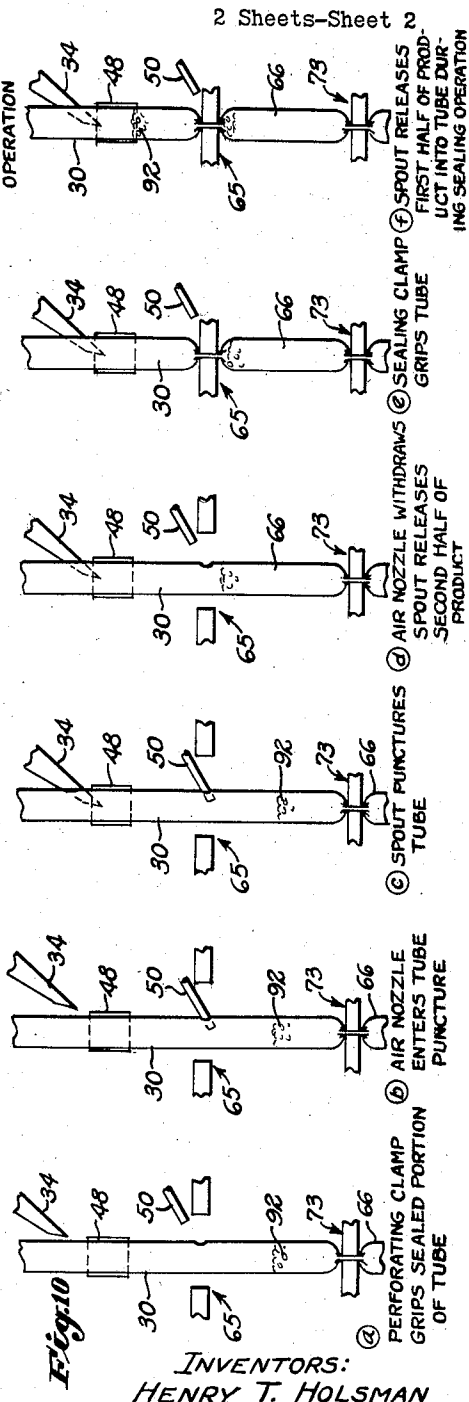
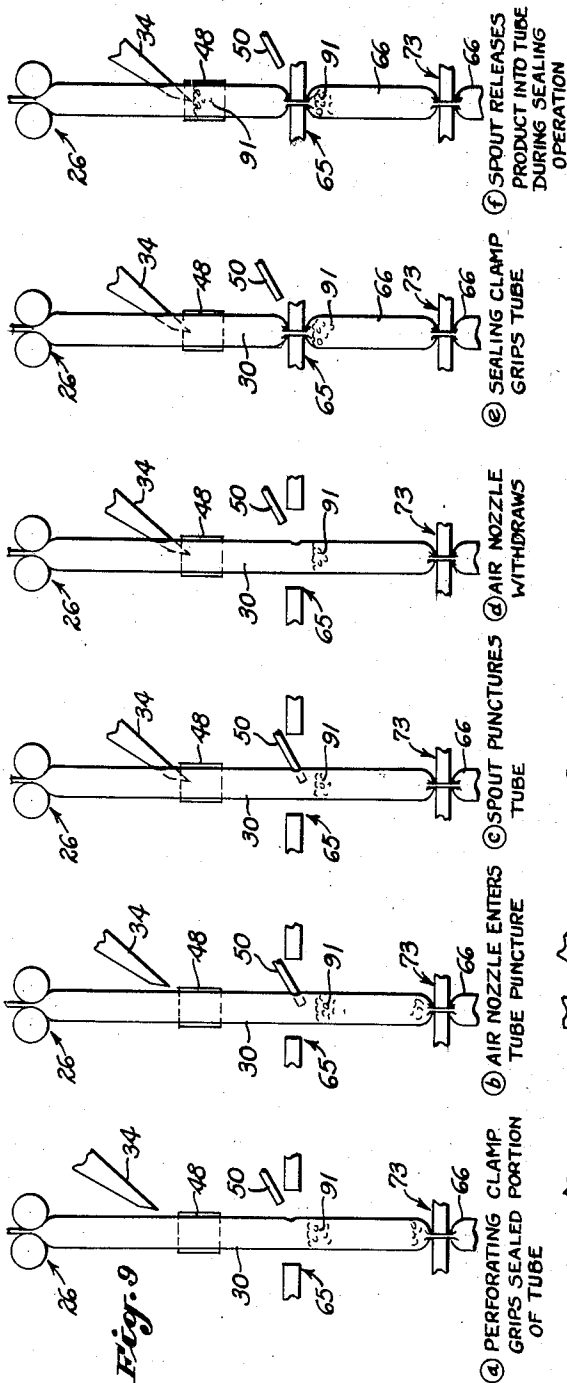
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PACKAGING METHOD AND APPARATUS

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25 Claims. (Cl. 53—29)

The present invention relates to a method of and apparatus for packaging substances of various types wherein spaced charges of the substance to be packaged are introduced into a continuous tube which is closed and sealed between charges to provide packages each containing one of the charges, such packages subsequently being separated from each other if desired by severing the tube intermediate the ends of the seals so as to produce independent packages each containing a predetermined amount or charge of the substance. Various substances may be packaged in accordance with the present invention, the term "substance" being regarded herein as including any packageable food or other products, materials, articles and the like, liquids as well as solids.

