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[54] METHOD OF AND MEANS FOR MAKING AND FILLING CONTAINERS WITH BEVERAGE
12 Claims, 5 Drawing Figs.

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[51] Int. Cl. B65b 55/06
[50] Field of Search ..... 99/28, 171, 182, 181, 181C; 53/30, 184; 113/120, 120A; 161/Polyamide Digest; 220/62, 63, 64

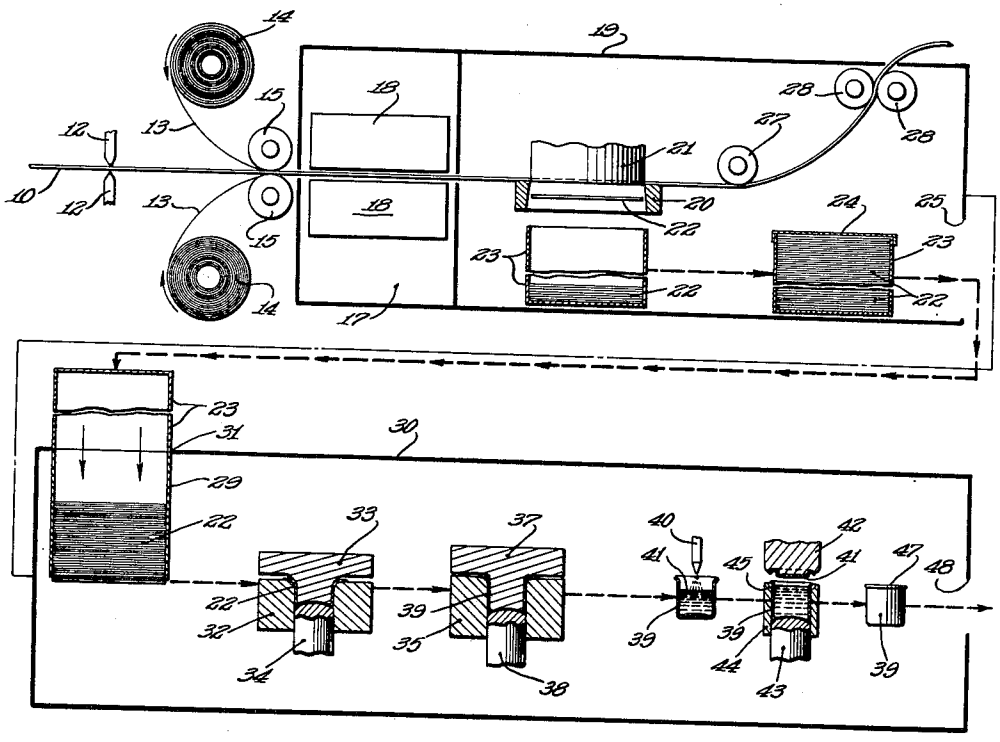
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ABSTRACT: Making and filling of beverage containers wherein a film of nylon-type plastic is bonded by heat to sheet metal, said heat serving to sterilize the coated metal, blanks are cut from the sterilized coated metal and the sterile blanks are shaped into open-top containers which are then filled, capped and hermetically sealed. The shaping, filling, capping and sealing are carried out in a common sterile working space.



