(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 317 008 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88202533.1**

(22) Date of filing: **11.11.88**

(51) Int. Cl.[4]: **B65D 53/00 , B21D 51/46 , B65D 8/20**

(30) Priority: **20.11.87 NL 8702793**

(43) Date of publication of application:
24.05.89 Bulletin 89/21

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI NL SE

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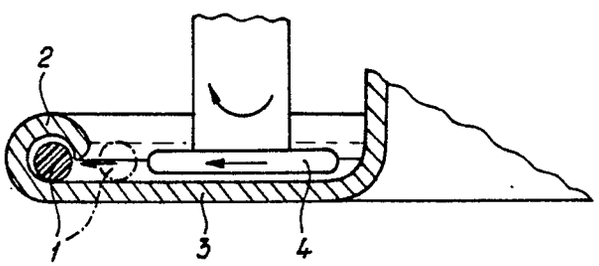
(54) Drum with sealed folded seam.

(57) The invention relates to a drum and its process of manufacturing, in particular the sealing of the seam between end wall and body which seal is obtained by means of a filament (1) of a deformable plastic which is placed in a precurl (2) of the end wall flange (3) and during the seaming operation as a result of the heat developed therewith is deformed into a closed ring which fills the core of the seam, is inert with respect to the contents of the drum and capable to adhere to the steel of the drum.

Fig - 1



EP 0 317 008 A1

Drum with sealed folded seam

The invention relates to a drum comprising a steel body and steel end walls which are joined together by means of a folded seam which is provided with a seal in the core.

Such a drum is generally known. The folded seam joint between body and end wall can consist of a flat, so-called double folded seam or a more or less rounded triple folded seam. The latter folded seam is preferable.

It is known here to inject a liquid sealing material into the folded seam in the process of formation just before or during folding, said sealing material subsequently drying or hardening during a subsequent heating process, such as, for example, during stoving of the lacquered drum.

It is also known here to make a folded joint between the radially projecting flange of the drum body and the radially projecting edge or flange of an end wall by first of all giving the outside edge of the edge or flange of the end wall a 180° preliminary curvature opening inwards and subsequently injecting the sealing material into this preliminary curvature, then possibly allowing the sealing agent to dry or hardening it in an oven before the folding operation is carried out. Drying or hardening before the folding operation is carried out has advantages because it benefits the integrity of the seal, but it has the disadvantage that the production process has to be interrupted and additional energy has to be supplied for rapid drying or hardening.

All these seals have the disadvantage that they sometimes do not seal properly, particularly if the sealing material is not injected very accurately, they are not always resistant to the contents of the drum, and in particular in the event of damage, for example if the drum falls, can give rise to leaks. Another disadvantage is that some sealing means are unsuitable for packaging of foodstuffs.

Attempts have been made to solve this problem by fitting a prefabricated rubber ring in the preliminary curvature beforehand, but this did not give a satisfactory result, quite apart from the problem that placing such a rubber ring is difficult, because the diameter of a drum of, say, 55-gallon capacity is large, so that the ring is unwieldy.

An attempt was also made to place a vulcanised rubber filament in the preliminary curvature, but the problem then was that the ends could not be joined in sealing fashion.

An endeavour was also made to extrude vulcanisable rubber or a plastic into the preliminary curvature, but this again was without satisfactory results.

The object of the invention is then to produce a solution to this sealing problem

This object is achieved according to the invention in that the seal comprises a filament made of a deformable plastic, which can adhere with its surface to the steel surface of the folded seam parts, and is chemically resistant as regards the contents of the drum. Chemically resistant is understood to mean an acceptable resistance and/or a material which does not breach any regulations concerning the packaging of foodstuffs.

When a filament of a deformable plastic is used the length of the filament is not found to be critical. It can be equal to the peripheral length of the preliminary curvature, but it is preferably shorter. After folding, it is found that a plastic ring which is closed all the way round and has no opening at all now is obtained. This can be explained by the fact that during the folding locally, as a result of the deformation of the material a temperature and pressure are produced which are sufficiently high to cause the deformable plastic material to flow, so that said material not only adjusts to the developing cross section of the cavity intended for the seal and situated in the core of the folded seam, but also undergoes a displacement in the peripheral direction, during which the ends grow towards each other and are united to form one unit.

