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(54) Title: NOVEL WRAPPERS

(57) Abstract: A wrapper comprising a layer of polyethyleneterephthalate or bi-axially oriented polypropylene and a layer comprising polymeric alkylene with an intermediate layer disposed there between, wherein surface tension of said layer comprising polymeric alkylene is greater than 32 dynes/cm.

WO 2007/134911 A1

- 1 -

NOVEL WRAPPERS**Technical field**

The present invention relates to wrappers for articles,
5 particularly for detergent bars.

Background and prior art

Detergent bars are conventionally manufactured by extrusion
process in which a pre-formed composition comprising all
10 components of the bar is plodded and extruded through an
eye-plate, to form a continuous "rod" , which is then cut
into smaller pieces of predetermined length, commonly
referred to as "billets" or bars. These billets are fed
through a stamper, wrapped and packaged to make them ready
15 for the consumer. Similar process, with appropriate
modifications is followed to make conventional soap and
dish-wash bars. Generally, such bars are wrapped in heat
sealable Polyethylene based laminated wrappers.

20 Bars are wrapped in an envelope wrapping format wherein the
outermost and innermost layers are sealed to each other,
either using adhesives or by heat-sealing. Such individually
wrapped bars are then stacked one above the other and
collectively packed, generally in corrugated paper board
25 boxes. These boxes are stored in godowns for usually 1 to 2
weeks, before they are opened at retail outlets to remove
the individually wrapped bars.

Temperature of the detergent bars is typically in the range
30 of 60 to 85°C. When such hot detergent bars are wrapped in
conventional heat-sealable Polyethylene wrappers having

- 2 -

laminated outer and inner layers of polyethylene, with a layer of stiffening material, such as paper, in between the two. It is commonly observed that the wrappers stick to each other inside the corrugated paper board boxes, which leads
5 to a failure of the wrapper/packaging, commonly referred to as "bunching" in the packaging industry.

"Bunching" occurs when the hot bars are wrapped and packed immediately into outer boxes without allowing them to
10 sufficiently cool, where under the dual effect of resident heat and pressure in the stack, the wrappers tend to stick to each other and eventually tear in transit and distribution. This happens primarily because the outer heat-sealable polyethylene layers of individually wrapped bars
15 have the tendency of sticking to each other because of the available heat and pressure. This problem is more acute during summers in tropical countries, when the ambient temperature is around 45°C, which prevents heat from being dissipated from the wrapped bars. Detergent bars contained
20 in such torn wrappers are not fit for retail sale owing to failure of the packaging material. Therefore, it amounts to wastage of time, money, energy and material, which is a permanent loss to the manufacturer.

25 In factories where detergent bars are produced in low volumes, the bars are usually wrapped manually. Here, they are allowed to cool to ca. 35°C, before being wrapped individually. Detergent bars do not easily dissipate the heat contained therein and therefore, the cooling cycle is
30 usually 24 hours long. Such a prolonged cooling cycle is not suited for factories where the daily production of bars is

- 3 -

in the order of tones. Such factories are equipped with modern day on-line wrapping machines operating at high speeds, which are synchronized with the production rate of bars.

5

Modern continuous production lines which wish to shorten the time taken by the bars to cool have a conditioning tunnel installed after the billet cutter and before the stamper in the production line. The conditioning tunnels use
10 refrigerated air to cool the bar. Refrigeration/cooling units are not economically viable to operate in high ambient temperatures. Therefore, if one wishes to use the conventional Polyethylene wrappers and overcome "bunching" problems, he is forced to cool the bars to an appreciable
15 degree, either by air cooling or by allowing them to cool on their own.

The above problem can be solved by using non heat-sealable wrappers, which are be sealed by using suitable adhesives,
20 generally hot melt adhesives. The use of adhesives however, brings in an additional step of applying the same or one has to use adhesive coated laminates. In addition, adhesive coated laminated wrappers are costlier than un-coated ones. Further, a common drawback of adhesive bonded wrappers is
25 that the sealed areas frequently open out during storage and transit.

Thus, it can be appreciated that there exists a need for heat sealable wrappers to wrap detergent bars, which are
30 free from undesirable "bunching" problems, a phenomenon commonly observed with heat-sealable polyethylene wrappers.

- 4 -

It is therefore an object of the present invention to provide heat sealable wrappers for detergent bars, which can be used for wrapping the bars, while they are in hot condition.

5

Another object of the present invention is to provide wrappers which do not stick to each other during storage and transit.