The invention preferably utilizes a tube made of a flexible, heat sealable plastic material. Any suitable conventional plastic material may be utilized in practicing the invention, including the following: unplasticized or modified polyvinyl chloride; unplasticized polyvinylidene chloride; plasticized or modified polyvinylidene chloride; cellulose acetate; cellulose acetate butyrate; unplasticized copolymer of vinyl chloride and vinyl acetate; plasticized or modified copolymer of vinyl chloride and vinyl acetate; methyl methacrylate; unplasticized polystyrene; plasticized or modified polystyrene; nylon; combinations of acrylonitrile and vinyl chloride vinyl acetate copolymers; polytetrafluorethylene resins and modifications thereof; casein; and cellulose nitrate. However, as will become apparent, various features of the present invention may be utilized in conjunction with a tube of other materials and the invention is, therefore, not to be regarded as limited to any particular material for the tube except as specified in the claims hereof.

A primary object of the present invention is to provide a method and apparatus which involve expanding the flexible tube, puncturing the tube while it is expanded so as to provide access to the interior thereof, and subsequently introducing the substance to be packaged into the tube through the puncture.

More particularly, an important object of the invention is to close the ends of a section of the tube so as to isolate it from the remainder of the tube, to expand the isolated section of the tube by inflating it with a gas, to puncture the tube while it is inflated, and subsequently to introduce the substance to be packaged into the tube through the puncture.

In most instances, air may be utilized to inflate the isolated section of the tube, although, for other applications of the invention, other gases may be used. For example, inert gases may be used where such gases are desirable to prevent deterioration of the packaged substance, or gases having certain desired effects on the packaged substance may be utilized in other instances. Also, if food or other products are to be maintained in an aseptic condition, the tube and the air or other inflating gas may be sterilized. Any of the foregoing and other, simi-

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lar practices may be utilized in conjunction with the invention without departing from the spirit thereof.

Other important objects of the invention reside in various combinations of sealing the tube closed at one end of a particular section thereof, clamping the tube closed at the other end of such section to isolate same from the balance of the tube, inflating the isolated section of the tube by an inflating nozzle extending through a puncture in the isolated section of the tube, making another puncture in the isolated section of the tube with a piercing means while the isolated section of the tube is maintained relatively rigid by inflation, and subsequently introducing a charge of the substance to be packaged through the piercing means and the other puncture formed thereby.

A further object of the invention is to provide means whereby a conventional, cheap, flattened plastic tubing may be expanded and the walls thereof separated to permit a simple and economical filling operation. Such conventional tubing is normally wound into a roll on a reel and is thus supplied to the trade. In the winding operation, the tubing is flattened and the walls thereof engage and stick together, usually so tightly that great difficulty is experienced in separating them to reform any section thereof into tubular form, with the consequence that it is ordinarily impractical to attempt to employ such tubing as a packaging material. By the use of our invention such tubing may readily be employed as a packaging material, which has not heretofore been economically possible.

Another important object is to advance the tube lengthwise of itself to bring successive ones of the punctures formed by the piercing means into registry with an inflating nozzle so that the latter may be inserted through the punctures formed by the piercing means, such punctures thus serving the double function of admitting the substance to be packaged and of admitting the inflating gas, which is an important feature.

Another object is to seal the tube in a zone registering with each puncture after such puncture has been utilized to admit the inflating gas and after a charge of the substance to be packaged has been introduced through the tubular piercing means, the punctures thus being closed by the seals separating the packaged charges of the desired substance.

A further object is to form the seals in such a way that the punctures are located at the edges of the seals.

The foregoing operations take place intermittently as the tube is advanced longitudinally of itself so that successive sections of the tube are isolated by successive seals and a clamping means, each isolated section being closed at one end by one of the seals and at its other end by the clamping means.

Another object is to provide an apparatus wherein the clamping means comprises rollers which serve the additional function of feeding or advancing the tube.

