

Sept. 6, 1938.

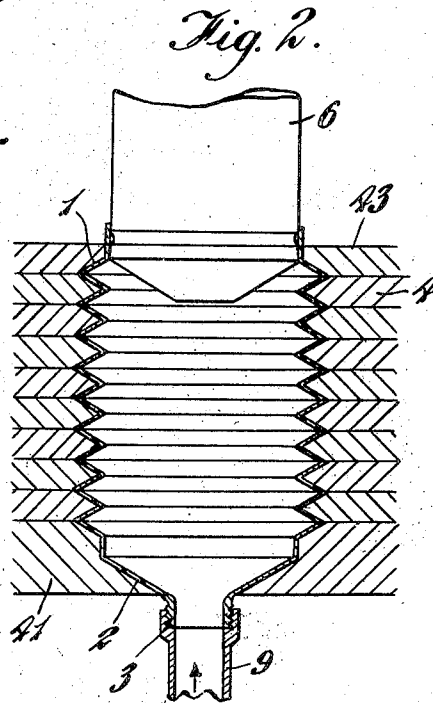
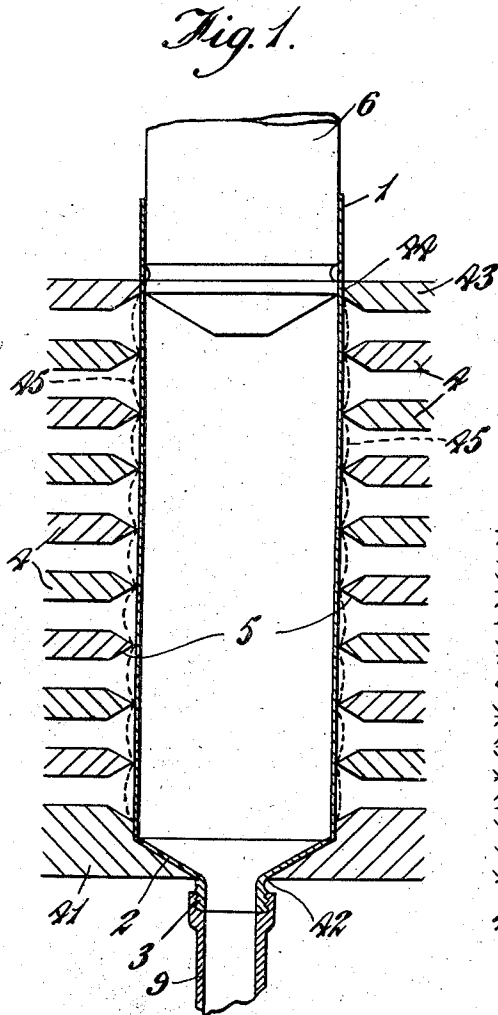
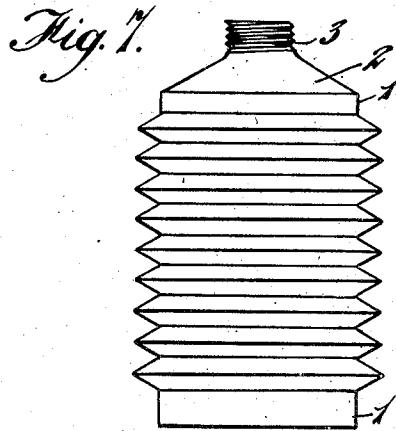
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2,129,120

