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⑤④ **Coated metal container and a method of forming such a container.**

⑤⑦ A metal container formed by the draw-redraw process or the drawing and ironing process has a seamless body and an integral end wall and has, on at least its interior surfaces, a protective coating which consists of a modified butyl stearate which is utilized as a lubricant in forming the container, and an after-applied synthetic resin. The lubricant is applied as a mixture of butyl stearate, lanolin and silicone resin and is hardened before conversion of the metal into the container. The said mixture can be applied over a previously-applied base coating.

EP 0 135 986 A1

"COATED METAL CONTAINER AND A METHOD OF FORMING
SUCH A CONTAINER"

The present invention relates to a coated metal container and a method of forming such a
5 container.

The well known three-piece sheet metal food or beverage container is fast being supplemented or supplanted by a two-piece container having a seamless body with one end wall integral with
10 the body. A second end wall is secured to the body by means of a double seam after filling the container. Such containers for beer and soft drinks are made by the drawing and ironing process. Similar containers for fruits and vegetables
15 require heavier and sturdier side walls and are beginning to be made by a newer process known as draw/redraw.

Although the production of sheet metal containers by means of multiple draws is not new,
20 the draw/redraw process is an improvement over the older drawing process in that it is done at higher speeds with greater draw ratios in each drawing step. Achieving this higher productivity rate requires special machines and, inter alia,
25 special lubricants for the metal working operation.

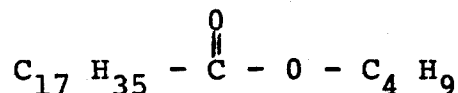
To maintain this higher productivity rate, subsequent processing steps applied to the formed container must also be performed at high speed or eliminated where possible.

5 Butyl stearates have been used as rolling lubricants in steel mills and as lubricants for aiding in the mobility of synthetic fiber manufacture. Butyl stearate has been used for intricate metal forming operations such as bending
10 tabs and necking and flanging can body ends, but has not been used for deep drawing. The need for butyl stearates in connection with particular precoating materials for can manufacture has not been appreciated.

15 The present invention involves the discovery that the butyl stearates not only act as effective lubricants in the drawing and redrawing of ferrous metal stock to form a container but that these lubricants when modified, unlike metal-working
20 lubricants used heretofore, need not be removed from the surface of the formed container and may be used with vinyl based coatings without concern for the deterioration of same. Other lubricants useful as compatible postcoatable draw/redraw
25 lubricants have a plasticizing effect on the vinyl

based coatings causing softening. In particular,
an ATBC being a citric acid ester will soften
a polyester or vinyl base coating when used
therewith. The softened coating will scuff
5 during the draw/redraw forming process. Coating
damage is unacceptable since the coating must
provide a complete barrier between the commestible
and the metal container body.

One type of butyl stearate which works well
10 is manufactured by C.P. Hall under their designation
UNIFLEX BYS - Code C and has the following
structural formula:



15 The method of the present invention has
been found equally applicable for tinplated ferrous
metal and for tin-free, low carbon sheet steel.
The tinplate referred to in column 2, lines 50-56
of U.S.-A 4,287,741 is usable in the present
20 invention, non-reflowed as well as matte finish
tinplate described in U.S.-A 3,360,157. The tin
weight on the steel basis metal may vary from
0.05 lbs to 1.00 lbs. per base box (1.12 to
22.4 g.m⁻²). A base box comprises 31,360 sq. in.
25 of metal plate (the area being the area measured

on one side).

According to the present invention there is provided a coated metal container comprising a side wall and a bottom wall integral therewith, the side wall being of substantially the same thickness as the bottom wall or thinner and the metal of the said walls being electrolytic tinplate for example non-reflowed, matte finish tinplate or tinless, low-carbon steel, the container walls being covered, on at least the interior of the container, by a coating comprising a hardened top coat which consists essentially of a mixture of a butyl stearate, liquid lanolin and a silicone resin which is compatible with a synthetic resin selected from a polyester resin, an acrylic resin and a vinyl resin.