Another object is to provide an apparatus wherein the aforementioned clamping rolls close and support one end of each isolated section of the tube, and wherein combined clamping and severing means support the other end of each isolated section, the combined clamping and severing means being engageable with the seal at the other end of such isolated section. Preferably, the clamping and severing means severs the seal approximately in the center of the seal so that the package on either side of the seal remains closed and sealed, the severing operation either completely or partially separating two adjacent packages.

Another object is to provide a heat sealing means for sealing the tube closed between adjacent packages which includes the two dies adapted to clamp the tube there-

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between, the dies having registering V-shaped edges the apices of which lie on the center of the tube so as to provide in each package an unsealed area converging toward one end thereof, such converging unsealed area providing a spout for dispensing the packaged substance when an end of the package is subsequently cut off to open it.

Another object is to provide an inflating nozzle which carries an annular collar, preferably of a soft material, which is engageable by the wall of the tube surrounding the opening or puncture therein through which the nozzle is inserted to inflate the isolated section of the tube, the gas pressure within the tube forcing the tube wall adjacent the puncture or opening into engagement with the collar on the nozzle to provide a seal to prevent excessive gas loss, which is an important feature.

Another object is to provide a piercing means which is mounted for movement toward and away from the inflated tube section along a path which is inclined at an acute angle with respect to the axis of the inflated tube section so that the piercing means engages and penetrates the inflated tube section at an angle, rather than perpendicularly, to minimize deformation or distortion of the inflated tube section and thereby to facilitate penetration or puncturing by the piercing means.

Another object is to provide a piercing means comprising a pointed spout having a sharp piercing point engageable with and adapted to puncture the inflated tube section, the substance to be packaged being introduced into the interior of the tube through such spout.

Another object is to provide a spout having an external blade extending longitudinally thereof from the piercing point to a point rearwardly thereof, this longitudinal blade serving to slit the inflated tube wall slightly in the vicinity of the puncture produced by the piercing point so as to facilitate entry of the spout into the inflated tube section.

Another object is to inflate the isolated section of the tube through the puncture utilized to introduce the substance to be packaged while such substance is being introduced, such inflation helping to keep the isolated tube section expanded to facilitate introduction of the substance to be packaged.

Another and important object is to seal the tube between packages and to introduce the next charge of the substance to be packaged at the same time so that while one package is being filled, a seal between it and the previously filled package is being formed so as to utilize the time available in the over-all operating cycle most effectively.

Another object is to provide a method and apparatus wherein the combined clamping and severing means grips the tube a little before the advancing of the tube by the feeding rolls is terminated so as to produce a little slack in the tube, which avoids stretching of the tube by the weight of the substance being packaged.

Another object is to provide an intermediate point or zone of support between the zones or points of support provided by the feeding or clamping rolls and the combined clamping and severing means, such intermediate zone of support being adjacent the piercing means so as to further facilitate piercing of the inflated tube section. Preferably, such intermediate support is provided by a sleeve through which the tube extends.

The foregoing objects, advantages and features of the present invention, together with various other objects, advantages and features thereof which will become apparent, may be attained with the exemplary embodiments of the invention illustrated in the accompanying drawings and described in detail hereinafter. Referring to the drawings:

Fig. 1 is a view which is partially in elevation and partially in section and which illustrates a packaging apparatus of the invention capable of performing the method thereof;

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Fig. 2 is a fragmentary elevational view taken as indicated by the arrowed line 2—2 of Fig. 1;

Figs. 3 and 4 are fragmentary sectional views taken along the arrowed lines 3—3 and 4—4, respectively, of Fig. 1;

Fig. 5 is an enlarged, fragmentary sectional view taken along the arrowed line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken along the arrowed line 6—6 of Fig. 1;

Fig. 7 is an elevational view of an alternative seal;

Fig. 8 is an elevational view of a sealing die for forming the seal of Fig. 7; and

Figs. 9 and 10 are diagrammatic views respectively illustrating two modes of operation of the packaging apparatus of the invention.

Referring particularly to Figs. 1 and 2 of the drawings, the numeral 20 designates a frame at the upper end of which is mounted a rotatable supply reel 21 carrying a roll 22 of flexible, heat sealable plastic tubing 23. The tube or tubing 23 is thin-walled so that it lies flat as it comes from the roll 22, whereby a substantial length of the tubing may be wound into a relatively small roll to conserve space. The wall thickness of the tube 23 may, for example, be of the order of 0.001 to 0.020 inch. Such tubing, as conventionally supplied to the trade, is flattened so that its walls adhere together and are normally difficult to separate.