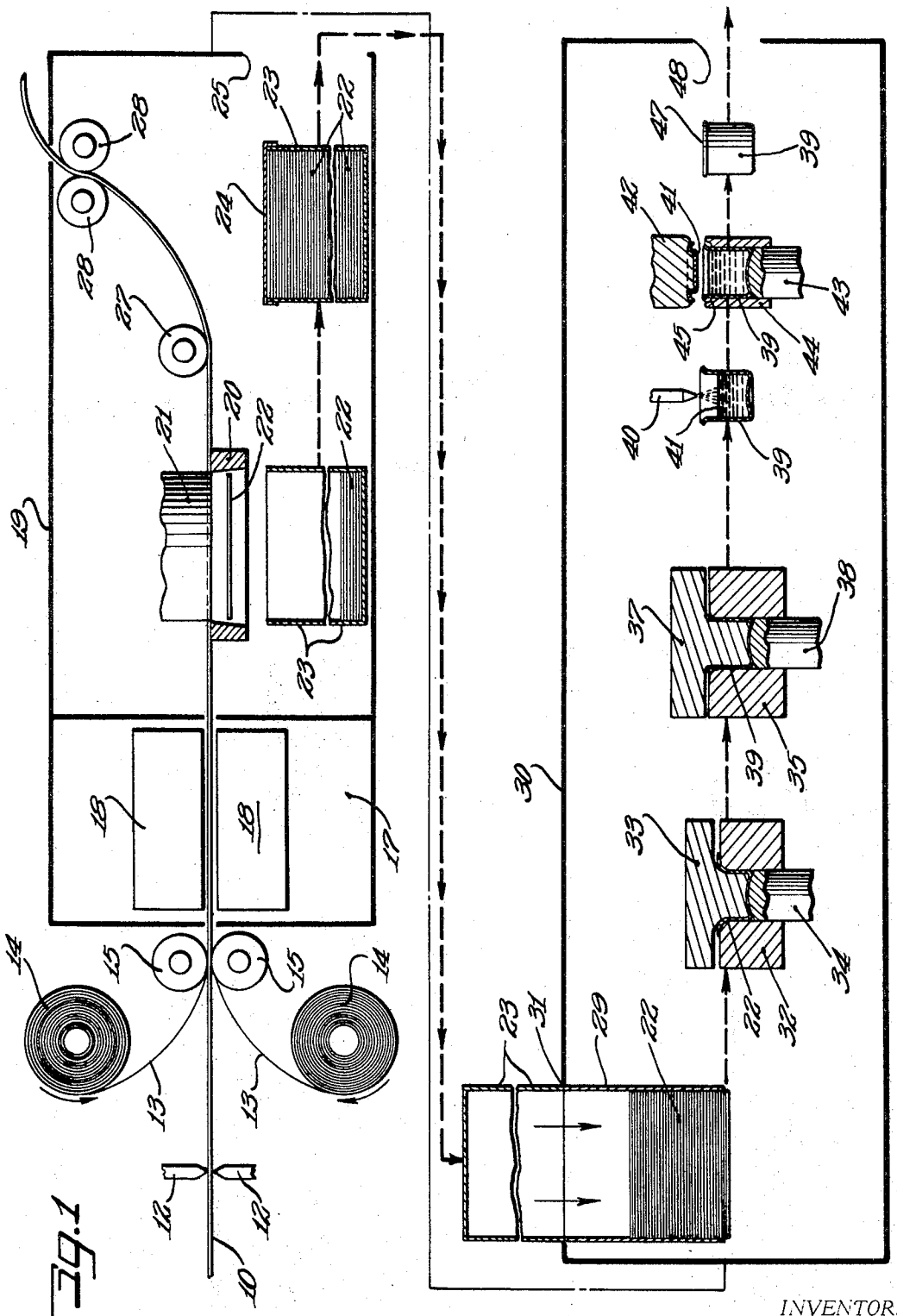


Fig. 1

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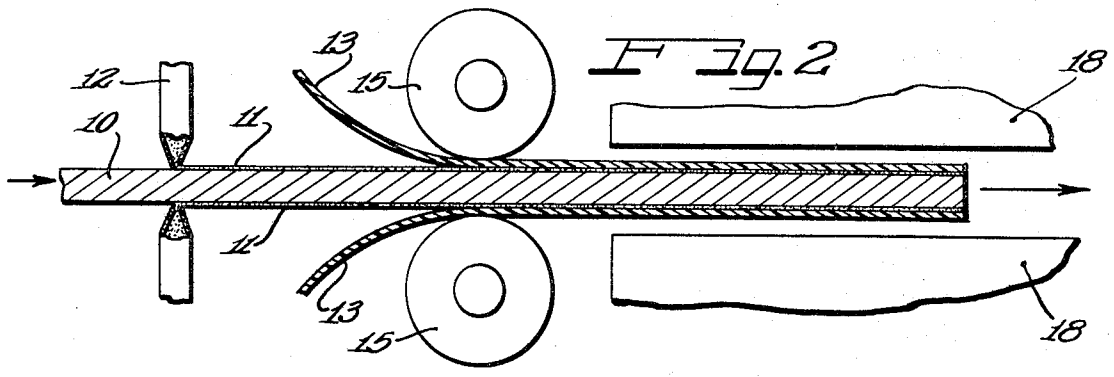