METHOD OF FORMING EXTRUSION CONTAINERS

Filed April 22, 1937

5 Sheets-Sheet 1



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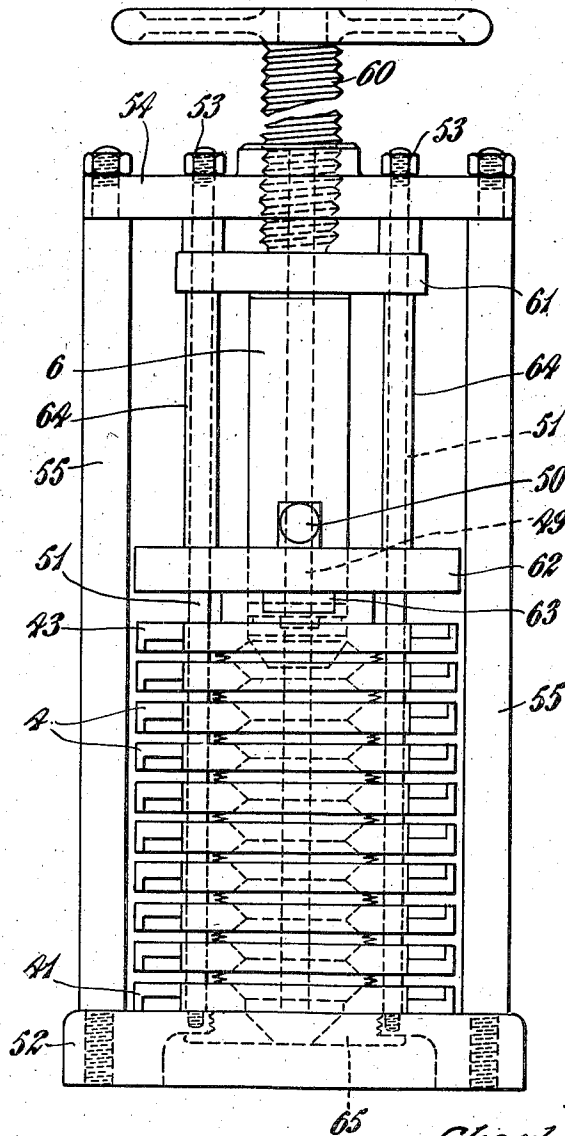
2,129,120

METHOD OF FORMING EXTRUSION CONTAINERS

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5 Sheets-Sheet 2

Fig. 3.



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METHOD OF FORMING EXTRUSION CONTAINERS

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5 Sheets-Sheet 3

Fig. 4.

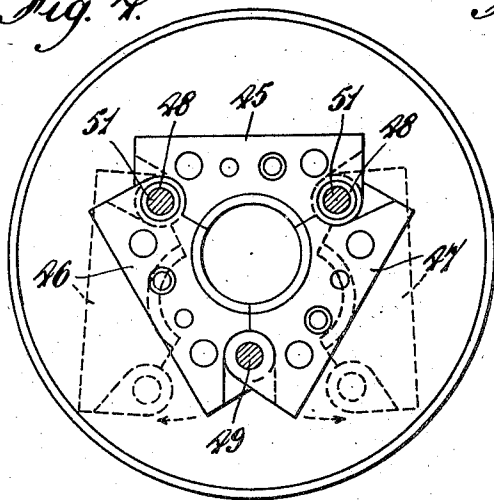


Fig. 9.

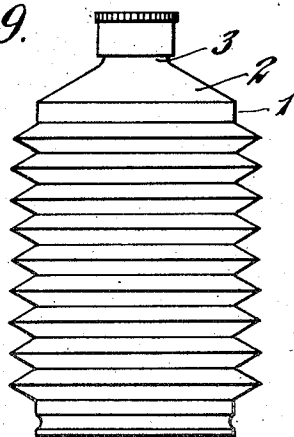


Fig. 8.

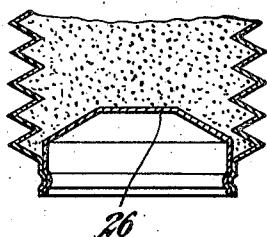
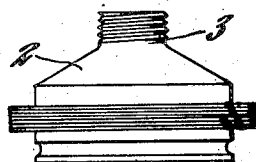


Fig. 10.