10 The present inventors have developed novel wrappers for detergent bars after which meet the above objects.

Summary of the Invention

According to an aspect the present invention relates to wrappers comprising a layer of polyethyleneterephthalate or
15 bi-axially oriented polypropylene and a layer comprising polymeric alkylene, with an intermediate layer disposed there between, wherein surface tension of the layer comprising polymeric alkylene is greater than 32 dynes/cm.

20

According to a preferred aspect, the surface tension is from 36 dynes/cm to 50 dynes/cm and more preferably from 38 to 42 dynes/cm.

25 The invention, its' advantages and its' method of use will now be described in details.

Detailed description

According to an aspect, the present invention relates to
30 wrappers for articles, particularly for detergent bars.

- 5 -

During the manufacture of detergent bars, the composition is milled i.e. mixed in high-shear mixers and plodded. This composition is later extruded through dies, to form logs or rods, which are cut to required size into bars or billets.

5 These billets are stamped and generally, envelope wrapped in polyethylene wrappers. Enveloped wrapping involves a belly-seal and two side seals. This format requires both the outer and inner layers of the wrapper to have good sealing properties or receptivity towards sealing to give fiber-
10 tear, which is accepted as the visual indication of a good seal. The temperature of the detergent bar composition as it extrudes out of the dies is typically around 60 to 85 deg C. In factories where the bars are wrapped manually, they are cooled to ca. 35°C before being wrapped, either by
15 allowing them to cool on their own or by circulating cold air in a conditioning tunnel. Either of the two methods is economically un-acceptable from the manufacturer's point of view.

20 On the other hand, when such hot bars are wrapped on-line i.e. without allowing them to cool, in heat-sealable polyethylene wrappers having laminated outer and inner layers of polyethylene, with a layer of stiffening material, such as paper, in between the two, which are later stacked
25 one above the other and packed in bulk quantities in corrugated paper boxes, it is observed that the wrappers stick to each other over a period of time,. This happens because of the dual effect of resident heat and stack pressure. When one tries to separate the individual bars,
30 the wrappers tear. Such torn wrappers do not serve the primary and secondary function of packages. This type of

- 6 -

packaging failure is commonly referred to as "bunching", in the industry.

Customers, do not like to buy products with a damaged
5 packaging, therefore, this leads to loss of time, money, material and resources to the manufacturer.

Therefore, it is desirable to have heat-sealable wrappers that can be used to wrap detergent bars, while in hot
10 condition, which later can be safely transported and stored and which are free from "bunching".

The present inventors have developed novel wrappers that can serve the desired primary and secondary functions of
15 wrappers. These wrappers do not stick to each other during transit and storage and can be used to wrap detergent bars in hot condition. Accordingly, the present invention relates to wrappers comprising a layer of polyethyleneterephthalate or bi-axially oriented polypropylene and a layer comprising
20 polymeric alkylene, with an intermediate layer disposed there between, wherein surface tension of the layer comprising polymeric alkylene is greater than 32 dynes/cm.

The term "detergent bar" is use herein to include laundry
25 bars, soap bars and dish wash bars.

The term "comprising" for the purpose of this invention means wrappers essentially having at least one layer of polyethyleneterephthalate or bi-axially oriented
30 polypropylene and at least one layer that include polymeric alkylene, with at least one intermediate layer situated

- 7 -

between the above layers. It is essential according to the invention that when the wrapper is used to wrap articles, particularly detergent bars, the layer of polyethyleneterephthalate or bi-axially oriented

5 polypropylene and the layer comprising polymeric alkylene are sealed to each other, with the article contained therein, the layer of polyethyleneterephthalate or bi-axially oriented polypropylene forming the outermost layer,

10 Wrapper Materials

Preferred thickness of the wrappers of the invention ranges from 30 to 200 microns, more preferably from 60 to 160, further more preferably from 50 to 120 and most preferably from 40 to 100 microns.

15

Polyethyleneterephthalate is also commonly known as PET. Preferred thickness of this layer is from 7 - 100 microns, more preferably 7 to 80 microns and most preferably from 7 to 50 microns.

20

Bi-axially oriented polypropylene is commonly known as BOPP. Preferred thickness of BOPP layer is in the range 7 - 250 microns, more preferably 10 to 200 microns and most preferably from 20 to 100 microns.

25

PET is available in heat-sealable and non-heat sealable grades. It is preferred that the PET layer is not heat sealable, although heat sealable grades can also be used without departing from the scope of this invention. BOPP is
30 also available in heat-sealable and non-heat sealable grades. Non-heat sealable grades of BOPP are preferred over

- 8 -

heat-sealable grades. If desired, the layers can be pre-printed, reverse printed on either side with information pertinent to the product to be covered. This layer provides superior aesthetics and gloss to the wrappers and superior
5 aroma retention.