Fig. 2

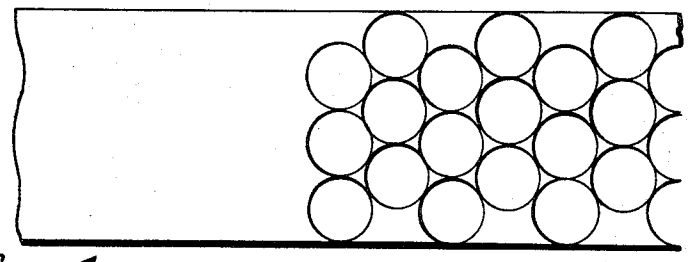


Fig. 3

Fig. 4

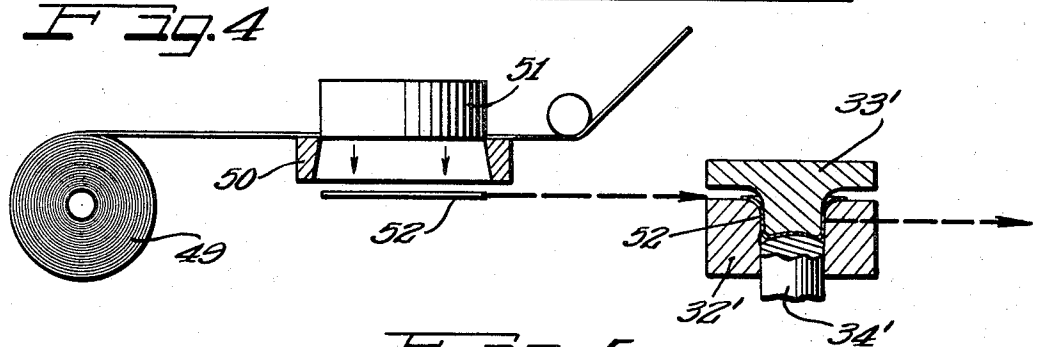
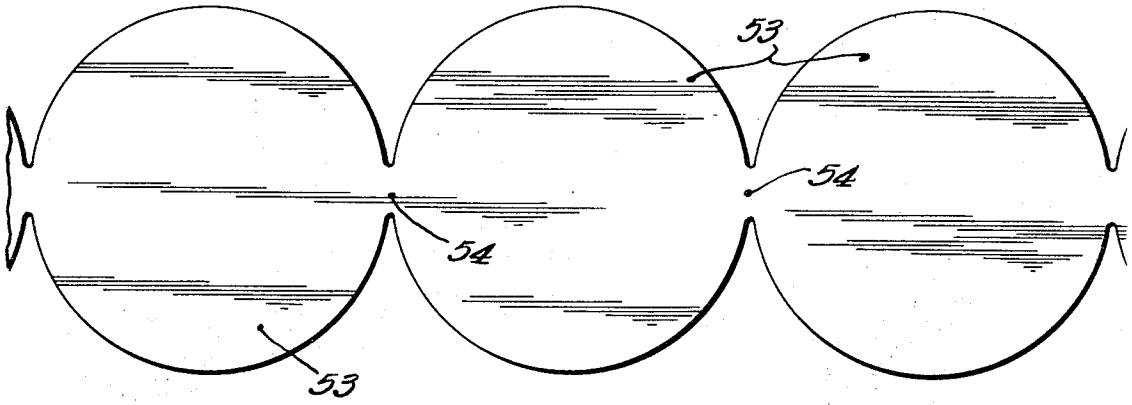


Fig. 5



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METHOD OF AND MEANS FOR MAKING AND FILLING CONTAINERS WITH BEVERAGE

This is a continuation of application Ser. No. 533,566, filed March 11, 1966, now abandoned.