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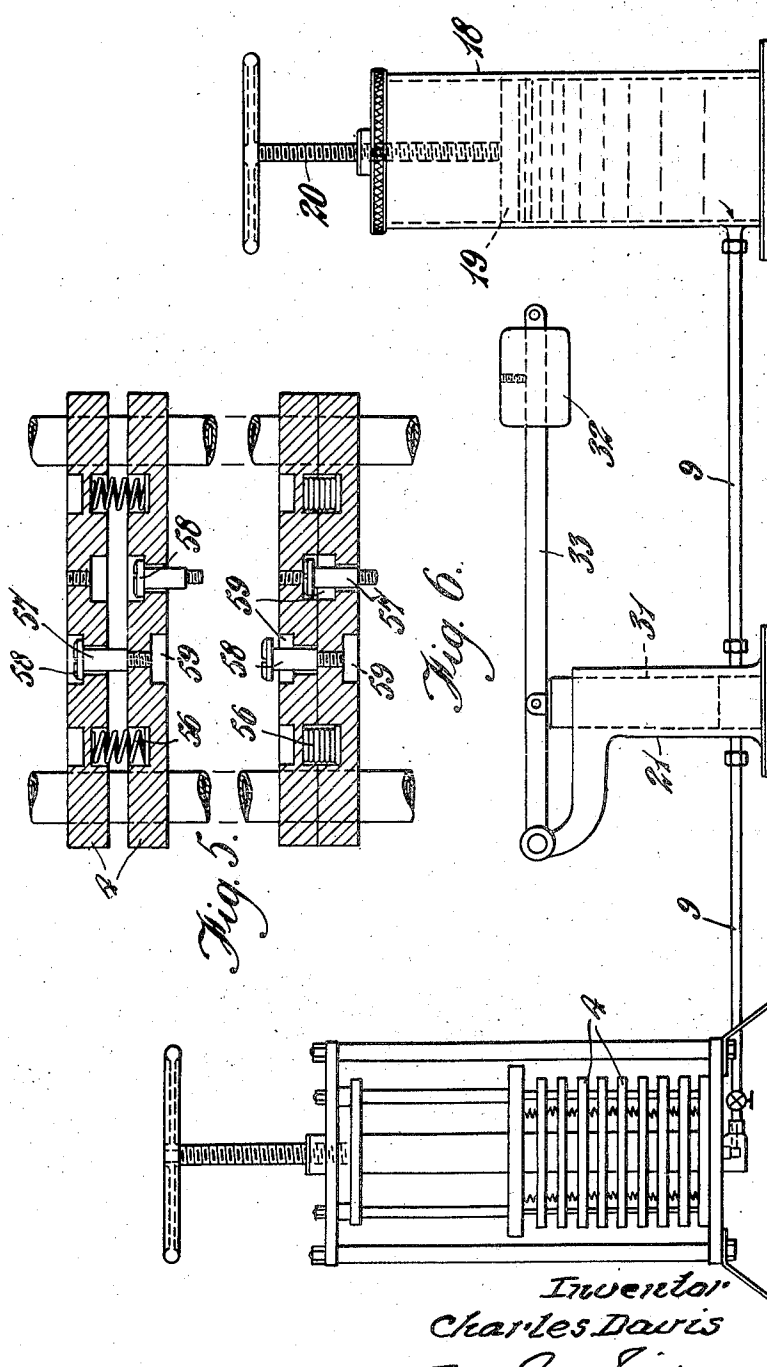
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METHOD OF FORMING EXTRUSION CONTAINERS

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5 Sheets-Sheet 4



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METHOD OF FORMING EXTRUSION CONTAINERS

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5 Sheets-Sheet 5

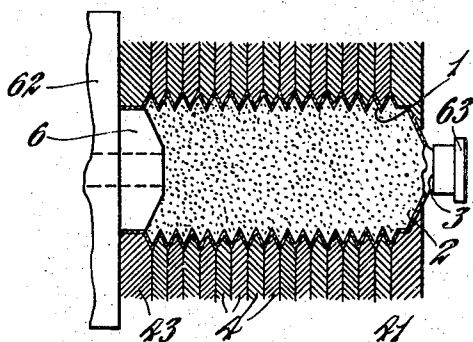
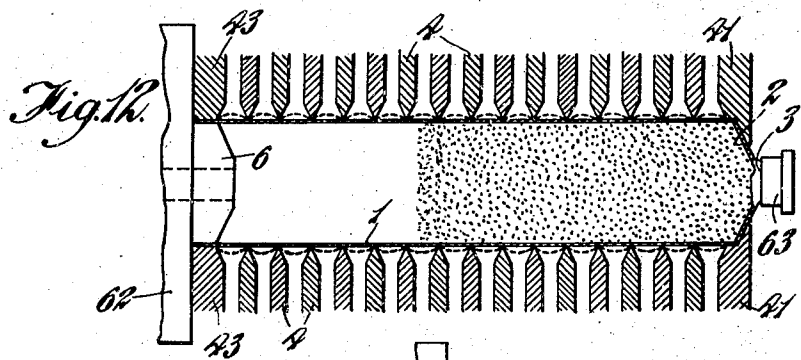
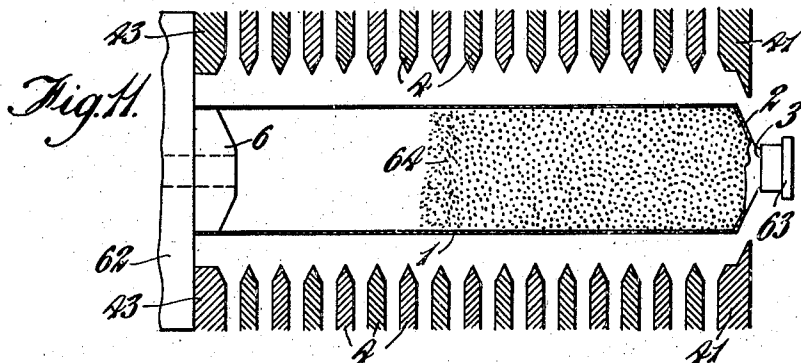


