A recyclable bag for dry based powders, grains, particulates or aggregates having a minimum single ply of high-density porous paper adapted to be foldably configure into a sealable bag shape wherein at least one ply of high density porosity paper has an adhered layer of a hydrophobic biodegradable material on an external and/or internal side wherein the adhered layer of hydrophobic biodegradable material includes a series of holes, spacing and/or slots within or around the hydrophobic biodegradable material to allow air to pass there through for aeration of the bag during filling of the bag.
RECYCLABLE PACKAGING CONTAINER FOR DRY BASED POWDERS, GRAINS, PARTICULATES AND AGGREGATES

FIELD OF THE INVENTION

[0001] This invention relates to a new unique potentially recyclable high-density porous paper-based packaging container used in the bagging of dry based powders, grains, particulates and aggregates.

[0002] More particularly this invention relates to a high-density porous paper-based packaging container that not only can be suitable for recycling but also inherently adapted to offer adequate protection to achieve moisture proofing of the bag in order to protect the contents therein without the use of a conventional synthetic polymer and/or plastic based liners.

BACKGROUND OF THE INVENTION

[0003] The person skilled in the art would be familiar with a range of substantially dry based powders, grains, particulates and aggregates that for the most part are bagged using high density porous paper so that the product can be sold conveniently to members of the purchasing public in various hardware or trade stores across the country.

[0004] The bagging of the product is required by the very nature of the product contained within the packaging, because as it is for the most part a dry based particulate substance it needs to be sealed well and housed in effective containers so that there is no moisture contamination during storage and transportation which could then inadvertently change the aggregate to a conglomerate of unusable product.

[0005] While it is possible to transport such product in bulk form through the use of large containers and hoppers, this method of delivery is inappropriate for more conventional consumers and trades people who require a more limited amount, often to confined locations where bulk delivery would make it difficult to access and deposit.

[0006] High density poresity paper at least over the last several decades has been the preferred choice of the bags used by such dry based particulates and aggregates suppliers in that the actual filling process of rapidly filling these bags with the products can lead to a significant creation of fumed dust of the product being filled, unless the bags have a certain degree of aeration available.

[0007] As the person skilled in the art will appreciate if the bag has no degree of porosity as the fluidizing step of introducing the particulate product into the bag sees a back draft of air which translates to a certain percentage of the particulate matter released as airborne dust particulate about the filling station.

[0008] Accordingly the paper porosity of the bag has become an important consideration of the type of material that needs to be used for these bags but nonetheless as introduced above there is a competing concern with the use of substantially high-density porosity paper.

[0009] As is to be expected the ability to allow air to be ventilated through the paper bag during filling also provides a suitable opportunity for an exchange between the general environment and the bag, once filled, whether that being during transportation or storage.

[0010] This then presents the opportunity that moisture could permeate or infiltrate its way through the porous paper thus contaminating the bagged dry particulate.

[0011] In order to achieve a greater moisture proofing of these kinds of high density porosity paper-based bags, synthetic polymer and/or plastic base liners have been incorporated that have been successful in providing a protective barrier of moisture infiltration into the bagged product.

[0012] Nonetheless the introduction of the synthetic polymer and/or plastic based liners to these kinds of high density porosity papers has led to its own problems in that the recyclability of such bags has now become quite restrictive, in that the ability of the synthetic polymer and/or plastic liner to self decompose once sent to landfill is extremely limited, which then means that the overall recyclability of these kinds of packaging bags becomes quite restricted and limited as soon as a synthetic polymer and/or plastic liner has been introduced.

[0013] Various solutions have tried to be put forward in order to overcome this dilemma in the use of high density porosity paper-based bags that require the use of synthetic polymer plastic liners to get the required balance level between the ability to allow aeration of the bag during filling but also at the same time to achieve moisture proofing of the bag once in storage.

[0014] Some of these have involved the elimination of the plastic liner and the use of multiple ply high-density porous paper-based bags.

[0015] However up until this stage research suggests that while three and even four ply base high-density porous paper bags may offer enough available aeration during filling of the product into the bag, their ability cost effectively, and from the point of view of ease of manufacturing when constructing the bag during high volume processing remains still significantly cumbersome and expensive.

[0016] Therefore there remains a need in the relevant packaging industry of bagging dry based powders, grains, particulates or aggregates that not only have the inherent capability of being able to adequately self-aerate during the filling of the product during bagging, but also have the ability of maintaining moisture-proofing such that the shelf life of the product within a high-density porosity paper-based bag remains adequate and acceptable, all without the use of plastic or synthetic polymer liners which substantially reduce the effective biodegradability of such high-density porosity based paper bags.

[0017] Accordingly it is an object of this invention to provide a recyclable packaging container for bagging dry based powders, grains, particulates and aggregates for a suitable shelf life with a degree of required moisture proofing and with also the inherent capabilities within the bag material to allow adequate aeration during the filling of the product into the bag.

SUMMARY OF THE INVENTION

[0018] Accordingly in one form of the invention there is provided a recyclable bag for dry based powders, grains, particulates or aggregates, said bag including:

[0019] a minimum single ply of high-density porous paper adapted to be foldably configured into a sealable bag shape to provide a paper-based receptacle for powders, grains, particulates or aggregates,

[0020] wherein at least one ply of high density porosity paper has an adhered layer of a hydrophobic biodegradable material on an external and/or internal side wherein the adhered layer of hydrophobic biodegradable material includes a series of holes, spacing and/or slots within
or around the hydrophobic biodegradable material to allow air to pass there through for aeration of the bag during filling of the bag with powders, grains, particulates or aggregates.

