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SRI LANKA STANDARD 222 : 1973

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SPECIFICATION FOR GLASS BOTTLES FOR PASTEURISED MILK AND STERILISED MILK

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BUREAU OF CEYLON STANDARDS

SPECIFICATION FOR GLASS BOTTLES FOR PASTEURISED MILK AND STERILISED MILK

S.L.S. 222 : 1973

Gr. 6

BUREAU OF CEYLON STANDARDS
53, DHARMAPALA MAWATHA,
COLOMBO 3.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This Standard does not purport to include all the necessary provisions of a contract.

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SRI LANKA STANDARD SPECIFICATION FOR GLASS BOTTLES FOR PASTEURIZED MILK AND STERILISED MILK—METRIC UNITS

This Sri Lanka Standard was prepared by the Drafting Committee for Glass Milk Bottles. It was approved by the Metric Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 12th November, 1973.

This standard is prepared with a view to help the bottle manufacturers and the dairy industry change over to the metric system. The presently used 1 pint (568 ml), $\frac{1}{2}$ pint (284 ml) and $\frac{1}{3}$ pint (189 ml) bottles are being replaced by 500 ml, 250 ml and 200 ml bottles.

In the absence of an international standard, suitable metric dimensions of milk bottles have been chosen from those widely used in the continent. However, in view of the fact that automatic filling machines are widely used for packing milk, neck finish dimensions of bottles presently used have been retained. Hence both the 38 mm and 44 mm finishes are specified for the bottles to be used to pack pasteurised milk.

All standard values given in this specification are in SI (metric) units.

For size grading C.S. Sieves conforming to C.S. 124: 1971—Test Sieves are specified. Where these sieves are not available other equivalent standard sieves as judged by the aperture may be used.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final values, observed or calculated expressing the result of a test or observation shall be rounded off in accordance with CS. 102: 1971—Presentation of Numerical Values. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

1. SCOPE

This Sri Lanka Standard specifies the requirements and methods of test of cylindrical glass bottles used for packing pasteurized milk and sterilized milk.

2. TERMINOLOGY

For the purpose of this standard the following definitions shall apply:—

2.1 Cords—Glassy inclusions of different composition particularly in the form of drawn out lines and possessing optical and other properties differing from those of the surrounding glass.

2.2 Bubble—A cavity within glass.

2.3 Blisters—Bubbles of more than 2.0 mm in diameter. It shall be measured by the average of the maximum and minimum dimensions.

2.4 Stones—Imperfections in glass resulting from inclusions from such sources as batch materials, refractories and blow pipes or resulting from devitrification of glass.

2.5 Nominal Capacity—The volume of fluid normally expected to be filled in the bottle at $27 \pm 2°C$.

2.6 The terms Sealing surface, Finish, Bead, Neck, Body, Insweep, Bottom, Base and Push-up shall be as defined in Fig. 5.

3. TYPES AND NOMINAL CAPACITIES

The bottles shall be of the following types and nominal capacities:—

Type I—Bottles for packing pasteurized milk—500 ml, 250 ml and 200 ml.

Type II—Bottles for packing sterilized milk—500 ml and 250 ml.

4. REQUIREMENTS

4.1 Material and Workmanship—The bottles shall have a smooth surface without cracks, pin holes, sharp edges or broken bubbles. They shall be free from cords, bubbles, blisters, and stones. The inner edge of the lip shall be smooth and rounded. There shall be no sharp edges inside the neck or any scouring on the top. The neck shall be joined to the body of the bottle without forming a sharp angle. The bottles shall be well formed with a uniform distribution of glass all over the walls and the base.

Bottles shall be well annealed.

4.2 Limit of Alkalinity—The bottles shall pass the test prescribed in Clause 4.2.

4.3 Shapes and Dimensions—Bottles of Type I shall have the general shape and dimensions shown in Fig. 1a. They shall have a finish of 38 mm or 44 mm conforming to the dimensions given in Fig. 2b or 2a respectively.

Bottles of Type II shall have the general shape and dimensions shown in Fig. 1b and shall have the standard crown finish conforming to SLS 321—Sri Lanka Standard for Glass Container finishes.