As the tube 23 is unrolled from the roll 22, it passes through a feeding or clamping means 26 which preferably includes two clamping rolls 27 carried by the frame 20, the clamping rolls being geared together by gears 28 and being driven by a handle 29. The clamping means 26 thus serves to close the upper end of a tube section 30 located therebeneath so as to isolate and seal this section off from the supply roll 22. Additionally, the clamping means 26 serves a support function in that it supports the tube section 30 as it is processed in the manner hereinafter discussed. Further, the means 26 serves as an advancing or feeding means for advancing the tube 23 downwardly as the handle 29 is turned so that successive portions of the tube 23 may be advanced into the processing zone occupied by the tube section 30.

Carried by the frame 20 below the clamping means 26 is a feeding and piercing means 33 for puncturing the tube section 30 at spaced intervals as the tube 23 is advanced so as to permit the introduction of charges of the substance to be packaged into the interior of the tube section, the latter being inflated, as hereinafter described, to hold the tube 23 open to facilitate puncturing and to permit the introduction of the charges of the substance to be packaged. The piercing means 33 includes a spout 34 through which each charge of the substance to be packaged may be introduced into the interior of the inflated tube section 30 after the latter has been punctured. The lower end of the spout 34 is cut at an angle to the axis of the spout to provide a piercing point 35 which is sharpened to facilitate puncturing of the material of which the tube 23 is formed. In order to enlarge the hole or puncture produced by the piercing point 35 sufficiently to permit insertion of the lower end of the spout 34 into the interior of the tube section 30, as illustrated in Fig. 1, an external blade 36 is preferably carried by the spout 34, the blade 36 extending rearwardly from the piercing point 35. The cross-sectional configuration of the lower end of the spout 34 is best shown in Fig. 3 of the drawings, a similarly-shaped puncture being produced in the wall of the inflated tube section 30.

The spout 34 is movably mounted on a mounting means 39 carried by the frame 20 in such a manner that the spout is movable toward and away from the inflated tube section 30 along a path which is inclined at an acute angle to the axis of the tube section 30. The mounting means 39 comprises a rail 40 carried by the frame 20 and along which the slides 41 on the spout 34 are slidable. Also mounted on the spout 34 is a detent means 42 en-

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gageable in a recess 43 in the rail 40 to hold the spout in its extended position, as shown in Fig. 1 of the drawings, and engageable in a recess 44 in the rail to hold the spout in its withdrawn or retracted position, diagrammatically shown in Figs. 9 and 10 of the drawings.

When the tube section 30 is inflated in the manner to be described hereinafter, the pressure therewithin maintains the tube section relatively rigid to facilitate penetration thereof by the spout 34. Moving the spout into penetrating engagement with the inflated tube section 30 along a path inclined at an acute angle to the axis of the tube section 30, as hereinbefore described, facilitates puncturing of the tube section materially as compared to a perpendicular approach to the tube section, which is another feature of the invention.

Preferably, in addition to introducing air or other gases into the tube section 30 for inflation purposes in a manner hereinafter described, air or other gas is introduced into the tube section 30 during the operation of introducing the substance to be packaged into the tube section through the spout 34, as by means of a tube 45 extending downwardly into the spout 34 and connected to a suitable source of gas supply, not shown. Such introduction of air, or other gas, during the operation of introducing the substance to be packaged into the tube section 30 assists in keeping the tube section 30 open to permit the substance being packaged to fall into a compact pile at the bottom of the tube section 30. Also, such introduction of gas also results in a slight inflation of the final package, which is frequently desirable to avoid compression of the packaged substance, the latter being maintained in a loose condition within the final package by this procedure. Such gas, of course, may also be a sterilizing or other treating or conditioning agent, adapted to treat the interior of the tube section 30 or the substance being packaged therein.

In order to further facilitate puncturing of the tube section 30 by the spout 34, the spout moves downwardly into a sleeve 48 carried by the frame 20 and encompassing the tube section 30. This sleeve prevents bowing of the inflated tube section 30 as the spout 34 is brought into puncturing engagement therewith and thus rigidifies the inflated tube section 30 to facilitate puncturing, which is a further feature.

Carried by the frame 20 below the spout 34 a distance equal to one package length is an inflating means 49 which includes a reciprocable inflating nozzle 50 insertable into the tube section 30 to inflate the same. As will be discussed in more detail hereinafter in considering the operation of the present invention, the inflating nozzle 50 is insertable into the interior of the tube section 30 through an opening or puncture previously formed by the spout 34 and previously utilized to introduce a charge of the substance to be packaged into the tube section 30. Thus, each puncture formed by the spout 34 preferably does double duty, which is an important feature of the invention.

The inflating nozzle 50 includes a reciprocable tube 51 the inner end of which is open to provide the inflating nozzle 50. Carried by and encircling the tube 51 and spaced from the inner end thereof is a collar 52, preferably formed of a material such as soft rubber, or the like. When the inflating nozzle 50 is inserted into the tube section 30 and an inflating gas is introduced thereinto through the nozzle, the internal pressure in the tube section 30 forces the wall of the tube section 30 against the collar 52, the latter serving as a seat for the tube material surrounding the puncture through which the nozzle is inserted. Consequently, a relatively tight seal is effected to minimize escape of the inflating gas, which is another feature.