This invention relates to a new method of and means for making and filling containers with beverage.

Although relatively high priced beverage, of which beer is an example, has been purveyed in throw-away containers of non-glass type, such purveying of other beverages, and more particularly carbonated soft drinks, has not heretofore been found practical due to excessive costs.

Soft drinks are sold in largest quantity in individual bottled units of about six to seven ounce volume. Container cost is therefore a vital factor in the total cost. Glass bottles are calculated at a relatively low unit cost because they are generally returned, cleaned and reused. Furthermore, the consumer public has become accustomed to paying a deposit charge for the bottles, by which expedient the consumer absorbs the relatively high bottle cost on failure to return the bottles. However, handling of empty bottles, cleaning and sterilizing the returned bottles, and the handling and storage facilities requisite for such operations imposes a substantial burden upon all those in the chain of supply, including bottlers, distributors, and vendors.

As heretofore practiced, supplying of any beverage in throw-away containers, and more particularly carbonated beverages within which a pressurized condition must be maintained, has been under the disadvantage of high container costs stemming from such factors as limitations in can-making techniques, handling and storing of supplies of empty cans, necessity for decontamination and sterilization of the cans before filling, and the like.

An important object of the present invention is to provide a new combined method of making and filling containers with beverage which will greatly reduce the container costs and render practical supplying of low cost beverages and more particularly carbonated beverages in throw-away containers.

Another object of the invention is to provide a new method of making and filling sheet metal containers with beverage.

A further object of the invention is to provide new apparatus for making and filling containers with a beverage with high efficiency and economy.

Still another object of the invention is to provide new apparatus for making containers under substantially sterile conditions and immediately filling the containers with beverage.

Yet another object of the invention is to provide a new method of and apparatus for producing coated sheet metal blanks for making and filling beverage containers.

It is also an object of the invention to provide new laminated material comprising precoated sheet metal especially suitable for beverage containers.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain preferred embodiments thereof taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic illustration in substantially flow diagram form showing a respresentative sequence of operations and apparatus used in practicing the invention;

FIG. 2 is an enlarged fragmentary, partially longitudinal sectional, schematic illustration of the metal sheet coating portion of the diagrammatic showing of FIG. 1;

FIG. 3 is a plan view of a sheet metal strip and efficient blanking pattern;

FIG. 4 is a fragmentary illustration of a modified blank stamping and shaping arrangement; and

FIG. 5 is a plan view of a strip form of the blanks adapted for another modification of the invention.

According to the present invention suitable material is shaped into a succession of substantially aseptic open-topped containers adjacent to beverage filling means. The containers are maintained in aseptic condition while transferred to the filling means where they are filled with the beverage. Immediately after filling the containers are capped and hermetically sealed. This eliminates handling of the formed containers; avoids any storage or container shipping problems; and enables the containers to be produced substantially aseptically and immediately filled while in the original aseptic condition.

Material for the containers desirably comprises sheet metal having a sterilized coating, punched into substantially aseptic blanks and formed under substantially sterilized conditions into substantially aseptic containers adapted to be filled with the beverage immediately after forming. In one desirable arrangement, as exemplified in FIGS. **1** and **2**, a sheet metal strip **10** is coated on at least the surface thereof which will provide the inside of a beverage container with a plastic material which will not only serve as an excellent barrier between the container contents and the metal, but will also serve as an efficient aid in drawing of the coated sheet metal. By preference the coating is applied to both opposite face surfaces of the sheet metal strip, and may comprise the same coating material or selectively different coating materials, as desired. The sheet metal strip **10** may be of any preferred can-making stock, such as steel or aluminum sheet of thin gauge suitable for drawing into seamless cup-shaped container form with little, if any change in gage or elongation in the drawing.