Bottles of both types shall have an insweep at the base of the body and the bottom shall have the minimum amount of push-up necessary to obviate the bottle rocking on its base.

4.4 Capacity—Capacity of the bottles when filled to the brim shall be as given below:

Nominal Capacity ml	Brimful Capacity of Bottles ml			
	Type I		Type II	
	Min.	Max.	Min.	Max.
500	510	520	533	547
250	260	270	265	275
200	210	220	—	—

Method of determination of capacity is described in Clause 6.4.

4.5 Mass—The maximum permitted mass of bottles shall be as follows:—

Nominal Capacity ml	Mass of Bottles (Max.)	
	Type I g	Type II g
500	370	350
250	280	275
200	210	—

4.6 Thermal Shock Test—The bottles when subjected to the tests prescribed in Clause 6.6 shall not break or show signs of crack.

4.7 Impact Test—The bottles shall pass the impact test mentioned in Clause 6.7.

4.8 Bursting Strength Test—The bottles shall not burst or show signs of crack when subjected to bursting strength test prescribed in Clause 6.8.

4.9 Parallelism between the Base and the Top Sealing Surface—The base of the bottle shall be parallel to the top sealing surface to within 0.75° when tested as described in Clause 6.9.

4.10 Verticality—The bottles shall pass the verticality test mentioned in Clause 6.10.

4.11 Colour—The bottles shall be colourless. A slight tinge of green may be permitted.

5. MARKING

The nominal capacity of each bottle shall be clearly and indelibly marked on the side of the bottle in letters or figures of at least 5 mm high.

The bottom or base of each bottle shall bear the name of the trade mark of the manufacturer in letters of at least 10 mm high and the production year or identification number in figures of at least 5 mm high.

6. METHODS OF TEST

6.1 Quality of Glass and Workmanship—Bottles shall be examined for the requirements of Clause 4.1 by visual inspection.

6.2 Test for Alkalinity

6.2.1 Apparatus

6.2.1.1 Erlenmeyer Flask Assembly—of chemically resistant glass, preferably borosilicate; consisting of Erlenmeyer flask of 250 ml capacity with a suitable reflux condenser with ground glass joints.

6.2.1.2 **Graduated Flask**—of chemically resistant glass, of known brand (preferably borosilicate) 250 ml capacity.

6.2.1.3 **Mortar**—a suitable mortar made of steel.

6.2.1.4 **Test Sieves**—two, one of aperture size 425 μm and the other of aperture size 600 μm see CS 124:1971—Test Sieves).

6.2.2 **Reagents**

6.2.2.1 **Quality of Reagents**—Unless specified otherwise, chemicals of analytical grade and distilled water shall be employed in tests.

6.2.2.2 The following reagents are required:—

(i) **Standard Hydrochloric Acid Solution** 0.01N.

(ii) **Ethyl Alcohol or Rectified Spirit**
(*a*) ethyl alcohol, 95 percent by volume, or
(*b*) rectified spirit, containing 95 percent ethyl alcohol by volume.

(iii) **Standard Sodium Hydroxide Solution** 0.05N.

(iv) **Methyl Red Indicator**—Dissolve 0.04 g of methyl red in 75 ml of ethyl alcohol or rectified spirit. Add 1.5 ml of standard sodium hydroxide solution or a quantity sufficient to ensure that the colour of the solution corresponds to pH 5.2 and then dilute to 100 ml with water.

(v) **Test Solution**—Take 1.0 ml of standard hydrochloric acid and 1.0 ml of methyl red indicator in a previously tested Erlenmeyer flask (See 6.2.3.1) and 240 ml of water. Boil for five minutes, cool quickly under running water and make up to 250 ml in the graduated flask.

6.2.3 Testing of Erlenmeyer Flask Assembly

6.2.3.1 Transfer 100 ml of test solution to the Erlenmeyer flask to be tested. Place the flask quickly in a bath of boiling water so that the level of the solution in the flask is below the level of the water in the bath and attach a small reflux condenser. Continue boiling for one hour and at the end of this period observe the colour of the solution. Reject the flask if any change of colour of the test solution has taken place.

Erlenmeyer flask assemblies which have once passed the test (see 6.2.3.1) for suitability may fail to do so after prolonged storage. In such a case, they may be reviewed by washing with 5 percent (m/v) solution of glacial acetic acid followed by washing with water until free from acid before use.