Preferred materials forming the intermediate layer include paper, paperboard, metallized paper, metal foils such as Aluminum foil, vapor deposited metal layer, nylon or
10 ethylene vinyl alcohol. More preferred barrier layer is made from maplitho, poster or chromo paper.

This intermediate layer provides superior stiffness to the wrapper, thereby improving its' machinability and transit
15 performance and also acts as a barrier layer. Grammage of this layer is preferably in the range of 30 gsm to 200 gsm, more preferably from 80 to 150 gsm and most preferably from 45 to 80 gsm. It is to be understood that more than one such layers can be used.

20

The term "layer of polymeric alkylene" means one or more layers of polymeric alklenes. Ethylene and Propylene are the preferred alklenes, suited to the invention. Preferred polymeric ethylene is selected from the group consisting of
25 low density polyethylene, linear low density polyethylene, blends of low density polyethylene with linear low density polyethylene, copolymers of ethylene with methyl acrylate or copolymers of ethylene with vinyl acetate. Low density Polyethylene (LDPE) is preferred over others.

30

Polypropylene is the preferred polymeric propylene.

- 9 -

Preferred grammage of this layer is from 8 gsm to 50 gsm, more preferably from 12 gsm to 20 gsm.

It is essential according to this invention that the surface
5 tension if this layer of polymeric alkylene is greater than
32 dynes/cm, preferably from 36 dynes/cm from 50 dynes /cm
and more preferably from 38 dynes/cm to 42 dynes/cm. Surface
tension of the above materials is generally below 30
dynes/cm. It was observed by the present inventors, after
10 experimentation, that for good sealing characteristics, the
surface energy of this layer must be above 32 dynes/cm,
preferably in the range of 36 to 50 dynes/cm and most
preferably in the range of 38 dynes/cm to 42 dynes/cm.

15 The surface tension of the polymeric alkylene layer is
increased, preferably by treating the surface with corona
discharge, although other forms of treatment such as laser
discharge, plasma or flame treatment can also be used.

20 Corona discharge treatment

Under a strong electric field, air, which is normally
electrically insulating can be made to breakdown and
conduct. This process involves electron collision within the
gas followed by resulting ionizing collisions such that a
25 permanent corona discharge is seen as a bluish discharge.
Within this corona discharge the excited molecules
dissociate to form free radicals, ions, photons, electrons,
excited oxygen and nitrogen. As the power to the corona is
increased more ions are formed and the average kinetic
30 energy of the corona is increased. The ions impact the film
with this kinetic energy and can dislodge any low molecular

- 10 -

weight material and can also start to break polymer bonds know as chain scission. Also new bonds can be made on the surface as in an increase in the oxygen content at the surface. In some cases some of the low molecular weight
5 material can be cross linked into the longer bulk polymer chains. Such corona treatment increases the surface tension and surface energy of the layers.

The components of a corona treating system include a power
10 supply, a high-voltage transformer, and the treating station through which the material to be treated passes. The station itself typically comprises an electrode, an electrical insulator or dielectric, and a return path (ground), and it can be configured in a number of ways to accommodate
15 different materials.

The power supply has the function to raise the frequency and voltage of the incoming power to levels sufficient to generate a corona in the station.

20

Generally, Power of 1 KW to 2.2 KW is used to get the desired surface tension values of 36 to 50 dynes/cm.

Whilst the layer comprising polymeric alkylene forms the
25 innermost layer, i.e. the layer, which is in contact with the detergent bar, it can also serve as the outermost layer. The wrapper is especially useful for covering individual bars of detergent bars or soaps or dish-wash bars. However, it will be understood that the use of the wrappers is not
30 limited only to detergent bars, alone, but any desired article may be wrapped therein.

- 11 -

Wrappers are preferably rectangular or square in shape for packaging detergent bars, but it will be appreciated that it can be tailored to assume any shape and size to suit the particular article it covers.

5

The invention will now be explained in detail with the help of the following non-limiting examples.

Example no.1

10

Effect of corona discharge on the sealing characteristics of the wrapper.

The effect of corona treatment on sealing characteristics of a wrapper was studied after exposing the polymeric alkylene layer of a wrapper to corona discharge. The seal integrity was determined by checking for fiber-tear, one tries to pull apart the sealed layers, which is a marker of a good seal between the layers. Sealed wrappers that do not exhibit fiber tear, when one tries to pull apart the sealed layers, have poor seal integrity.