The invention also provides a method of forming a coated metal container comprising the steps of applying a modified butyl stearate, liquid lanolin lubricant and a silicone resin mixture to electrolytic tin plate or tinless, low carbon steel, providing a circular flat blank from said metal, drawing said blank into a shallow cup, subjecting said cup to multiple draws in rapid sequence to form said container, applying a vinyl

resin coating over the interior of said container and over said lubricant on said container interior and heating said coated container to harden said coating and adhere it to said container interior

5 The preferred tin-free steel has a chromium surface treatment. While it is still in flat sheet form prior to its formation into a container, a synthetic resin base coat is applied and adhered to this treated surface. The most usual compositions
10 for application as a base coat are those containing an epoxy resin, or vinyl resin, or polyester resin.

The invention will now be explained in more detail by way of example in the following non-limitative description.

15 The tin-free steel preferred for use in the present invention is aluminum killed, continuous cast steel with a chromium/chromium oxide surface treatment. The chromium in the oxide is present at about 0.5 to 2.0 mg per square foot (5.4 to 21.5
20 mg/m) and the chromium metal at about 3 to 13 mg per square foot (32.3 to 140 mg./m). The material described is known in the art as TFS-CT for tin-free steel, chromium type. The treatment is described in a paper published in the Journal of the Electrochemical Society,
25 Vol, 116, No. 9, pp 1299-1305.

The preferred tinplate has the same composition

of steel as set forth above and at the steel mill in a well known manner, has tin applied to its surface electrolytically in various amounts, for example 0.25 lb per base box (5.6 g.m^{-2}). As
5 mentioned, this tinplate may be left in a matte condition, i.e, is not flow brightened. The tinplate is oiled for rust inhibition and coiled for shipment to a container-making installation.

Thereafter, the tin-free steel when received
10 in the can making plant has a base coating applied to its surfaces. The preferred coating contains a vinyl resin which is e.g. a vinyl organosol including low molecular weight vinyl copolymers, high molecular weight vinyl homopolymer dispersion resins and
15 heat reactive cross linking resins to include phenolics, epoxies and aminoplasts. The preferred coating is manufactured by Midland Dexter of Waukegan, Illinois and is identified and sold as MM 519. This coating is known to contain as a primary resin a
20 high molecular weight vinyl dispersion resin and lesser amounts of solution vinyl, polyester, epoxy and melamine resins as modifiers. While MM 519 performs well in the practice of this invention there are situations when other coatings may be
25 preferred. By way of example, another preferred

coating is known to be MC 9788-101 sold by Mobil Chemicals. Unlike the MM 519, MC 9788-101 is not a vinyl organosol, and instead is composed of an isophtholic acid based polyester resin that
5 is cured or cross-linked through the action of heat-reactive epoxy and melamine resins.

Those base coatings may be applied to both sides of the steel while the steel is still in coil form or the steel may be cut into scrolled sheets
10 and the coating applied to individual sheets, which coating is subsequently baked to form a tough, adherent base coat on the tin-free steel.

The butyl stearate lubricant mixture of the present invention is either electrostatically
15 coated, dip coated or spray coated onto both surfaces of individual sheets of the base coated tin-free steel. The sheets are then fed into a blanking and cupping press which cuts from the sheet one or more circular discs of 7.947 in.
20 (20.18 cm) in diameter, and draws the disc into a cup of 5.007 in. (12.72 cm) in diameter and 1.850 inches (4.69 cm) in side wall height. In two subsequent operations, the cup is successively reduced in diameter with concurrent lengthening
25 of its side wall, i.e., drawn; and simultaneously

the side wall is slightly thinned, i.e. to about 10% less than the starting gauge, and further elongated, i.e., ironed, in the manner similar to that described in U.S.-A 3,360,157. The final diameter and side wall height accomplished in the drawing plus ironing are 3.060 in and 4.450 in (7.77 and 11.30 cm) respectively and are accomplished in a few seconds. The diameter of the starting blank, the height-to-diameter ratios, and the draw ratios, in the ensuing metal working process may be varied depending upon the desired size of the finished can. Also, as between different draw/redraw systems, the amount of draw in each step may be varied providing the cumulative effect of the plural draws and with ironing produces the can of desired height and diameter.

The severity of the concurrent diameter reduction and side wall thinning (ironing) requires an excellent lubricant which will not attack the coating. It is readily apparent that a draw/redraw system with ironing is a more severe metal working process than a draw/redraw system without ironing. The butyl stearate lubricant of the present invention performs equally well in both systems.