Referring particularly to Fig. 5, the tube 51 is slidable in a sleeve 55 mounted on the frame 20 and is provided with a port 56 therein which registers with a port 57 in the sleeve 55 when the inflating nozzle 50 is extended,

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i. e., when the inflating nozzle is inserted into the tube section 30 to inflate same. The port 57 is connected to a suitable source of inflating gas, such as air, under pressure. Thus, the structure disclosed provides an inflating valve 58 which automatically opens when the inflating nozzle 50 is moved inwardly to its extended position, which is an important feature. The outer end of the tube 51 is, of course, closed.

The inflating nozzle 50 is biased outwardly into its retracted position, as shown in phantom in Fig. 1 of the drawings, by a spring 60 which encircles the tube 51. This spring is seated at one end against a seat 61 on the tube 51 and is seated at its other end against a seat 62 on the sleeve 55. Thus, after the inflating nozzle 50 has been extended to inflate the tube section 30, it is automatically retracted by the spring 60 when released.

Registering with the inflating means 49, i. e., located at the same level as the inflating means, is a combined clamping and sealing means 65 which serves to heat seal the tube 23 closed in the particular construction illustrated, thereby forming one end of a package containing a charge of the substance in question, such packages being designated by the numeral 66. The sealing means includes two handles 67 pivoted on a shaft 68 carried by the frame 20, these handles being movable together from the broken line positions shown in Fig. 4 to the solid line positions shown therein. The handles 67 carry sealing dies or clamps 69 which may be heated in any suitable manner, not shown, and which clamp the tube 23 therebetween, as shown in Fig. 4, thereby producing a seal 70.

By locating the sealing means 65 at the same level as the inflating nozzle 50, and by so orienting the sealing means 65 that it flattens the tube 23 in a plane containing the axis of reciprocation of the inflating nozzle 50, the puncture in the tube 23 through which the inflating gas was introduced, and through which the substance being packaged was previously introduced, is sealed shut and is also located at one edge of the seal 70, as indicated by the numeral 71 in Fig. 4. Locating the sealed puncture on one edge of the sealed area keeps the puncture from interfering with the structural strength of the seal, which is a further feature.

Located below the inflating means 49 of the sealing means 65 a distance equal to one package length is a combined clamping and severing means 73 which, as hereinafter described, supports the lower end of the tube section 30 during inflation and filling, and which also at least partially severs the seal 70 produced by the sealing means 65 so as to completely or partially separate adjacent packages 66 from each other. The severing means 73 is illustrated as comprising two pivoted handles 74 mounted on the shaft 68 and carrying severing dies 75 adapted to clamp the tube 23 therebetween and adapted to at least partially sever it in the sealed area. In the particular construction illustrated, one of the severing dies 75 carries projections 76 which, in effect, perforate the seal 70 between adjacent packages 66, as indicated by the numeral 77 in Fig. 1. The severing means 73 may either be mechanical, in which case it actually cuts through the seal 70 between packages 66, or the cutting projections 76 may be heated so that, in effect, they burn their way through the seal 70 to produce the severing action.

Referring to Figs. 7 and 8 of the drawings, illustrated therein is an alternative interpackage seal 81 and an alternative sealing means 82 for producing the seal 81. In this embodiment, the sealing means 82 includes two sealing dies 83, only one of which is shown in Fig. 8 of the drawings, having registering V-shaped edges 84 with their apices at the center of the sealed area. With this construction, an unsealed area 85 which converges centrally toward one end of the resulting package 86 is provided. When the packages 86 are subsequently opened, as by cutting along a line 87, the corresponding unsealed area 85 produces a convenient pouring spout, which

is a further feature. After sealing by the sealing means 82, the interpackage seal 81 may be at least partially severed by the severing means 73 in the manner hereinbefore described, perforations 88 being shown. Also, the seal 81 may be provided with holes 89 formed therein by suitable projections, not shown, on the severing means, such holes being utilized in hanging the resulting packages 86 on a display rack, or the like.

Considering the operation of the invention, two different modes of operation are illustrated in Figs. 9 and 10 of the drawings, the mode illustrated in Fig. 9 being considered first as a matter of convenience. Figs. 9 and 10 illustrate the two modes of operation of the invention diagrammatically and it should be pointed out that the dies of the sealing means are shown displaced 90° about the vertical operating axis as a matter of convenience.