Fig. 13.

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UNITED STATES PATENT OFFICE

2,129,120

METHOD OF FORMING EXTRUSION
CONTAINERS

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Application April 22, 1937, Serial No. 138,453
In Great Britain July 28, 1936

3 Claims. (Cl. 153—73)

The invention concerns the manufacture of collapsible tubular extrusion-containers which are made of metal, such as lead, tin or aluminium and contain fluid or semi-fluid or pasty substances such as tooth-paste, cosmetics, ointment, shaving cream, paint, polishing material and the like and also to the filling of such containers.

Hitherto these extrusion-containers have been made of plain tubular form, the tube together with a nozzle at one end being usually formed by drawing or stamping a disc of metal, such as tin, lead or aluminium. Such a container has many defects, it is untidy in use and soon becomes unsightly, is difficult to empty entirely and will not stand erect.

In order to enable such a container to be collapsed axially it has been suggested to provide it with pleats extending inwardly relatively to the original diameter of the tube, but the manufacture of such a pleated container presented difficulties in manufacture and so far as I am aware, the results obtained have not been satisfactory. Even if such an inwardly pleated tube could be made satisfactorily, it will have the disadvantage that its capacity would be seriously reduced.

In the well known Hollerith system (see U. S. Patent No. 349,718) and later modifications thereof of making corrugated copper and phosphor bronze tubes for use as resilient expandible and contractible bellows or containers of volatile liquids for use in thermostatic apparatus, a plain tube which may be closed at one end is placed in an expanding and contracting multi-plate mould while the mould plates are spaced apart axially. The tube is subjected to an initial internal fluid pressure to bulge slightly or mark off the tube. The mould is then contracted with maintenance or increase of pressure, so that the tube is corrugated. The internal operative edges of the mould plates are so shaped that the metal of the tube is merely corrugated, that is to say, is well rounded at the roots and crests because it is essential that the container or bellows made from the corrugated tube shall be resilient in order that it shall expand and contract under variations of the pressure of the contained volatile liquid.

In these prior proposals, while a well rounded form is obtained at the crests and roots of the corrugations, the intermediate parts are in planes at right angles to the central axis of the tube.

A similar method has been suggested for making corrugated steam and hot water pipes, the mould plates in this case being so shaped that while at the crests and roots the corrugations

have a rounded form, the intermediate portions are in planes which are inclined to the axis of the pipe. Corrugated tubular containers and pipes made as above described are unsuitable for the purpose of the present invention.

According to the invention, a plain tubular container made of metal such as lead, tin or aluminium, preferably having a nozzle at one end and open at the other, similar to the well known plain collapsible tubular container used for toothpaste and the like pasty material, is subjected to internal fluid pressure while in an expansible and contractible multi-plate mould which is distinguished from those hereinbefore referred to in that the inner or operative edges of the mould plates are so shaped that when the mould is contracted, they form alternate ridges and grooves of V-shape and preferably of sharply defined V-shape, that is, the crests and roots of the V-shaped grooves and ridges are relatively sharp.

Similarly to the known corrugating process, the tubular container is first subjected to internal pressure while the mould is expanded to bulge the tube slightly or mark it off and then the mould is contracted with maintenance or increase in the internal pressure so that the tube is provided with V-shaped outward pleats and preferably pleats having sharp crests and roots.