- 9 -

The amount of lubricant applied over the base coat can vary from 10 to 40 mg/sq ft. (108 to 431 mg.m⁻²) and preferably 10 to 20 mg/sq. ft. (108 to 215 mg.m⁻²) of total surface, i.e., both sides, of the sheet being fed into the draw/redraw apparatus. It has been found that the lubricating effect falls off appreciably below 10 mgs/ft² (108 mg.m⁻²) and for most operations 20 mgs/ft² (215 mg.m⁻²) is sufficient to achieve the high speed, trouble free, multiple draws from flat blank to formed container. Substantial heat is generated on the surfaces being worked due to the severity of the metal-working operation, i.e., the appreciable draw ratios and draw speed plus ironing.

No particular theory is known as to why the butyl stearate lubricant is compatible for post-coating without need for removal of same. Other lubricating materials (under identical conditions) have been known to attack the base coating as already described. Moreover, the severe metal forming operations of precoated sheet at high speed and pressure could drive the lubricant into the coating and so a lubricant which is compatible with the coating even under such conditions is needed.

Certain silicone resins such as General Electric's SR 82 are known for their ability to modify coatings and thereby enhance their bond with a metal substrate to which they are applied.

5 However, the addition of silicone resin such as General Electric's SR 82 to butyl stearate to permit subsequently applied coatings (after forming) to cover the surface of the metal substrate completely was not appreciated. That is to say, the addition of
10 silicone resin to the butyl stearate allows complete coverage of all portions of metal substrates by coatings applied after forming without leaving eye holes or discontinuities in the coverage and without any tendencies for the postcoating to bead up. The
15 effect without silicone resin is much like water on freshly waxed surfaces. The addition of silicone resin permits a wetting action and alters the surface tension of the butyl stearate sufficiently to allow the coatings as applied to spread evenly and
20 completely over the lubricated metal substrate and to form a good bond over the entire surface. The proposed combination of silicone resin and butyl stearate when preapplied to coils or panels of tin free steel plate, electrolytic tinplate or
25 other materials for deep drawing containers or

- 11 -

cup-like objects which are intended to be post sprayed or post decorated performs successfully because of the bonding and good adherence of the wettable combination to the lubricated metal surface.

Compatibility Lube - Wettability Test

Ingredients which have good lubricating properties were tested for compatibility with the postsprayed top coat.

10 The test procedure consisted of wiping a thin film of the lubricant on a piece of base coated plate (the lubricant was applied at a weight of about 50 to 75 mgs sq. ft. - 538 to 807 mg.m^{-2}). A water base top coating was then sprayed over the
15 lubricant bearing plate. These panels were allowed to stay at room temperature for at least 15 minutes to see if the coating would de-wet from the lubricant treated area.

20 The results with the various lubricants tried were as follows:

1. Butyl stearate - no de-wetting.
2. Liquid lanolin - very slight de-wetting.
3. SR-882 silicone - no de-wetting.
- 25 4. Petrolatum - severe de-wetting.

Using this test procedure combinations of the lubricants listed were tried and when these ingredients are blended at the proper ratios (not petrolatum) no de-wetting of the spray top coat occurred.

- 5 For sheet feeding, the lubricant mixture must have less than 50% liquid lanolin. Adjacent sheets stick together when the lanolin is applied at heavier rates. For coil stock or prelube spot coating the liquid lanolin level may be increased
10 beyond the 50%.

DISCUSSION OF THE VARIOUS LUBRICANTS

- While butyl stearate is a lubricant it is really inadequate for the heavy loads in draw and redraw forming operations. Enhanced lubricity can
15 be had by the addition of liquid lanolin but use of lanolin, without reduction of its viscosity, with butyl stearate makes difficult application at the mentioned rates. The use of butyl stearate only will not be adequate to lubricate the material as
20 the latter is drawn and redrawn. Conversely, the use of liquid lanolin only would be a problem because of its viscosity. Therefore, the combination of butyl stearate and liquid lanolin are important.
- There may also be a need for something which will
25 allow the combination to be postcoated. If lubrication

- 13 -

were the only requirement and a complete coverage of the metal surface were not necessary, the drawing tools might tend to spread whatever lubricant is available. The postcoating of lubricant could
5 be effected by the build-up of the lube on the tools. That is, the lube would be sufficient to lubricate for the forming process but the material might be slightly over lubricated in certain areas. The additional wetting provided by General Electric's
10 SR 82 silicone resin is necessary to provide sufficient wettability to the metallic substrate for the postcoating.