Referring first to Fig. 9a, the tube section 30 is shown as supported and closed at its upper end by the clamping means 26, the lower end thereof being shown as clamped by the severing means 73 at one of the seals 70 previously produced by the sealing means 65. The lower end of the tube section 30 contains a charge 91 previously introduced. The spout 34, the inflating nozzle 50 and the sealing means 65 are all retracted.

Referring now to Fig. 9b, the next step is to insert the inflating nozzle 50 through a puncture previously formed, whereupon the tube section 30 is inflated to render it rigid for penetration by the spout 34. At the start of operations with a new roll 22 of tubing, it may be necessary to form the first puncture in the tubing by manually cutting a suitable hole therein to permit the insertion of the nozzle 50. The air pressure delivered by the nozzle 50 is then sufficient to separate the walls of the flat tubing and form the expanded tubing section 30. As shown in Fig. 9c, the next step is to move the spout 34 downwardly along its inclined path, whereupon it punctures the inflated tube section.

Subsequently, the inflating nozzle 50 is withdrawn, as shown in Fig. 9d, the tube section 30 being inflated only long enough to permit puncturing thereof by the spout 34. Referring to Fig. 9e, the next step is to actuate the sealing means 65 to produce a seal at the upper end of the previously introduced charge 91. As soon as the tube section 30 has been closed by the sealing means 65, another charge 91, Fig. 9f, of the substance to be packaged may be introduced into the tube section 30 through the spout 34 above the sealing means 65 while the sealing means is producing the desired seal, the filling and sealing operations thus taking place simultaneously to save time, which is an important feature. The simultaneous filling and sealing operations are illustrated in Fig. 9f.

After the sealing and filling operations have been completed, the spout 34, the sealing means 65 and the severing means 73 are all retracted and the clamping or feed rolls 27 are rotated to advance a fresh length of the tube 23 into the processing zone between the clamping means 26 and the severing means 73. Thereafter, the severing means 73 is actuated to at least partially separate two adjacent packages 66 in the seal 70 therebetween, which brings us back to Fig. 9a in readiness for a repetition of the operating cycle.

An important feature of the present invention is that various operations are performed simultaneously in order to save time, the simultaneous filling and heat sealing having been mentioned previously. The portions of each operating cycle taken up by the various individual operations may best be considered by way of a numerical example, which is not intended to be limiting. For the purposes of this illustrative example, it is convenient to consider the complete cycle as covering a range of 360°. Approximately the first 180° of the operating cycle may be taken up in advancing the tube 23 by means of the feeding rolls 27 to bring a fresh portion

of the tube into the operating or processing zone between the clamping means 26 and the severing means 73. Somewhere between 160° and 180° of the cycle, the severing means 73 is actuated to grip one of the seals 70 as hereinbefore described, this clamping action by the severing means preferably taking place a little before 180° of the cycle have elapsed. The reason for this is that a little slack is produced in the tube section 30 which takes the tension off the tube and which avoids stretching of the tube by the weight of the previously introduced charge 91, the weight of such charge being transferred to the severing means 73.

After 180° of the cycle have elapsed, the feed rolls 27 are stopped and the inflating nozzle 50 is inserted into the puncture formed by the spout 34 in the preceding cycle. A few degrees of the operating cycle are required to inflate the tube section 30, the tube wall around the puncture through which inflation is taking place generally seating against the sealing collar 52 by the time 190° of the cycle have elapsed. At about 190° of the cycle, the spout 34 is moved into engagement with the inflated tube section 30 to puncture it and, at about 192° of the cycle, the inflating nozzle 50 may be retracted. Shortly thereafter, i. e., at about 193° of the cycle, the sealing means 65 may be actuated to begin the sealing operation and to separate the preceding package from the package to be filled. Thereupon, the filling operation can begin, this operation taking place concurrently with the heat sealing operation. The filling operation may extend from approximately 194° of the cycle to approximately 350° thereof, the balance of the cycle being occupied by withdrawal of the spout 34, retraction of the sealing means 65 and retraction of the severing means 73 in readiness for repetition of the operating cycle.

In the event that air or other gas is introduced through the spout 34 during the filling operation, this may begin at around 192° to 193° of the operating cycle.

It will be noted that, in the mode of operation illustrated in Fig. 9, a complete charge of the substance to be packaged was introduced during the filling operation of the complete operating cycle. The mode of operation of Fig. 10 differs from that of Fig. 9 in that only a half charge 92 is introduced at a time, the filling operation thus being split up into two parts. Otherwise, the different operations are quite similar to those illustrated in Fig. 9 so that a brief description of Fig. 10 is all that is required.