The V-shaped pleats and particularly such pleats having sharp or acute crests and roots ensure that the pleated container is practically non-resilient axially, that is, it can be easily collapsed axially and has practically no tendency to expand or return to its original form after partial collapse. The substance in the pleats can be practically wholly extruded while the container is being collapsed, and as the end of the container remote from the nozzle can be fitted with a stopper or extrusion piston which conforms to the shape of the nozzle, practically the whole of the contents can be extruded.

The stopper may be shaped to enable the container to stand erect on it.

The internal pressure medium used to subject the tubular container to internal pressure may be a compressed gas such as compressed air, or it may be constituted by the fluid, semi-fluid or pasty substance which is to form the ultimate contents of the container, or a plain tube may be dosed with its contents before insertion in the mould and then subjected to a pressure medium such as compressed air.

In the accompanying drawings:

Figure 1 is a diagrammatic section through a

part of a multiplate mould, with an ordinary collapsible tube in position, before the mould is collapsed axially,

Figure 2 being a similar view, but showing the mould collapsed.

Figure 3 is a side elevation of a mould,

Figure 4 being a plan of one of the mould plates, and

Figure 5 being a sectional elevation through several mould plates.

Figure 6 is a diagrammatic layout of a mould and pressure medium supply system.

Figure 7 is a side elevation of a pleated container as removed from the mould as formed without filling.

Figure 8 is a side sectional elevation of part of a filled and sealed container,

Figures 9 and 10 being side elevations, respectively, of the filled and completed container ready for use and of the container after it has been collapsed to extrude its contents.

Figure 11 is a diagrammatic section through a part of a modified mould in the open condition with a tube inserted.

Figure 12 shows the mould closed, and

Figure 13 shows the mould collapsed.

In one method of carrying out the invention, a tin or lead tube 1, Figures 1 and 2, as usually employed hitherto as a collapsible or extrusion container; provided with a conical nozzle 2 and screw-threaded nipple 3, is inserted in a mould comprising a number of plates 4, each presenting an internal circular edge 5 of V-shape in cross-section. The angle of this V should be about 62°.

The tube 1 is inserted while the mould is expanded, that is, while the plates 4 are separated as indicated in Figure 1.

The lowermost plate 41 is shaped to conform to the nozzle 2 and has a central hole 42 to allow the nipple 3 to protrude so that it can be connected to a fluid supply pipe, for example, a supply pipe 9 for compressed air. The uppermost plate 43 has a cylindrical hole 44.

A plunger 6 is inserted in the open end of the tube 1. This end of the tube may be a fairly good fit on the plunger and the plunger may have packing rings or grooves to prevent the undue escape of air.

Compressed air under light pressure is first admitted through the nipple 3 so that the inflated tube is pressed outwardly against the sharp edges 5 of the plates 4, a slight bulge of the tube occurring between each adjacent pair of edges as indicated in dotted lines 45, Figure 1. A slight contraction in the length of the tube may occur under these conditions. The nozzle end of the tube being held, the other end of the tube may be free to allow for this contraction as the plunger 6 takes the internal pressure.

The mould is then contracted until the plates 4 are in close contact with a resulting increase in the pressure of the air in the tube.

The tube 1 then assumes the sharply defined pleated form indicated in the mould in Figure 2. The air supply pipe is then disconnected from the nipple 3 and the pleated tube is removed and has the appearance shown in Figure 7.

In order to remove the pleated container from the mould, it is necessary that the plates 4 and 43 shall each be made in sections capable of being moved apart laterally. Such a form of mould will now be described with reference to Figures 3 to 6 as well as a simple form of apparatus capable of being used with a fluid or pasty substance which is intended to be used as a

pressure medium and also for filling the pleated container.

The mould comprises a number of plates 4, a plate 41 and a plate 43, each composed of three sections 45, 46 and 47, Figure 4.

The sections of each plate have interengaging parts or joints and the section 45 is pivotally connected at its joints with the sections 46 and 47 by ferrules 48, 48. A removable rod 49 having a handle 50 (Figure 3) at its upper end passes through all the joints between the sections 46 and 47 when the sections are in the condition shown in Figure 4. When the rod 49 is withdrawn, the sections 46 and 47 of each plate may be moved apart laterally as indicated by the dotted lines in Figure 12, so that the mould can be opened.