It is, of course, also important that the filament, which in fact has to form the seal, is chemically resistant as regards the contents of the drum. "Chemically resistant" can be understood to mean that the filament is completely inert in its behaviour relative to the contents, but also that the material of the filament undergoes an extraction which remains well below the limit which is set for it when an effort is made to dissolve it in the material which can form the contents of the drum. It is also important for the filament to be made of a material which meets all regulations concerning the packaging of foodstuffs.

The adhesion of the plastic filament to the steel surface of the folded seam parts is another essential condition. Heat is necessary for optimum adhesion. It can arise during folding, but is fed in particularly after folding during heating to higher temperatures, for example during stoving of the coat of paint which is applied to the outside of the drum. The effect achieved by this adhesion is that, even if the folded seam is deformed due to damage to the drum, the seal remains in place even at the so difficult intersection of the lengthwise seam of the drum body with the folded seams. It has also been found in falling tests that the good adhesion makes an essential contribution to the strength of the folded seam. If the drum is damaged, unfolding

of the folded seam now occurs less quickly, which also helps the seal.

There are different deformable plastics which can meet the condition set. For example, various thermoplastics are conceivable, such as polyamides, polyesters and polyolefins. A copolymer of polyethylene is preferred, having a melt index of less than 300 and particularly preferable is a copolymer with vinyl acetate or (met)-acrylic acid.

The invention also comprises a process for the production of the drum, which is characterized in that the filament to be placed in the preliminary curvature is made of a length that is shorter than the peripheral length of the preliminary curvature, which gives the effect of the closed plastic sealing ring already described.

This filament can be placed in the preliminary curvature after the end wall in the folding machine is placed on the drum body. The body with the end wall or cover placed thereon is then set in rotation; the preliminary curvature is provided if it has not already been carried out in an earlier operation, and the filament to be guided by suitable means into the preliminary curvature then remains in position therein as a result of the centri fugal action. This is preferably carried out just before the edge of the body flange goes into the preliminary curvature, so that the opening of the preliminary curvature, which opening is facing said body flange, is closed immediately after introduction during the further folding operation.

The filament can also be placed in the preliminary curvature before the end wall is placed on the body of the drum. The end wall is set in rotation, the preliminary curvature is provided, and during or after this operation the filament is guided into the preliminary curvature. In order to hold the filament in place during storage and transport of the end walls a slight adhesion of the filament in the precurl can be obtained by heating the end wall but, it is preferable, after the application of the filament, to make the opening of the preliminary curvature of a size which is slightly smaller than the diameter of the filament.

The filament can be placed by mechanical means, but the best solution with the most rapid effect is obtained if the filament is fed into the preliminary curvature by means of a stream of air which guides and transports the filament.

The filament can be a solid filament, but can also have a cellular structure. Some rigidity is desirable, so that the filament is not only easily guided to bridge the distance between the insertion means, such as the air jet nozzle, and the preliminary curvature, but also so that the filament can be held with some tension in the preliminary curvature, for the filament is in fact bent according to the curvature of the periphery.

The drawings show schematically two means for introducing the filament into the preliminary curvature of the end wall flange.

Fig. 1 shows a mechanical insertion device;

Fig. 2 shows a pneumatic insertion device;

Fig. 3 also shows a pneumatic insertion device.

In the embodiment shown in Fig. 1 the filament 1 is pressed into the preliminary curvature 2, which has an opening which is slightly smaller than the diameter of the filament, from the end wall flange 3 by means of a rotary roller 4. This operation is preferably carried out before the end wall 3 is joined to the body.

In the embodiment shown in Fig. 2, end wall flange 3 and body flange 5 have already been placed on each other, and the end wall flange is already provided with a preliminary curvature.

Reference number 6 indicates a compressed air nozzle through which the filament 1 is conveyed and is, as it were, sprayed into the preliminary curvature 2 of the end wall flange, and takes up the position there indicated by solid lines. This can be carried out just before the folding rollers of the folding machine fold the curvature 2 further and finish the folded joint.

In the embodiment shown in Fig. 3 the end wall is already provided with a preliminary curvature 7 and filament 9 fed in by means of a compressed air nozzle 8 before the end wall is placed on the body of the drum. Immediately after the filament is guided into the preliminary curvature, the opening of the preliminary curvature is reduced to a size which is slightly smaller than the diameter of the filament as indicated by 10.