Comparing Fig. 10a to Fig. 9a, it will be seen that the same conditions obtain, except that only a half charge 92 is in the tube section 30, as compared to the full charge 91 of Fig. 9a. The operations of Figs. 10b and 10c are the same as the operations of Figs. 9b and 9c. In Fig. 10d, the remaining half charge is introduced after retraction of the inflating nozzle 50 and before actuation of the sealing means 65, thereby completing the filling of the package in question. Fig. 10e illustrates the same operation as Fig. 9e. Fig. 10f is the same as Fig. 9f, except that, in the operation illustrated in Fig. 10f, only a half charge 92 of the substance being packaged is introduced, the remaining half charge being introduced later in the operation illustrated in Fig. 10b, as previously described.

Although as shown and described in the clamping means 26, the feeding and piercing means 33, the inflating means 49, the sealing means 65, and the clamping and severing means 73 are all operated manually, it will be understood that they may individually be readily operated by suitable power-operated means interconnected and controlled by suitable driving means, so as to provide an automatic operation, without departing from the spirit of the invention. It will also be understood that our invention may be employed for the aseptic packaging of food materials by simply enclosing the operating elements in a closely fitting steam hood and injecting superheated steam continuously into the hood so as to provide

a slightly higher pressure inside the hood than outside, which prevents the entry of contaminated or non-sterile air into contact with the tubing during the packaging operation.

Although various exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined in the appended claims.

We claim as our invention:

1. A method of packaging a substance in a tube of flexible material, including the steps of: closing the tube at two longitudinally spaced points; inflating the tube between said longitudinally spaced points through an opening therebetween; puncturing the tube at a point spaced longitudinally of the tube from said opening while the tube is inflated; and subsequently introducing the substance to be packaged into the tube through the resulting puncture.

2. A method of packaging a substance in a tube of flexible material, including the steps of: closing the tube at two longitudinally spaced points; inflating the tube between said longitudinally spaced points through an opening therebetween; puncturing the tube at a point spaced longitudinally of the tube from said opening when the tube is inflated; subsequently introducing the substance to be packaged into the tube through the resulting puncture; and supplying an inflating material to said tube through said puncture during the introduction of the substance to be packaged to maintain it inflated during said introduction.

3. A method of packaging a substance in a tube of flexible material, including the steps of: clamping the tube closed at two longitudinally spaced zones; inflating the tube through an opening therein between said zones; puncturing the tube between said zones at a point spaced longitudinally of the tube from said opening while the tube is inflated; and subsequently introducing the substance to be packaged into the tube through the resulting puncture.

4. A method of packaging a substance in a tube of flexible material, including the steps of: clamping the tube at two longitudinally spaced points so as to support the tube and so as to isolate the section of the tube lying between said points; inflating the section of the tube lying between said points so as to render it relatively rigid; puncturing the tube intermediate said points while it is inflated; and introducing the substance to be packaged into the tube through the puncture.

5. A method of packaging a substance in a tube of flexible material, including the steps of: clamping the tube at two longitudinally spaced points so as to support the tube and so as to isolate the section of the tube lying between said points; supporting the section of the tube lying between said points at an intermediate point; inflating the section of the tube lying between the points first mentioned; puncturing the tube adjacent said intermediate point while it is inflated; and introducing the substance to be packaged into the tube through the puncture.

6. A method of packaging a substance in a tube of flexible material having a first puncture therein, including the steps of: clamping the tube at two longitudinally spaced points respectively disposed on opposite sides of said first puncture so as to support and isolate the intervening section of the tube; inflating said intervening section of the tube through said first puncture; making a second puncture in said intervening section of the tube at a location spaced longitudinally from said first puncture and while said intervening section of the tube is inflated; and subsequently introducing the substance to be packaged into the tube through said second puncture.

7. A method of packaging a substance in a tube of flexible, heat sealable material, including the steps of:

clamping the tube at two longitudinally spaced points to support and isolate the intervening section of the tube, said intervening section having a first puncture therein; inflating said intervening section through said first puncture; making a second puncture in said intervening section while inflated and at a location spaced longitudinally from said first puncture; heat sealing said intervening section closed in a zone registering with said first puncture; and introducing the substance to be packaged into said intervening section through said second puncture while the heat sealing step is being performed.

8. A method of packaging a substance in a tube of flexible, heat sealable material which is sealed closed at a first point, which is provided with a first puncture therein at a second point spaced longitudinally from said first point, and which contains a charge of the substance to be packaged therein between said first and second points, including the steps of: clamping the tube at said first point and at a third point spaced longitudinally from said second point, and located on the opposite side of said second point from said first point, so as to support and isolate the intervening section of the tube; inflating said intervening section through said first puncture; making a second puncture in said intervening section while inflated and at a fourth point intermediate said second and third points; heat sealing said intervening section closed at said second point in a zone overlying said first puncture; and introducing an additional charge of the substance to be packaged through said second puncture while the heat sealing step is being performed.