The plates 4 are mounted to slide on rods 51, Figures 3 and 4, which are screwed at their lower ends in a base 52 and secured by nuts 53 at the upper ends in a yoke 54 which is firmly mounted on pillars 55 similarly attached to the base 52 and to the yoke 54.

Springs 56 arranged in recesses in adjacent plates 4 tend to separate them. The distance which they can be separated is determined by studs 57, each stud being screwed into one plate and freely sliding in a hole in the adjacent plate and having a head 58. Recesses 59 are provided for the reception of these heads.

When the mould plates 4 are assembled in the apparatus as shown in Figure 3, they are capable of being pressed together by a screw 60 which acts on a cross-head 61 sliding on the rods 51 and transmitting pressure to a pressure plate 62 by means of spacing sleeves 64 on the rods 51.

The cross-head 61 also presses on a plunger 6 which passes through a hole in the pressure plate 62. The pressure plate 62 has a boss 63 which engages with the uppermost mould plate 43.

The lowermost plate 41 rests on the base plate 52 which is provided with the bushing 65 having a hole shaped to conform to the nozzle 2 and allowing the nipple 3 to protrude. When the mould is used for both filling and forming the container, the nipple is connected to means for supplying fluid or pasty substance. Such means is indicated in Figure 6.

It will be assumed that a lead or tin tube has been inserted in the mould while the plates 4 are separated by their springs 56, that is, with the mould in the expanded condition. The nipple 3 of the tube 1 is connected to a pipe 9 which is connected to a pressure regulator 21 which is fitted with a plunger 31 loaded by an adjustable weight 32 and a lever 33.

The regulator 21 is connected by the pipe 9 to a source of supply for the pressure medium, in this example diagrammatically illustrated by a storage cylinder 18 fitted with a piston 19 operated by a screw 20.

If the pressure medium is a fluid or pasty substance which is to constitute the ultimate contents of the pleated container, the plunger 6 is first inserted right down in the tin, aluminium or lead tube 1 so as to expel air therefrom before the connection is made to the supply pipe 9.

The pressure medium is then supplied by operating the screw 20 gradually so that the tube in the mould is filled and the plunger is raised until arrested by the cross-head 61, the pressure of the medium being only sufficient to do this. The screw 20 is then slightly operated still further to apply a light internal pressure to the

tube in the expanded mould so that the tube is pressed against the sharp V edges 5 of the mould plates 6 and a slight bulging of the tube between those edges occurs.

The screw 60 is then operated to contract the mould and cause the plunger 6 to follow the contraction. This sets up a higher pressure in the fluid or pasty medium in the tube or container, any excess substance expelled through the small orifice of the nipple passing into the pipe 9. The regulator 21 automatically affords accommodation for excess substance and prevents an unduly high pressure occurring.

As the mould is contracted, the tin, lead or aluminium tube or container is pleated.

The pleats are outward pleats, that is, extend outwardly relatively to the tube 1 and are sharply defined.

The pressure may be relieved by operation of the screw 20 or by closing a valve 10 on the pipe 9 while the pipe is disconnected from the nipple of the tube or container. The mould is then opened after removal of the rod 49 and the filled pleated tube or container is removed.

The open end of the filled container is fitted with a stopper or piston 26 (Figure 8), which may be of metal or other suitable material.

The filled pleated container, shown in Figure 9, thus manufactured can be collapsed axially, as is shown in Figure 10, to extrude its contents through the nipple 3. The container will stand erect on the stopper 26. It may be placed in a protective casing although it is capable of being used without such a casing.

When compressed air is used to form the container, it is not necessary to start with the plunger 6 at the bottom of the tube as there is no need to expel air from it. The cylinder 18 shown in Figure 6 may be utilized as a pump or compressor to force air into the mould or the mould may be connected to any suitable source of compressed air. Instead of a pressure regulator as shown at 21, a suitable safety valve may be employed in the compressed air line.

In place of the springs 56 inserted between the plates 4, 41 and 43, the plate 43 may be pulled up by springs, the remainder of the plates being separated and spaced apart correctly by means of the studs 57.