In coating either or both face surfaces of the sheet metal strip **10**, within the principles of the present invention, a heat-curable bonding agent or cement **11** is applied through suitable means in a thin, uniform layer to the respective surfaces of the strip. Respective flow type applicator nozzles **12** are disclosed for this purpose and which are coordinated in operation with the speed of travel of the metal strip thereby to apply the cement material in fluid, adhering relation uniformly to the associated surface of the strip. Other types of applicators may be employed, if desired, such as spraying means, roller applicators, or the like. Desirably the cement **11** is of a kind which is free or substantially free from solvents, such as a polymerizable plastic of which epoxy is an example. Such material is applicable to the metal sheet in suitable fluid condition and is curable by heat applied thereto. Instead of epoxy, any other protective barrier and bonding material such as the usual varnish type material suitable for use as can liner may be used.

While the cement **11** is still in a fluent or at least sufficiently tacky condition, a preformed plastic film **13** is applied respectively to either or both of the surfaces of the metal strip **10**. This film is desirably as thin as practicable such as on the order of ½ mil and possessed of toughness, substantial ductility, self-lubricating characteristics, resistance to heat at least in excess of that required for curing the cement **11**, and inertness to the constituents of the beverage to be handled in the resulting container. Nylon is such a material, is readily available and inexpensive, but any other desirable material possessing the enumerated properties and others of nylon may be utilized. Conveniently, the coating film **13** for either surface of the metal sheet is supplied from a respective roll **14** and in a web width equal to the width of the metal strip. Each of the films **13** is pressed by a pressure roller **15** toward the respective surface of the metal sheet **10** and into bonding contact with the cement layer **11**.

Although nylon is a preferred film material, for economy as well as other attributes inherent therein and some of which have been mentioned, other suitable plastic film material may be utilized as preferred. If desired, films **13** of different materials may be used on the opposite surfaces of the sheet metal strip. For example, a nylon film may be used on one surface such as the surface which will be on the inside of the container, and polyethylene film may be used on the outside surface. Instead of applying the film or films as preformed strips, the film material may be applied in an uncured state as by spraying, roller coating, or the like, and cured directly on the metal sheet. Polytetrafluorethylene is an excellent film material, but is presently relatively more expensive than nylon. The most important characteristics of the film material for beverage containers, and more particularly low cost soft drink beverage containers must be economy, drawing lubricity, duc-

tility, toughness, high resistance to splitting or detachment from the base sheet, attractive appearance, tastelessness, odorlessness, and chemical inertness in the presence of carbonated beverages. In addition, the material should be subject to desirable coloration to meet decorative preferences. Nylon is possessed of these attributes, and where the expression "having the properties of nylon" is used herein a material having those attributes in a generic sense is intended.

Where it is desired to provide color, especially on the outside surface of the container, the bonding plastic **11** may be suitably colored and the plastic film **13** colorless and translucent. Alternatively, the bonding cement plastic **11** may be colorless and the plastic film **13** of the preferred color. As a further alternative, the cement **11** and the film **13** may be colorless and translucent to permit the container surface to show through.

After leaving the pressure rollers **15**, the laminated sheet enters a curing oven **17** wherein the cement **11** is set to effect a permanent bond with the metal sheets **10** and the attached film **13**. Curing heat may be applied in any suitable manner such as by means of electronic or radiant heaters **18**. Since the film **13** has a higher curing temperature, or at least melting point, than the epoxy or vinyl cement **11**, the film is unaffected by the cement-curing heat. A beneficial effect of the cement-curing heating step resides in sterilization of the coating film, so that as the finished laminate leaves the oven **17** the sheet material is in a satisfactory aseptic condition.