20

In a control experiment, the seal integrity of untreated wrappers having identical structure was studied. In these control wrappers, the innermost layer of polymeric alkylene was not exposed to corona discharge.

25

The structure of the wrapper from outermost layer to innermost layer was as indicated below.

12 microns non-heat sealable PET layer (ex Garware Polyester, India) /45 gsm poster paper (ex. BILT, Ballarpur, India)/ 12 gsm 100% LDPE layer (LA17 1070 ex. IPCL, India).

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- 12 -

Surface tension of the LDPE layer of the corona treated wrapper was measured and found to be 38 dynes/cm after corona treatment (Test wrapper), while that of the control wrapper was measured and found to be 32 dynes/cm, by the
5 process described below.

Method of measuring surface tension of polymeric alkylene layer.

Surface tension is measured in dynes per centimeter which is
10 commonly referred to as the dyne level of any material.

The method is based on solutions that contain varying proportions of two chemicals, formamide and ethyl cellosolve each resulting solution will have a known surface tension
15 level anywhere from 30 to 70 dynes/cm and testing stations generally have a selection of premixed and labeled solutions on hand.

The test involves applying the solution to the material to
20 be tested.

If the test solution wets the surface for approximately 2 seconds before breaking into droplets, the dyne level of the material is the same as that of the solution being applied.
25 If the solution continues to wet the surface for longer than 2 seconds without breaking up, the dyne level of the material is higher than that of the test solution.

In this case, higher-level solutions are used to continue to
30 test the material until the exact level is determined.

On the other hand, if the solution breaks into droplets in less than 2 seconds, the dyne level of the material is lower than that of the solution being used, and lower-level solutions are used to find the material's dyne level.

5 Optimum results are obtained when the testing is done by starting with lower-surface-tension solutions and working up to higher-level mixtures until the surface-tension level is determined.

10 Alternatively dyne pens could also used in the above manner.

In the experiment, two pieces of the wrapper (approximately 5 sq. cm) were taken and the PET layer of one piece was sealed to the LDPE layer of the other piece with a

15 laboratory Impulse sealer for 5 seconds at a temperature of ~ 200 deg C. When the two pieces were separated from each other by pulling them apart, the following observations were recorded.

20	For Test wrappers	Fiber tear observed
	For control wrappers	No fiber tear observed, sealed pieces could be easily peeled apart.

From this experiment, it was concluded that when the surface
25 tension of the LDPE layer was 32 dynes/cm, the sealing characteristics were not acceptable, whereas, when the same layer was treated with corona discharge so as to increase its' surface tension, in this experiment to 38 dynes/cm, very good sealing characteristics were observed. Therefore,
30 wrappers wherein the layer of polyalkylene is untreated, cannot be sealed by heat sealing means.

The experiment was repeated with the following wrapper;

12 microns heat sealable PET layer (ex Garware Polyester, India) /45 gsm poster paper (ex. BILT, Ballarpur, India)/ 12
5 gsm 100% LDPE layer (LA17 1070 ex. IPCL, India).

Following observations were recorded,

	For Test wrapper	Fiber tear observed
10	For control wrapper	No fiber tear observed, sealed pieces could be easily peeled apart.

Thus it can be concluded that even when the wrapper comprises a heat-sealable PET layer, the layer does not seal
15 to a LDPE layer, whose surface tension is 32 dynes/cm, whereas the same wrapper, when treated with corona discharge to increase the surface tension of the LDPE layer (in this case, to 38 dynes/cm) the wrapper does exhibit good sealing behavior.

20

Example 2

Demonstration of non-bunching of wrappers containing detergent bars, upon storage and transit.

25 Hot detergent bars having temperature in the range of 73 - 75 deg C and penetration value of 29 - 34 mm were wrapped (in envelope format) at a speed of 130 bars/minute in wrappers having the following structure (from outside to inside). The set seal temperature was fixed at 210 deg C

30

- 15 -

12 microns heat sealable PET layer (ex Garware Polyester, India) /45 gsm poster paper (ex. BILT, Ballarpur, India)/ 12 gsm 100% LDPE layer (LA17 1070 ex. IPCL, India).

5 Surface tension of the LDPE layer was 40 dynes/cm.

After wrapping the individual bars in wrappers, they were packed in corrugated paper boxes, (where individual bars were stacked one above the other) and stored (where
10 individual boxes were stored one above the other) as per standard practice.

A week after packaging the bars in paper boxes, a sample size of 5 bars from 20 different boxes was randomly selected
15 (making a total sample size of 100 wrapped bars) to check for evidences of "bunching". The sample wrappers were then inspected to check for any defects.