In the accompanying drawings, the thickness of the tube has been shown exaggerated for the sake of clearness, but in practice, the ordinary tubes having a thickness of about .1 to .2 millimetre can be used.

Instead of the fluid or semi-fluid or pasty substance being introduced through the nozzle of the tube while in the mould, it may be introduced through a duct in the plunger, the duct being connected by a flexible or telescopic connection to a supply pipe which may have a pressure regulator on it as in the example above described.

It will be noticed that in the example illustrated, the upper and lower mould plates 43 and 41 are so shaped that tubular ends or parts of the tube 1 are left plain, the pleated part of the body extending outwardly beyond the circumference of these parts. The tubular ends are shown in Figures 7 to 9.

The upper end, Figures 7 and 9, is finished off with a conical nozzle 2 having a nipple 3 of usual form, but a flat, domed or other shaped nozzle and appropriate cap can be provided, the nozzle having round holes, slits or other shaped orifices.

A modification of the process described above with reference to Figures 1 and 2 is illustrated

by Figures 11, 12 and 13, it being assumed that the mould plates 4 are provided with the devices shown in Figures 4 and 5, similar reference numerals indicating corresponding parts in the various figures. In this modified process, the plunger 6 is provided with a duct 62 through which the pressure medium, for example, compressed air, is introduced to the tube 1, the nipple 3 on the nozzle 2 of which is closed by the usual cap 63 before the tube is inserted in the open mould, as indicated in Figure 11.

If an empty container is inserted, the mould plates 4 are closed laterally as shown in Figure 12. Compressed air is then admitted to bulge slightly or mark off the tube 1, as indicated by dotted lines in Figure 12. The mould is then collapsed, that is, the plates 4 are closed together, as indicated in Figure 13, the flange or cross-head 61 and plunger 6 being moved relatively to the stationary plate 41, the internal pressure of the compressed air being maintained so that the container or tube 1 is provided with sharply defined outward pleats.

Before the tube or container 1 is inserted in the mould, it may be dosed with the substance it is ultimately to contain, as indicated by 64, the compressed air acting on this substance during the pleating operation to maintain the internal pressure.

I claim:

1. A process for making an axially collapsible nonresilient metallic tubular extrusion container for fluid, semifluid, or pasty substances, consisting in inserting a tube of metal, such as lead, tin or aluminum, in a multi-plate expansible and contractible mold, the plates of the mold having opposite edges so shaped that when the mold is contracted, such mold edges cooperate to form alternate ridges and grooves of V-shape, the metallic tube being inserted while the mold is expanded, injecting a fluid pressure medium into said tube, and then contracting the mold while maintaining the internal pressure so that the tube conforms to the mold and the elasticity of the tube is very materially reduced in the metal of the tube at the roots and crests of the V-shaped outward pleats formed by the mold.

2. A process for making an axially collapsible nonresilient metallic tubular extrusion container for fluid, semifluid, or pasty substances, consisting in inserting a tube of metal, such as lead, tin, or aluminum, in a multi-plate expansible and contractible mold, the plates of the mold having opposite edges so shaped that when the mold is contracted the mold edges cooperate to form alternate ridges and grooves of V-shape, the metallic tube being inserted while the mold is expanded, injecting under pressure into said tube the substance which the container is to contain ultimately, and then contracting the mold while maintaining the internal pressure so that the tube conforms to the mold and the elasticity of the tube is very materially reduced in the metal of the tube at the roots and crests of the V-shaped outward pleats formed by the mold.

3. A process for making an axially collapsible nonresilient metallic tubular extrusion container for fluid, semifluid, or pasty substances, consisting in providing a tubular element having a nozzle at one end and open at the other end and charged with the substance it is ultimately to contain, inserting such charged tubular element in a multi-plate expansible and contractible mold, the plates of the mold having opposite edges so shaped that when the mold is contracted the

3 mold edges cooperate to form alternate ridges and grooves of V-shape, the charged tubular element being inserted while the mold is expanded, injecting compressed air into the tubular element to place the contained material within the element under appropriate pressure, and then contracting the mold while maintaining the in-

ternal pressure so that the tubular element conforms to the mold and the elasticity of the tube is very materially reduced in the metal of the tube at the roots and crests of the V-shaped outward pleats formed by the mold.

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