6.2.4 Procedure

6.2.4.1 Use Erlenmeyer flasks as tested under 6.2.3.1. Rinse the glass bottles selected for this test with distilled water, dry in a stream of dry air and crush them in the mortar such that the glass particles pass through the sieve of aperture size 600 μm but fail to pass through the sieve of aperture size 425 μm. The crushing and sieving should be done in three to four stages to avoid too much fines. Spread the sieved particles, weighing more than 5 g, on a glazed paper and pass a magnet over them to remove any particle of iron which may have been introduced during crushing. Wash the sieved glass free from dust in Erlenmeyer flask with four successive 30 ml portions of ethyl alcohol or rectified spirit and dry the flask and contents at 98°C to 100°C. Take two more Erlenmeyer flasks and transfer exactly

5g of the sieved, clean, dry glass to one of the two flasks. Transfer a 100 ml portion of the freshly prepared test solution (see 6.3.2.2 v) to both flasks. Place the flasks quickly in a bath of boiling water so that the levels of the contained solutions are below the level of the water in the bath and attach the previously tested reflux condensers. Keep the flasks in the boiling water bath for 30 minutes and then take them out and cool quickly under running water. From the first flask containing powdered glass sample, decant out the test solution into a third Erlenmeyer flask. Add 4 ml of water to the powdered glass residue in the first flask, shake a little and decant out into the third flask, taking care to see that transference of the powdered glass is avoided as far as possible. Also add 4 ml of water to the second flask containing only the test solution (blank), titrate the solution in the third flask immediately with standard hydrochloric acid to the pink colour of the blank test solution in the second flask.

6.2.5 Result

The glass containers shall be taken to have passed the test if not more than 3 ml of 0.01 N hydrochloric acid is required for the titration.

6.3 Shapes and Dimensions

Bottles shall be examined for compliance with Clause 4.3. Acceptable limit gauges or measuring instruments of sufficient accuracy shall be used.

6.4 Capacity of a Single Bottle

6.4.1 Apparatus—A balance having a limit of error of 0.1 g and a thermometer.

6.4.2 Procedure—Use each bottle in turn. Weigh the clean dry bottle to the nearest 0.1 g. Fill the bottle with distilled water at a temperature between 20°C and 30°C. to approximately 25 mm below the top, keeping the outside of the bottle dry. After half an hour, measure the temperature of the water in the bottle. Using a depth gauge to the centre of the surface of the liquid, adjust the water level in the bottle exactly to the brim. Weigh the bottle and the contents to the nearest 0.1 g. Calculate the capacity of the bottle as follows:

$$\text{Capacity of bottle in millilitres at } T_1\ ^\circ\text{C} = (M_2 - M_1) \times V \times [1 - 0.0002\ (T_1 - 29)]$$

Where M_1 = mass of empty bottle,

M_2 = mass of bottle filled to the brim with distilled water,

T_1 = temperature of the water in degree Celsius,

V = the volume, in millilitres, of 1 g of water at 29°C, and

0.0002 = the coefficient of expansion of water per degree Celsius in the range 10°C to 30°C.

6.5 Mass—Mass of the bottle shall be determined to an accuracy of $\pm$ 0.5 g.

6.6 Thermal Shock Test for the body and the rim of bottles

6.6.1 Thermal shock test for the body

6.6.1.1 Apparatus—The apparatus required for the thermal shock test is shown in Figure 4. It consists essentially of a basket for holding the bottles upright, two water baths, one containing hot water and the other containing cold water and automatically timed means for transfering and immersing the basket of bottles from the hot to the cold bath. The temperature of the water baths shall be controlled within $\pm$1°C. Each water bath may also be provided with a stirrer to keep a uniform temperature.