9. The method defined in claim 8 including the additional step of at least partially severing the tube at said first point while clamping it at said first point.

10. A method of packaging a substance in a tube of flexible material, including the steps of: advancing the tube longitudinally thereof; clamping the tube at a first point while continuing to advance it so as to slacken the tube; clamping the tube at a second point spaced from said first point so as to close and support the intervening section of the tube; inflating said intervening section of the tube; puncturing said intervening section of the tube while inflated; and introducing the substance to be packaged into the tube through the puncture.

11. In an apparatus for packaging a substance in a tube of flexible material, the combination of: clamping means adapted to clamp the tube at a pair of points spaced apart longitudinally of the tube to support and isolate the intervening section of the tube; an inflating nozzle located between said points and insertable into said intervening section of the tube for inflating said intervening section; and piercing means located between said points and adapted to puncture said intervening section of the tube to provide access to the interior of said intervening section, said piercing means being tubular to provide for introduction of the substance to be packaged there-through into the interior of said intervening section of the tube.

12. An apparatus as defined in claim 11 including means mounting said piercing means for movement toward and away from said intervening section of the tube along a path which make an acute angle with the axis of said intervening section.

13. An apparatus as defined in claim 12 which is oriented vertically so that said axis of said intervening section is vertical.

14. In a packaging apparatus for use with a tube of flexible material, the combination of: means for supporting the tube; piercing means adapted to puncture the wall of the tube to provide access to the interior thereof, said piercing means being tubular to provide for the introduction therethrough into the interior of the tube of a substance to be packaged; and means mounting said piercing means for movement toward and away from the tube along a path inclined at an acute angle to the axis of the tube.

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15. A packaging apparatus according to claim 14 wherein said piercing means includes a tubular member having an end inclined at an acute angle to the axis thereof to provide a piercing point, said tubular member carrying a blade externally thereof which extends rearwardly from said piercing point.

16. A packaging apparatus as defined in claim 11 including a sleeve located adjacent said piercing means and adapted to encircle said intervening section of the tube.

17. In an apparatus for packaging a substance in a tube of flexible, heat sealable material, the combination of: clamping means for closing and supporting the tube; severing means located below said clamping means for clamping and at least partially severing the tube; an inflating nozzle located between said clamping means and said severing means and insertable into an intervening section of the tube for inflating same; heat sealing means located at the same level as said inflating nozzle and engageable with said intervening section of the tube for heat sealing same closed; and piercing means located below said clamping means but above said inflating nozzle and said heat sealing means for puncturing said intervening section of the tube, said piercing means being tubular to provide for the introduction therethrough into the interior of said intervening section of the tube of a substance to be packaged.

18. A packaging apparatus according to claim 17 including a sleeve adjacent said piercing means and adapted to encircle said intervening section of the tube.

19. A packaging apparatus as defined in claim 17 wherein said heat sealing means includes two dies adapted to clamp said intervening section of the tube therebetween, said dies having registering V-shaped edges with their apices at the centers thereof to provide a converging unsealed area usable as a spout.

20. A packaging apparatus as defined in claim 17 wherein said inflating nozzle carries a collar engageable with the exterior of said intervening section of the tube, the pressure within said intervening section seating the tube wall against said collar to provide a seal around an opening through which said inflating nozzle is inserted.

21. A method of packaging a substance in a tube of flexible material, including the steps of: closing the ends of a section of the tube; inflating said section of the tube through a first puncture therein; making a second puncture in said section of the tube while inflating same through said first puncture; introducing the substance to be packaged into said section of the tube through said second puncture; sealing said section of the tube in a zone

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registering with said first puncture; subsequently closing the ends of another section of the tube which includes said second puncture; inflating said other section of the tube through said second puncture; and making a third puncture in said other section of the tube while inflating same through said second puncture.

22. A packaging method utilizing an inflatable tube and including the steps of: forming an opening in the wall of the tube; closing the tube on opposite sides of said opening; subsequently introducing a substance to be packaged into the tube through said opening; and subsequently introducing an inflating medium through said opening.

23. A method as defined in claim 22 including the subsequent step of sealing said tube closed in a zone overlying said opening.

24. A continuous, step-by-step method of packaging a substance in a tube of flexible material, including the steps of: sealing the tube closed in one zone; clamping the tube closed in another zone spaced longitudinally from the first zone mentioned so as to isolate the section of the tube between said zones; inflating said section of the tube through a previously formed, first puncture adjacent the first zone mentioned; puncturing said section of the tube between said first puncture and the second zone mentioned, and while said section of the tube is inflated, so as to form a second puncture therein; and introducing the substances to be packaged into said section of the tube through said second puncture.

25. A method as defined in claim 24 including the additional step of sealing said section of the tube closed in a zone overlying said first puncture after forming said second puncture.

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