Means are provided for punching the coated metal sheet immediately after it leaves the curing oven **17** and while it is still aseptic. For this purpose, means such as a cabinet **19** or other suitable enclosure provide a sterile enclosed space about the path travelled by the material from the curing means and also about punching means including a die **20** and a cooperative punch **21** operative to punch a succession of substantially aseptic container blank disks **22** from the sheet material. As formed, the blanks **22** are desirably immediately, and in their aseptic condition, packaged in suitable stack relation in a sterilized container **23**. When filled, the container is moved away from the punching die and closed as by means of a sterilized cover **24** to maintain the aseptic condition of the packaged blanks. Then the closed packages discharge from the enclosure **19** as through an exit **25**. It will be understood that any suitable or conventional conveyor means may be employed in transporting the disk package containers **23**. Beyond the punch press including the die **20** and the punch **21**, the strip of scrap from the sheet material is disposed of in any suitable manner and removed from the the enclosure **19**. Where it is not practicable to deposit the scrap directly in a bin adjacent to the punch press, the scrap strip may be conveyed from the enclosure **19** in the manner depicted, assisted by suitable rollers **27** and **28**.

From the blanking, stacking and packing apparatus, the packaged, aseptic stacks of disk blanks **22** are transported to container forming and beverage filling apparatus where the blanks are successively shaped into open topped seamless can containers and immediately filled and capped. Exemplary apparatus for this purpose is represented in the continuous flow illustration of FIG. **1** and includes a magazine **29** located within a substantially sterile working space defined within enclosure means **30**. Introduction of the aseptic blanks **22** into the enclosure **30** may be effected in any suitable manner to maintain the uncontaminated condition of the blanks, as for example by discharging the blanks from the packaging container **23** through an entrance or inlet opening **31**.

From the hopper of the supply magazine **29**, the blanks **22** are fed successively in any suitable manner, utilizing conventional equipment or as preferred, to shaping apparatus comprising blank-cupping drawing dies including a female die **32**, a cupping punch **33**, and a cooperative bottom forming and ejector die plunger **34**. While the die **32** is mounted in stationary relation, the members **33** and **34** are suitably reciprocably mounted and operated. To enable high-speed dry-shaping of the aseptic blanks **22** while maintaining the aseptic condition thereof, and to maintain the protective plastic coats of the blanks free from damage, the die components, and more particularly the forming surfaces of the die components, are desirably highly polished and hard, such as carbide steel having mirror finish forming surfaces. Dry drawing may be practiced, utilizing the lubricity of the coating on the blanks. However, if due to high speed operation a combination coolant and lubricant is desired, substantially sterile water may be employed, such water being at least as pure as the water used in the beverage to be filled into the resulting container, thereby maintaining the aseptic condition of the drawn container. Depending upon the depth of draw desired and the drawing quality of the blanks, cupping may be accomplished in a single pass through the dies. In the system depicted, however, a two-stage cupping of the blanks is indicated. Thus, in the first stage of drawing the blank **22** may be shaped to a cup depth of two-thirds to three-fourths of the ultimate depth and slightly greater diameter than the ultimate diameter.

After the first stage cupping, the partially formed container cup is ejected from the first set of dies and immediately delivered, within the sterile working space in the enclosure **30**, to a second and final set of cupping dies including a female die **35**, a cupping punch **37** and a combination bottom shaping and ejector plunger **38**. In this set of shaping and sizing dies transformation of the blank into a cup-shaped open topped seamless can container **39** is completed. It will be understood that the upper edge of the completed container shell or cup may be slightly flared and such edge suitably trimmed for uniformity, and such trimming may be accomplished in the final drawing and sizing die set by conventional trimming die means (not shown). Furthermore, in this final drawing and sizing operation, the container **39** remains in aseptic condition within the substantially sterile working space, although after it is ejected from the dies it may be further sterilized as by subjecting it to chlorine gas decontamination. Preferably, however, conditions within the enclosure **30** should be maintained acceptably sterile to avoid the need for any such decontamination.

Immediately after completion of the open topped containers **39**, and within the sterile working space in the enclosure **30**, they are moved into position in suitable filling means including a filling nozzle **40** which fills each container with a predetermined volume of beverage **41**, and more particularly a carbonated beverage. By way of example, in a popular size the containers **39** may have a contents volume of about seven ounces. For this volume, a container having a diameter of about $2\frac{5}{8}$ inches and a similar length is suitable. Such a relatively squat container is also adapted to be drawn with facility in the manner already described. Moreover, such a container is convenient to handle, store and ship.