6.6.1.2 **Procedure**—Adjust the cold water bath to a temperature of 30±1°C and the hot water bath to a temperature of 72±2°C. Place the empty sample bottles in the basket vertically with the mouth upwards. When the baths have attained the prescribed temperature immerse immediately the basket containing the bottles in the hot bath in such a manner that the bottles become completely filled with the hot water. Allow the bottles to soak for 15 minutes. Transfer the basket with the bottles filled with hot water to the cold bath so that the bottles are immersed in water keeping about 10 mm of the neck above the water. Take care that no cold water enters into the bottles. Keep the bottles immersed for 2 minutes. Remove the basket from the cold bath. The process of transference from the hot to the cold bath shall be completed in 15±2 seconds. Take every precaution to protect the apparatus from draughts. Inspect each bottle for cracks or breaks.

6.6.2 Thermal Shock Test for the Rims

6.6.2.1 Apparatus

Cold water bath—Similar to that described in 6.6.1.1 and maintained at 30±1°C.

Oven—Having a thermostat capable of maintaining a temperature constant to ±1°C and preferably with air stirrer to ensure temperature uniformity.

6.6.2.2 **Procedure**—Place the bottles in the oven previously heated to and maintained at 72±2°C. Keep the bottles in the oven for 30 minutes. Remove the bottles one at a time by means of tongs and placing them upside down in the cold water bath maintained at 30±1°C. Immerse the bottle to a depth so that

the rim is immersed to a depth of about 25 mm. The process of transference from the oven to the cold bath shall be completed in 5 ± 1 second for each bottle. Take every precaution to ensure that entrapped air is not allowed to escape. Keep the rims immersed for 2 minutes. Inspect the rim of each bottle for cracks or breaks.

6.7 Impact Test—The bottles shall be struck with a hardened spherical steel ball 4 times in the same plane at the belly. i.e. 30 to 45 mm from the base and at the following points with a mass of 400g falling through a distance of 100 mm:—

(*a*) on both seams, and

(*b*) at the extremities of a diameter, at right angles to the joining seams.

A bottle shall be deemed to have failed to pass the test if a crack appears or if the bottle chips.

6.8 Bursting Strength Test

6.8.1 Apparatus—The apparatus shall embody the following principles:—

6.8.1.1 The bottles to be tested shall be held in such a manner that the bottle is not clamped, but is suspended from the bead of the finish.

6.8.1.2 There shall be a resilient sealing member which shall act with the sealing surface of the container to retain the pressurizing medium during the period of the test.

6.8.1.3 There shall be a means of applying fluid pressure to a predetermined level at a minimum rate of 7 kPa* per minute (1.0 psi per minute) and of maintaining that pressure constant during the period of test.

* 1 kPa = 1 kN/m²

6.8.1.4 There shall be an automatically controlled timing mechanism in the apparatus so that the container will be subjected to uniform internal pressure for a pre-determined period which shall be not less than 3 seconds and not more than 1 minute. The period of test shall be reproducible within ± 2 per cent.

6.8.2 Procedure

6.8.2.1 The containers may be filled with water or other low density liquid, if such is used as the medium for applying pressure.

6.8.2.2 An internal pressure of 590 kPa* (85.6 psi) shall be applied and held constant for 60 seconds.

6.9 Parallelism between the Base and Top Sealing Surface

6.9.1 Apparatus—Any acceptable apparatus suitable for determining whether the base of the bottle is parallel to the top sealing surface. Two optically flat plates and a spirit level calibrated to the accuracy required for the purpose may be used.

6.9.2 Procedure—Test each bottle for compliance with Clause 4.9.

6.10 Test for Verticality

6.10.1 Assembly—Assembly for the determination of verticality of the bottles shall be as shown in Figure 3.

6.10.2 Place the bottle on its base on a flat plate having a shaft bounded to it at right angles. Adjust the 'V' block mould on the shaft in such a manner that it is in contact with the outer diameter of the bottle at about the middle. Adjust the dial indicator fitted to the shaft so that its measuring point comes in contact with the actual edge of the neck of the bottle. Rotate the bottle such that the body is always in contact with the 'V' block and keeping the bottle always firmly on its base. The total deflection shown by the indicator shall be the difference in the verticality.

* 1 kPa = 1 kN/m^2

6.10.3 The bottles shall be deemed to have passed the test if the total deflection indicated is less than 1.5 mm.

6.11 Colour—Colour shall be determined by visual inspection unless otherwise agreed between the manufacturer and the purchaser.