Observation

20 Good fiber tear was observed on both the side seals and the belly seal, confirming that corona treatment did impart good sealing properties to the wrapper. Out of 100 wrapped bars, only 4 were found to be stuck to each other.

25 It is therefore, evident from the above experiment that wrappers of the present invention have good sealing characteristics, while at the same time, are free from undesirable phenomenon where they stick to each other under the effect of resident heat and stack pressure.

30

- 16 -

Process of making the wrapper

Wrappers of the present invention can be made by any known method or process.

5 A representative process is given below.

Paper, which forms the intermediate layer, is first coated with Polyethylene glycol, a humectant. This coating is allowed to cure for 24- 48 hours. The cured paper is then
10 laminated to a reverse printed film of PET or BOPP with the printing sandwiched in between. This laminate is cured for 24-48 hrs . This laminate is next taken to the extrusion coating line where the paper side is corona treated before extrusion with Polyethylene for getting good adhesion
15 between the paper and the polyethylene .The polyethylene coated laminate is again corona treated on the poly side. The laminate is cured for minimum of 24 hrs before slitting and using.

20 In an alternative process paper is first coated with Polyethylene glycol and the coat is allowed to cure for 24-48 hours. This cured paper is next taken to the extrusion coating line where the paper corona treated before extrusion with polyethylene for getting good adhesion between the
25 paper and the polyethylene. This is allowed to cure for approx. 24 hrs. This polyethylene coated paper is then laminated to a reverse printed film of heat sealable PET or PET or BOPP with the printing sandwiched in between. This laminate is cured for 24-48 hrs. The laminate is again
30 corona treated on the polyethylene side while or before slitting rewinding.

- 17 -

Thus, the present invention provides for heat-sealable wrappers which can be used for wrapping detergent bars. It also provides for wrappers that do not stick to each other during storage and transit and are free from
5 undesirable "bunching" problems.

The novel wrappers hereby meet all the objects of the invention and provide a much desired solution to a long standing problem in the field of detergent bar packaging.

We claim:

1. A wrapper comprising a layer of polyethyleneterephthalate or bi-axially oriented polypropylene and a layer
5 comprising polymeric alkylene with an intermediate layer disposed there between, wherein surface tension of said layer comprising polymeric alkylene is greater than 32 dynes/cm.
- 10 2. A wrapper as claimed in claim 1, wherein said polymeric alkylene is polymeric ethylene or polymeric propylene.
3. A wrapper as claimed in claim 2 wherein said polymeric ethylene is selected from the group consisting of low
15 density polyethylene, linear low density polyethylene, blends of low density polyethylene and linear low density polyethylene, copolymers of ethylene with methyl acrylate or copolymers of ethylene with vinyl acetate.
- 20 4. A wrapper as claimed in claim 2 wherein said polymeric propylene is polypropylene.
5. A wrapper as claimed in any preceding claim wherein said surface tension is from 36 dynes/cm to 50 dynes/cm.
25
6. A wrapper as claimed in claim 5 wherein said surface energy is from 38 dynes/cm to 42 dynes/cm.
7. A wrapper as claimed in any preceding claim wherein
30 thickness of said layer of polyethyleneterephthalate is from 7 microns to 100 microns.

- 19 -

8. A wrapper as claimed in any preceding claim wherein thickness of said layer of bi-axially oriented polypropylene is from 7 microns to 250 microns.
- 5 9. A wrapper as claimed in any preceding claim wherein grammage of said layer comprising polymeric alkylene is from 8 gsm to 50 gsm.
- 10 10. A wrapper as claimed in any preceding claim wherein said barrier layer is made of material selected from the group consisting of paper, paperboard, metallized paper, Aluminum foil, vapor deposited metal layer, nylon or ethylene vinyl alcohol.
- 15 11. A wrapper as claimed in claim 10 wherein said paper is maplitho, poster or chromo paper.
12. A wrapper as claimed in any preceding claim wherein grammage of said barrier layer is from 30 to 200 gsm.
- 20 13. A wrapper substantially as herein described with reference to the examples.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. B32B27/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 176 002 A1 (KUREHA CHEMICAL IND CO LTD [JP]) 30 January 2002 (2002-01-30)	1-13
Y	claims 1-11 examples	1
Y	----- DATABASE WPI Week 200130 Derwent Publications Ltd., London, GB; AN 2001-287574 XP002443900 & JP 2001 064419 A (OKURA IND CO LTD) 13 March 2001 (2001-03-13) abstract ----- -/--	1

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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