Drawing and redrawing are not the only forming operations the lubricated container must endure.
15 At the completion of the draw/redraw operation, the container is beaded to impart strength to the side and bottom walls before being fed into a device for applying a top coat to the container's inside surface. Most usually, this device involves a turret which
20 revolves the container past a reciprocating spray gun which enters the interior of the container as same is spun about its longitudinal axis. The spray gun is retracted from the container body and emits a 360° spray of a synthetic resin solution to coat
25 the entire interior surface of the container.

After completion of the top coating operation, the container is then subjected to a temperature of 400° F (204°C) for 2 to 4 minutes to harden and cure the top coat. Unlike prior procedures of metal forming which required the formed metal container to be washed to remove lubricant and then dried before application of the top coat, thereby to avoid contamination and improper curing of the top coat, the procedure of the present invention not only eliminates the expense and time-consuming step of removing the lubricant but also permits the application of the top coat directly to a still lubricated surface (the inside of the container). In addition, the wetted lubricant remaining after forming assists in firmly adhering the top coat to the base coat.

The butyl stearate and what remains thereof after the draw/redraw operation are soluble in organic solvents such as butanol, butyl Cellosolve, diisobutyl ketone, Cellosolve acetate and Solvesso 150. Therefore, resins for top coats which are also soluble in these same solvents and provide inert, continuous, resin films upon thermal curing are preferred. More particularly, resins such as epoxy resins, acrylic resins and vinyl resins are useful and particularly usable if they are applied

over a vinyl base coat and a lubricant which does not attack the vinyl or cause softening.

Evaluation of top coats applied over a butyl stearate lubricated vinyl base coat is done by testing process resistance as well as examination of intercoat adhesion between the base coat and the top coat. Intercoat adhesion is tested with a pressure sensitive adhesive tape. More particularly, a one inch strip (2.54 cm wide) of "3M" tape #610 is applied to the surface of the top coated sample. The tape is pressed to the surface with sufficient pressure to make complete contact (removing the air bubbles therebetween). The tape test requires that the tape be quickly pulled from the sample in an effort to peel with it any poorly adhering coating. In order to further test peeling, X's are scribed on the surface across which the tape is to be applied. These X's present freshly made scored edges which would help to initiate any peeling that might occur. Examples 1 to 5 which follow herein were tested for intercoat adhesion by this method and all passed. No separation of the top coat from the compatibly lubricated base coat occurred.

Similarly, the continuity of the top coat can be tested by the quick test method. In order to

perform a quick test a specific piece of equipment is required. More particularly, a Model 1071 WACO Enamel Rater with a 0 to 1 milliamp attachment is used. The apparatus has an electrode which is adapted to move vertically in and out along the axis of a can positioned beneath it. The electrode is positioned about 1" (2.5 cm) from the bottom of the can. The can is held in position by a vise-like device which clamps it about the bottom holding it so that the open end of the can faces up toward the electrode. The can is filled with 2% solution of sodium sulfate and allowed to soak for at least 30 seconds before the electrode is dropped into the can. The solution temperature should be maintained between 72 to 78°F (22 to 25.5°C), and the can should be filled so that when the electrode is lowered into the test position the solution will reach approximately 1/8" (3 mm) below the top flange radius of the can. Care should be taken to avoid wetting the flange since that will result in a false high reading. The milliamp meter of the tester is connected to the vise-like device which holds the bottom of the can. The electrode is connected to another lead of the milliamp meter. A zeroing of the instrument is required and the operator adjusts

- 17 -

the milliamp to read "T" on the scale. Shortly after zeroing the meter a warning light comes on and the reading should be taken immediately. When this procedure is applied to properly coated cans

5 readings in the range of 0 to 5 milliamps should be obtained and such data is indicative of an acceptable container.

Consequently, a coating system for a metal substrate which will withstand the severity of

10 multiple forming operations without destruction has been sought. A coating system which functions to protect the metal substrate and prevent corrosion and off flavor is the thrust of this invention.