7. SAMPLING

7.1 Lot—In any consignment bottles of the same type and capacity shall be grouped as a lot.

7.2 Scale of Sampling—The scale of sampling shall be as indicated in Table 1. The required number of sample bottles (Clause 3 of Table 1) shall be drawn from each lot, by the method described in Clause 7.3.

7.3 Method of selecting Glass Bottles

7.3.1 The bottles to be selected from the lot shall be chosen at random. In order to ensure the randomness of selection, a random number table shall be followed.

7.3.2 In case a random number table is not available, the bottles may be selected from the lot in the following manner:—

Starting from any bottle in a lot, the bottles shall be counted as 1,2 .....r and so on in one order. Every r th bottle thus counted shall be withdrawn to constitute the sample, where r is the integral part of N/n (N and n being the lot size and corresponding sample size respectively). This procedure shall be stopped as soon as the required number of bottles is obtained.

7.4 Criteria for Conformity

7.4.1 Out of the sample bottles selected in accordance with Clause 7.2 five sample bottles shall be subjected to alkalinity test described in Clause 6.3. If these five samples pass the test, then only further testing need be done to examine the conformity of the lot to other requirements. If the five samples fail, the lot shall be rejected without further testing.

7.4.2 From the sample bottles selected in accordance with Clause 7.2, ten sample bottles shall be subjected to thermal shock test described in Clause 6.7. Any sample bottle not satisfying the requirements of the test shall be considered as a defective.

7.4.3 If the number of defectives among the ten sample bottles tested for thermal shock is more than one the lot shall be rejected without further tests. Otherwise the non-defective bottles subjected to the thermal shock test shall be mixed with the remaining sample bottles selected in accordance with Clause 7.2 for further testing.

7.4.4 The number of sample bottles not conforming to any one or more of the requirements specified under Clauses 4.1, 4.3, 4.4, 4.6 and 4.9 shall be compared with the acceptance and rejection numbers in Columns 5 and 6 of Table 1. The directions given in Clause 7.4.6 shall determine the conformity or otherwise of the lot to these requirements.

7.4.5 The number of bottles not conforming to any one or more of the requirements specified under Clauses 4.2, 4.5, 4.7 and 4.10 shall be compared with the acceptance and rejection numbers in Columns 7 and 8 of Table 1. The directions given in Clause 7.4.6 shall determine the conformity or otherwise of the lot to these requirements.

7.4.6 If in the first sample the number of defective bottles is less than or equal to the first acceptance number, the lot shall be declared as conforming to the requirements. If the number of defectives is greater than or equal to the first rejection number, the lot shall be rejected. If the number of defectives is greater than the first acceptance number but less than the first rejection number, a second sample of the size equal to that of the first shall be taken to determine the conformity or otherwise of the lot. The number of defectives found in the first and second samples shall be combined and, if the combined number of defectives is less than or equal to the second acceptance number, the lot shall be declared as conforming to the requirements, otherwise not.

TABLE 1—SCALE OF SAMPLING

No. of Bottles in the lot	Sample	Sample size	Cumulative sample size	First Group*		Second Group*	
				Acc. No.	Rej. No.	Acc. No.	Rej. No.
Up to 1 200	1st	50	50	0	3	1	4
	2nd	50	100	3	4	4	5
1 201 to 3 200	1st	80	80	1	4	2	5
	2nd	80	160	4	5	6	7
3 201 to 10 000	1st	125	125	2	5	3	7
	2nd	125	250	6	7	8	9
10 001 to 35 000	1st	200	200	3	7	5	9
	2nd	200	400	8	9	12	13
above 35 000	1st	315	315	5	9	7	11
	2nd	315	630	12	13	18	19

*The first group includes testing of bottles for the requirements given in Clause 4.1, 4.3, 4.4, 4.8 and 4.10.

*The second group includes testing for the requirements given in Clauses 4.5, 4.7 and 4.9.