Immediately after filling, the container **39** is capped. For this purpose, a peripherally grooved flanged cap **41** is applied by a capping and curling die plunger **42** to the open top of the container **39** supported on a thrust member **43** within a confining ring member **44** having its upper edge formed with a curling groove **45** cooperative with the capping and curling member **42**. Thereby, the filled container is capped and hermetically sealed by a bead **47** formed about its upper edge. Any other suitable sealing expedient may be used. Quick-opening means may be provided on the cap.

After the container **39** has been released from the capping and sealing apparatus, it is transported out of the enclosure **30** through a suitable exit **48**. If a separate label is to be applied, that may now be done on the side or top of the sealed container, as preferred. Conveniently, the cap **41** may be equipped in advance with identification, advertising, legal information and the like, while the side of the can may be free of labelling for economy or appearance purposes. Since the container is intended as a throw-away item, every reasonable economy is desirably exercised.

The method, material and apparatus, as described, are especially suitable for small bottling operations. Packaged, aseptic

coated blanks can be supplied to the bottler, who then converts the precoated aseptic blanks into containers and fills and caps the containers. Several bottlers can thus be supplied by a single source of the precoated blanks and the caps. Due to mass production, the blanks can be supplied at low cost. By following the described aseptic procedures for shaping and filling the containers, the need for container cleaning and sterilizing equipment is eliminated, thus affording additional substantial economies for the bottler. These economies accrue as lower cost to the consumer.

By minimizing the amount of scrap in blanking the container disks, as for example by staggered three's, as shown in FIG. 3, further economy is effected.

For large scale bottling operations, the blanking, shaping and filling operations are desirably conducted on a continuous, uninterrupted close-coupled line basis wherein all of the operations are effected in the same sterile working space. For this purpose, the material for forming the containers is supplied in precoated form in an aseptic roll **49** and produced according to the method described in connection with FIG. 2, but rerolled after laminating and curing. In the substantially sterile environment of the working space, the material from the roll **49** is fed to a blanking die assembly including a female or cutting die **50** and a punch **51**, representative of a single punch or multiple punches where, for example, multiple line operation is practiced such as may utilize blanks produced from the staggered three punching arrangement depicted in FIG. 3. Immediately as punched and discharged from the blanking dies, the successive blanks **52** are transported to the shaping dies in accordance with the practice described in respect to FIG. 1. Thus the blanks **52** may first be partially drawn into cup shape in a die set **32'**, **33'**, **34'**, then immediately transferred to a second drawing and sizing die set, then filled, and immediately capped and sealed.

As another alternative, precoated and sterilized sheet metal may be punched to provide a continuous strip of circular container disk blanks **53** connected together at contiguous points on their peripheries along a longitudinal axis by integral narrow connecting necks **54**. These connected blanks are supplied in any desirable multiple length, and may be rolled to provide a large number of blanks in a compact package easily handled while maintaining the blanks in aseptic condition and supplied similarly as the roll **49** of FIG. 4 to the bottling plant. There, without any need for a blanking die, the strip of connected blanks is fed directly to the first cupping die set, equipped with suitable shearing means for severing each successive one of the blanks **53** from the strip as the container shaping progresses.

Where for any reason it is necessary to cleanse the containers before filling, such as to meet ordinance requirements, impracticability of maintaining aseptic conditions in the container material or blanks or in the shaping dies, that may easily be done. For this purpose, any desirable means for washing, cleaning, or substantially sterilizing the container may be located between the container shaping means and the filling means.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim:

1. A method of making and filling containers with product requiring an aseptic condition in the containers, comprising:
- protectively coating sheet metal under heat-curing conditions sufficient to heat-sterilize the coated sheet metal;
- maintaining the aseptic condition of the coated sheet metal and shaping it into open topped containers;
- after the shaping maintaining the containers aseptic;
- filling the aseptic containers; and
- closing the open tops of the filled containers.