Example 1

15

A composition called Formula 29-1 including 40% liquid lanolin made by Kraft and designated Ritalan was mixed with 50% n-butyl stearate made by C.P. Hall and 10% silicone resin with an abundance

20 of hydroxyls made by General Electric and called SR-82 were mixed together and applied to tin free steel designated TFS-CT which was base coated with 33 mg per 4 square inches (1.28 mg.cm^{-2}) of a vinyl coating made by Midland-Dexter and designated

25 MM-519. The base coating was cured at 400°F (204°C)

for 8 minutes. The composition of Formula 29-1 was applied at a rate of 25 mg per square foot (269 mg.m^{-2}) by means of spray.

These samples were tested as follows.

5 The scroll strips did not stick to one another with this formula. Thus, there was adequate viscosity reduction of the lanolin. They feed well and make excellent cans when drawn and redrawn and can be postsprayed
10 over directly without first washing and drying.

Example 2

A composition called Formula 28-1 including
15 55.55% liquid lanolin made by Kraft and designated Ritalan was mixed with 26.67% n-butyl stearate made by C.P. Hall and 17.78% silicone resin with an abundance of hydroxyls made by General Electric and called SR-82 were mixed together and applied to
20 tin free steel designated TFS-CT which was base coated with 33 mg per 4 square inches (1.28 mg.cm^{-2}) of a vinyl coating made by Midland Dexter and designated MM-519. The base coating was cured at 400°F (204°C) for 8 minutes. The composition
25 of Formula 28-1 was applied at a rate of 25 mg per

- 19 -

square foot (269 mg.m^{-2}) by means of spray.

These samples were tested and this formula caused the scroll strips to stick slightly, hampering feeding, because the lanolin was still too viscous. Good cans were made.

Example 3

A composition called Formula 26-4 including 66% liquid lanolin made by Kraft and designated Ritalan was mixed with 27% n-butyl stearate made by C.P. Hall and 17% silicone resin with an abundance of hydroxyls made by General Electric and called SR-82 were mixed together and applied to tin free steel designated TFS-CT which was base coated with 33 mg per 4 square inches (1.28 mg.cm^{-2}) of a vinyl coating made by Midland Dexter and designated MM-519. The base coating was cured at 400°F (204°C) for 8 minutes. The composition of Formula 26-4 was applied at a rate of 25 mg per square foot (269 mg.m^{-2}) by means of spray.

These samples were tested and this formula did not allow the scroll strips to feed into the press. The high lanolin content made the composition viscous causing the

strips to stick together. The lube allowed the cans to form very well.

Example 4

5 A composition called Formula 29-1 including
40% liquid lanolin made by Kraft and designated
Ritalan was mixed with 50% n-butyl stearate made by C.P.
Hall and 10% silicone resin with an abundance of
hydroxyls made by General Electric and called
10 SR-82 were mixed together and applied to tin free
steel designated TFS-CT which was base coated with
33 mg per 4 square inches (1.28 mg.cm^{-2}) of a
polyester coating made by Mobil and designated MC -
9788-101. The base coating was cured at 400°F (204°C)
15 for 8 minutes. The composition of Formula 29-1 was
applied at a rate of 25 mg per square foot (269 mg.m^{-2})
by means of spray.

The samples were tested and excellent cans
were made, with no problems of scroll strips
20 sticking together and with good postspray
coverage.

Example 5

A composition called Formula 24-10 including
25 17.17% liquid lanolin made by Kraft and designated

Ritalan, 66.99% n-butyl stearate made by C.P. Hall, and 15.84% silicone resin with an abundance of hydroxyls made by General Electric and called SR-82 were mixed together and applied to tinplated steel designated

5 ~~#~~25 ETP, which was electrolytically coated steel having 0.25 pounds of tin coating per base box (5.6 g.m^{-2}). Sample containers were then made from this plate using three draw/redraw steps. The completed cans were then inside post sprayed

10 without removing the residual lubricant after the drawing operations. The spray coating used was an aliphatic hydrocarbon, solvent-based aluminium pigmented modified epoxy phenolic resin. The post coating was cured at 400°F (204°C) for 5 1/2 minutes.

15 The composition of Formula 24-10 was applied at a rate of 20 mg per square foot (215 mg.m^{-2}) by means of a dip tank and squeegee metering. There were no fabrication failures during a 2000 can run using plate lubricated with this formula.

20 The sample containers of Examples 1, 4 and 5 were evaluated by means of a quick test procedure commonly used by can makers to determine the degree of coverage of inside sprayed containers. Quick test readings of zero are desirable, but values

25 up to 5 milliamperes of current flow during the

testing procedure are usually considered good. The sample containers tested had a quick test range of 0 to 5, with the average being about 1.5 milliamperes.