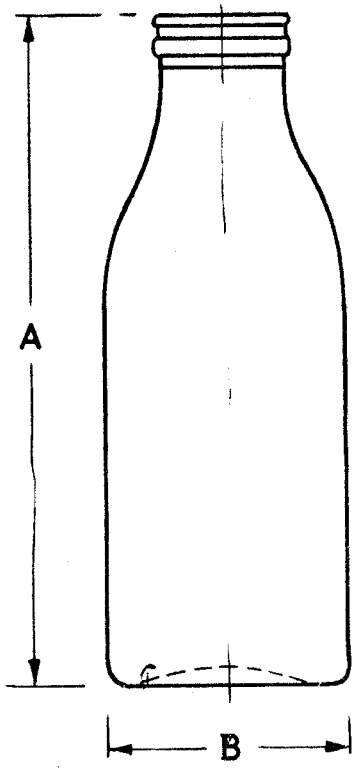


Fig. 1 (a)

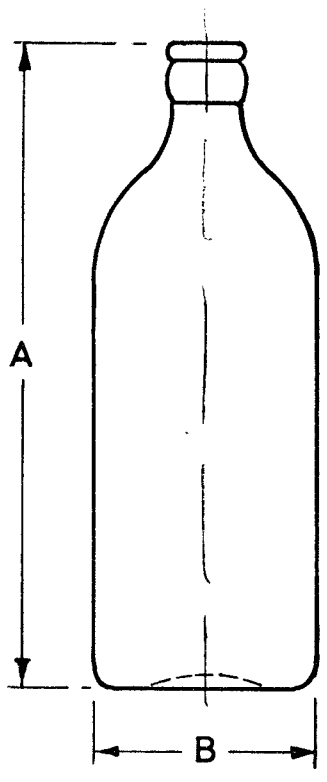


Fig. 1 (b)

Capacity ml	Height A mm		Base Diameter B mm	
	for Pasteurised Milk	for Sterilised Milk	for Pasteurised Milk	for Sterilised Milk
500	210 ± 1.3	214.5 ± 1.3	73.0 ± 1.4	73.3 ± 1.4
250	154 ± 1.1	128.0 ± 1.1	61.5 ± 1.2	70.3 ± 1.4
200	144 ± 1.1	—	56.4 ± 1.2	—

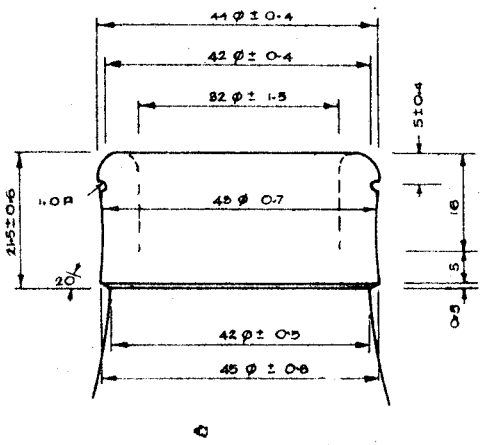


Fig. 2 (a)

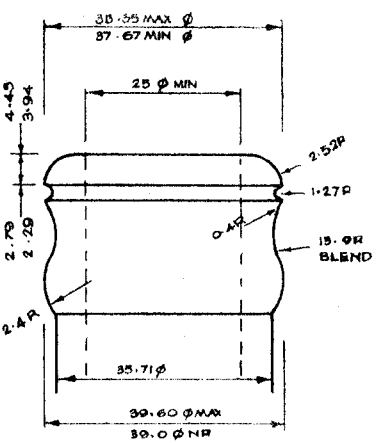
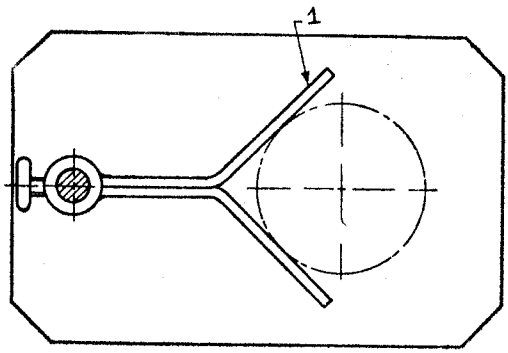