2. A method according to claim **1**, said coating comprising bonding a film of plastic having the properties of nylon to the sheet metal, simultaneously curing the film by applying curing and sterilizing heat thereto, punching the cured and sterilized laminate thus provided into aseptic container blanks, and supplying the aseptic blanks to aseptic forming apparatus to effect said shaping.

3. A method according to claim **2**, comprising supplying said film of plastic as a separate film, applying a heat curable cementing material to the surface of the sheet metal, applying the film as a lamina to the cementing material, and heat curing the cementing material and thereby effecting the sterilization of the laminate.

4. A method according to claim **1**, comprising shaping the sterilized coated sheet metal in sterile forming apparatus comprising highly polished hard dies and thereby drawing the sterilized coated sheet metal into seamless cans to provide said containers.

5. A method according to claim **1**, comprising punching the sterilized coated sheet metal into blanks adjacent to aseptic shaping apparatus in an aseptic environment, and in such environment directly transferring the resulting aseptic blanks to the shaping apparatus in which the blanks are shaped into said containers.

6. A combined method of making and filling containers with beverage, comprising:
- bonding a film of plastic having the properties of nylon to sheet metal;
- sterilizing the thus coated sheet metal;
- punching substantially aseptic container blanks from the coated sterilized sheet metal;
- packaging a stack of the blanks in a sterile container;
- transferring the stack of blanks in the sterile container to a position adjacent to forming apparatus and discharging the stack of blanks from the container;
- while maintaining the blanks in aseptic condition feeding them to the forming apparatus;
- shaping the blanks into a succession of substantially aseptic open-top containers adjacent to filling means;
- maintaining the aseptic condition of said containers while successively transferring them to the filling means and there filling them with beverage; and
- immediately capping and hermetically sealing the filled containers.

7. A combined method of making and filling containers with a beverage, comprising:
- stamping precoated and sterilized sheet metal to provide a continuous strip of circular container disk blanks connected together at contiguous points on their peripheries;
- feeding the strip in sterilized condition to aseptic container-shaping means and separating the individual blanks from the strip concurrently with shaping of the blanks into a succession of substantially aseptic open-topped containers adjacent to filling means;
- maintaining the aseptic condition of said containers while successively transferring them to the filling means and there filling them with beverage; and
- immediately capping and hermetically sealing the filled containers.

8. Apparatus for making and filling containers with product requiring an aseptic condition in the containers, comprising:
- means defining a substantially sterile working space into which is adapted to be received heat-sterilized protectively coated sheet metal;
- aseptic shaping means operative in said working space to shape said sterilized coated sheet metal into aseptic open-topped containers while maintaining the aseptic condition of said coated sheet metal;
- means in said space receptive of the aseptic containers and operative to fill them with said product; and
- means in said space for closing the open tops of the filled containers.

9. Apparatus according to claim **8**, said shaping means comprising polished carbide drawing dies adapted to shape the sterilized sheet metal where the coating is a self-lubricating tough and inert heat-resistant plastic possessed of the properties of nylon and including substantial ductility, said dies being

operative to draw said coated sheet metal without scratching or breaking the coat on the sheet metal.

10. Apparatus according to claim **8**, comprising:

means located in said working space for receiving the sterilized coated sheet metal and blanking the same into aseptic disks; and

said shaping means comprising cupping dies to draw the coated sheet metal disks into aseptic seamless cans providing said containers.

11. Apparatus according to claim **8**, including means for receiving in said sterile working space for supplying to said shaping means a stack of pre-punched aseptic blanks of said sterilized sheet metal from a sterile container in which the blanks have been transported to said space.

12. Apparatus of the character described, comprising:

means for bonding a film of plastic having the properties of nylon to sheet metal;

means for sterilizing the thus coated sheet metal;

means for punching substantially aseptic container blanks from the coated sterilized sheet metal; and

means for packaging a stack of the blanks in a sterile container to enable transferring the stack of blanks in the sterile container to a position adjacent to shaping apparatus in which the blanks are to be shaped into sterile containers for filling with a product.