Drums obtained with the invention and subjected to all the usual tightness and strength tests remained completely tight. This can be explained by the fact that the plastic filament completely fills the core of the folded seam during the folding, and the heating occurring during stoving ensures adhesion and thus sealing in all circumstances.

Claims

1. Drum comprising a steel body and steel end walls which are joined together by means of a folded seam which is provided with a seal in the core, characterized in that the seal comprises a filament made of a deformed plastic, which can adhere with its surface to the steel surface of the folded seam parts, and is chemically resistant as regard the contents of the drum.

2. Drum according to Claim 1, characterized in that the sealing filament is thermoplastic.

3. Drum according to Claim 1, characterized in that the filament is a copolymer of polyethylene, having a melt index of less than 300.

4. Drum according to Claim 3, characterized in that the filament is a copolymer with vinyl acetate or met (meth)acrylic acid.

5. Process for the production of a drum according to Claim 1, 2 or 4, in which a folded joint is made between the radially projecting flange of the drum body and the radially projecting edge or flange of an end wall by first of all giving the outside edge of the edge or flange of the end wall a preliminary curvature of approximately 180° opening inwards and subsequently introducing the sealing material into this preliminary curvature, characterized in that the deformable plastic filament to be placed in this preliminary curvature is made of a length that is shorter than the peripheral length of the preliminary curvature.

6. Process according to Claim 5, characterized in that the filament is introduced during the making of the preliminary curvature.

7. Process according to Claim 5 or 6, characterized in that the filament is introduced just before the edge of the body flange goes into the preliminary curvature during the folding.

8. Process according to Claim 6 or 7, characterized in that the filament is introduced into the preliminary curvature by means of a stream of air guiding and transporting the filament.

9. Process according to Claim 5, characterized in that the filament is placed in the preliminary curvature after making of the preliminary curvature.

fig-1

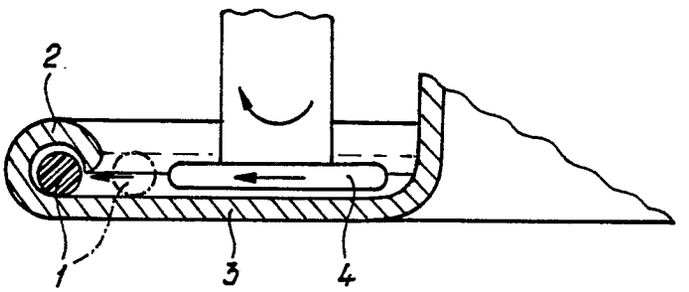


fig-2

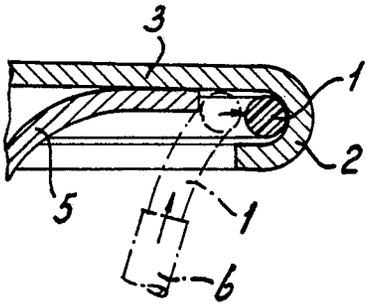
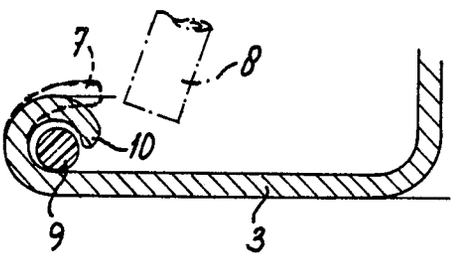


fig-3



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EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2533

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	DE-C- 412 448 (FELTEN & GUILLEAUME CARLSWERK) * Page 1, lines 1-30 *	1	B 65 D 53/00 B 21 D 51/46 B 65 D 8/20
A	EP-A-0 065 842 (WELLMAN FURNACES LTD) * Page 8, lines 22-35; figure 8 *	1	
A	EP-A-0 129 310 (W.R. GRACE & CO.) * Page 2, lines 6-17 *	3,4	
A	FR-A-2 056 925 (KONINKLIJKE EMBALLAGE INDUSTRIE VAN LEER)		
A	CH-A- 437 020 (CATALYTIC GAS PACK)		
A	DE-B-1 214 956 (LECHLER BAUTENSCHUTZCHEMIE)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 D
B 21 D
F 16 J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-02-1989	BERRINGTON N.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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