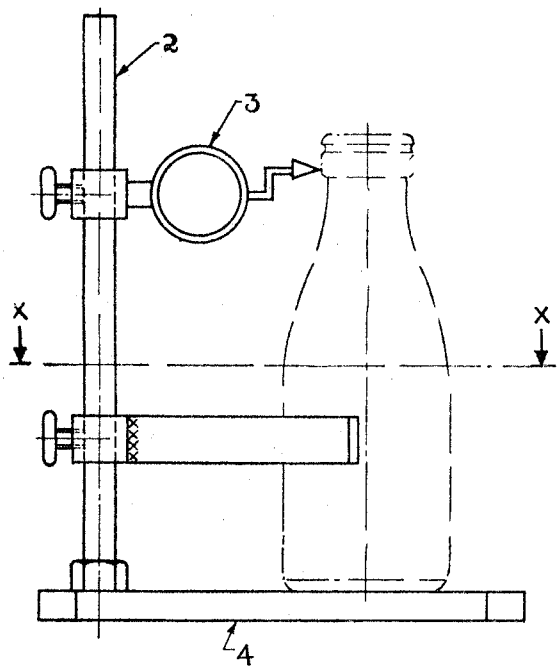
Fig. 2 (b)

Fig. 2 — Neck Finish for the Pasteurised Milk Bottle.



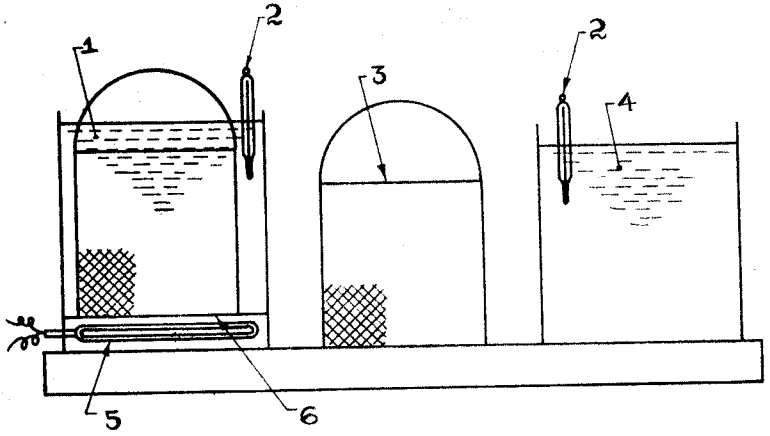
1. V Block

Section XX



2. Shaft 3. Dial Indicator 4. Flat Plate

Fig. 3 — Assembly for the Verticality Test.



1. Hot Water Bath
2. Thermometer
3. Wire Basket
4. Cold Water Bath
5. Immersion Heater
6. Basket Support

Fig. 4 — Apparatus for the Thermal Shock Test

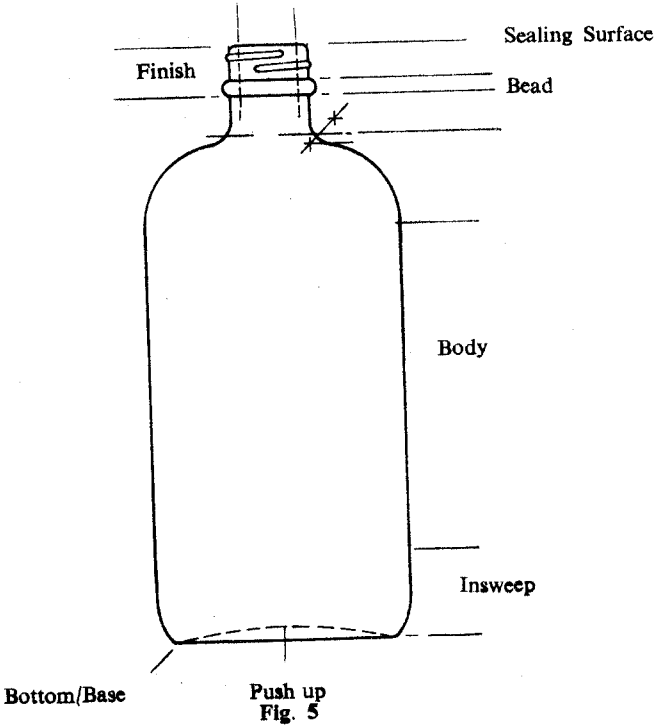


Fig. 5

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

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SRI LANKA STANDARDS INSTITUTION

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