A typical container as formed by the draw/
5 redraw process using the lubricant combination of this invention results in a 303 X 406 two-piece tin plated steel can. A 303 X 406 can is one having a diameter of $3 \frac{3}{16}$ in. and a height of $4 \frac{3}{8}$ in. (81 x 111 mm approximately). The inside diameter of
10 the triple drawn finished container of examples is 3.060" (77.7 mm), the height is 4.375" (111.1 mm), and the bottom and sidewall thickness are approximately .0083" (0.21 mm), when the feed stock was 75 #T-4 plate. Tin plate, either TFS-CT
15 tin free steel or electrolytic tinplate having various tin weights deposited on both sides of the plate will perform acceptably.

While the preceding description has dealt with various examples and various materials, the
20 invention in its broadest aspect is considered to include any type of silicone resin with liquid lanolin (the viscosity of which is reduced by the butyl stearate) to permit a subsequently applied organic coating to spread evenly over the remaining
25 combination after a deep drawing operation resulting

- in a good bond to the metal substrate after curing of the coating. For specific applications which require more severe draws and/or thinner post coatings, the amounts of the various constituents in
- 5 the combination can be varied in order to maintain low costs with a lubricant which will perform successfully. In addition, post coating of all ranges of tin coverage on steel will work successfully with this type of lubricant combination.
- 10 Lightly precoated tin free steels (TFS-CT) will also succeed in processing into post coatable containers using this combination.

Claims:

1. A coated metal container comprising a side wall and a bottom wall integral therewith, the side wall being of substantially the same thickness
5 as the bottom wall or thinner and the metal of the said walls being electrolytic tinplate for example non-reflowed, matte finish tinplate or tinless, low-carbon steel, the container walls being covered, on at least the interior of the container, by a
10 coating comprising a hardened top coat which consists essentially of a mixture of a butyl stearate, liquid lanolin and a silicone resin which is compatible with a synthetic resin selected from a polyester resin, an acrylic resin and a vinyl resin.
- 15 2. The metal container according to claim 1, wherein the top coat is overcoated by a polyester resin, an acrylic resin or a vinyl resin.
3. The metal container according to claim 1 or claim 2, wherein a hardened synthetic resin
20 base coat is interposed between the walls and said hardened top coat, the base coat covering and adhering to said walls, and the base coat being a resin selected from a polyester resin, a vinyl resin an epoxy resin, and an acrylic resin.
- 25 4. The metal container according to claim 3,

wherein the base coat is a vinyl resin and the resin of the top coat is selected from a vinyl resin, an acrylic resin and a polyester resin.

5 5. The metal container according to any of claims 1 to 4, wherein the hardened top coat is produced from a liquid coating formulation containing not less than 50% by weight of lanolin.

10 6. A method of forming a coated metal container comprising the steps of applying a modified butyl stearate, liquid lanolin lubricant and a silicone resin mixture to electrolytic tin plate or tinless, low carbon steel, providing a circular flat blank from said metal, drawing said blank into a shallow cup, subjecting said cup to multiple draws
15 in rapid sequence to form said container, applying a vinyl resin coating over the interior of said container and over said lubricant on said container interior and heating said coated container to harden said coating and adhere it to said container interior.

20 7. The method according to claim 6, wherein the side wall of said cup is subjected to ironing during the multiple draws whereby the side wall of said container is made thinner than the bottom wall.

 8. The method according to claim 6 or
25 claim 7, wherein a vinyl resin coating is applied

to and adhered to said metal prior to the application of said butyl stearate/lanolin/silicone resin mixture.



European Patent
Office

EUROPEAN SEARCH REPORT

0135986

Application number

EP 84 30 4384

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 450 276 (AMERICAN CAN) * Page 6, lines 9-13; page 13, lines 1-24 *	1,6	B 65 D 1/26 B 05 D 7/14 B 21 D 22/20 C 10 M 111/04
A	* Page 4, lines 22-25 *	2	
A	--- US-A-4 032 678 (G.A. PERFETTI et al.) * Column 2, lines 45-68; column 3, lines 1-25; column 7, lines 12-25 * -----	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 05 D B 21 D C 10 M
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20-11-1984	Examiner VAN THIELEN J.B.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			