[0021] An advantage of such an arrangement is that for the first time not only is a high-density porosity paper-based bag suitable for use to provide the necessary strength and ability for the paper to breathe during the filling process, but also at the same time there is avoidance of moisture infiltration into the bagged dried product, without any loss of biodegradability.

[0022] Advantageously what has been presented is a biodegradable recyclable paper-based bag that is able to adequately receive such dried particulate based product without any point of filling dust problems and so forth associated with poorly breathable paper but also importantly the competing interest against porosity for aeration and the introduction of moisture has also been eliminated advantageously without the requirement of lining or layering of the bag using conventional synthetic polymer or plastic liners through the use of the introduction of the series of holes, slots or spacing within the hydrophobic biodegradable material.

[0023] In preference the adhered layer of a hydrophobic biodegradable material is adhered to the external and/or internal side of the ply of high density porosity paper as droplets.

[0024] In preference the droplets are sprayed onto the external and/or internal side of the ply of high density porosity paper.

[0025] Rather than rolling, painting or using similar applications to adhere the hydrophobic biodegradable material to the paper, advantageously by spraying on the hydrophobic biodegradable material droplets provide inherent spacing one from the other between droplets, and the degree of spacing can be altered depending on the size of the droplets.

[0026] Selected use of patterned portions of hydrophobic biodegradable material which can be configured preferably say for example as droplets hydrophobic biodegradable material of a certain radius or pixel dimension so that spacing exists between the individual pixel or droplet of hydrophobic biodegradable material for adequate aeration of the bag during the filling process but still the establishment of a hydrophobic biodegradable material coating or layering on the high-density porosity based paper so as to achieve the necessary moisture-proofing to safeguard the bagged contents from moisture contamination thereby providing the necessary required shelf life for the product.

[0027] At the same time once the product has been used given that the bag contains no synthetic polymer or plastic based liner, it can simply be recycled which can include the ability to form part of landfill and so forth as the inherent characteristics of the wax, biodegradable synthetic polymer and/or biopolymer and paper-based ply sheets per se allow biodegradation far greater than other synthetic and polymer based materials.

[0028] In preference the recyclable packaging bag would be made up of an outer ply high-density porous paper and inner ply of high-density porous paper wherein the hydrophobic biodegradable material is adhered to an internal side of the outer ply high-density porous paper.

[0029] In preference the hydrophobic biodegradable material includes a colouring component such that the colour of the hydrophobic biodegradable material can be differentiated from the ply of high density porous paper.

[0030] In preference in one embodiment of the invention the layer of hydrophobic biodegradable material is adhered to an external face of the outer most ply of high-density porous paper of the container in a pattern configured for labelling of the bag.

[0031] Advantageously the hydrophobic biodegradable material could be adhered on as lettering, images and so forth. With the spacing between the letters or images providing that required degree of aeration during filling of the container.

[0032] It is well recognised that there are considerable difficulties in printing indicia such as company branding and manufacturing details on the external surface of the exposed ply of high-density porous paper that makes up the bag.

[0033] Advantageously in this invention the hydrophobic biodegradable material can provide additional functionality over and above those features introduced above, in that the patterned portion of the hydrophobic biodegradable material could be configured to represent the required indicia for the labelling detailing of the bagged product.

[0034] In preference in a further embodiment of the invention the layer of hydrophobic biodegradable material is adhered to areas on a ply of high-density porous paper of the container to re-enforce the strength of the bag in that area.

[0035] An advantage of such an arrangement is that in the past these bags that have the responsibility of filling such dried particulate products are often located in fairly harsh manufacturing environments, such as the processing of quarry products, which could include the bagging of cement and other similar type of pre-mixed concrete.

[0036] Packaging of bag product is often handled using forklifts, pallets, conveyer belts and other unforgiving types of material handling equipment.

[0037] Advantageously the hydrophobic biodegradable material can be preferentially placed in certain locations across the bag or within in the case of multiple ply bags to offer additional functionality over and above, porosity, moisture-proofing and biodegradability, that being strength or rigidity in locations of the bag under high stress during transport, storage and so forth.

[0038] Though the type of hydrophobic biodegradable material is not part of the inventive scope to this invention as any such hydrophobic biodegradable material will suffice in the preferred embodiments discussed above and illustrated herewith, however the hydrophobic biodegradable material may include but by no means limited to, biodegradable synthetic polymers and/or biopolymers, and/or waxes or blends thereof. Biodegradable synthetic polymers may include but are not limited thereto, to blends of emulsified polymers, waxes and polyethylene.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] In order now to describe the invention in greater detail a preferred embodiment will be presented with the assistance of the following illustrations and accompanying text.

[0040] FIG. 1A shows a general perspective view of the preferred recyclable packaging container of this invention with a part cut away view wherein FIG. 1B is a cross sectional view of the part cut away view in FIG. 1A.

[0041] FIG. 2 is a front view and part cut away view of a container as a bag in a preferred embodiment of the invention wherein the biodegradable hydrophobic material is adhered in areas where the bag is more likely to be subjected to stress during handling.
FIG. 3 is a front view of a container as a bag in a preferred embodiment of the invention wherein the biodegradable hydrophobic material acts also as labeling for the bag.

DETAILED DESCRIPTION OF EXEMPLARY VERSIONS OF THE INVENTION

FIGS. 1A and 1B show a preferred embodiment of this invention wherein the recyclable packaging container is a bag (14).

The bag (14) includes an outer ply of high density porous paper (16) and an inner ply of high density porous paper (18).

On the external surface (23) of the inner ply of high density porous paper (18) the hydrophobic biodegradable material (20) has adhered to the external surface (23) as droplets (19).

In between these droplets (19) are a series of spacings (21).

While not shown in the illustrations, when the contents of the bag (22) were received during filling, as the contents (22) are for the most part dry powders, particulate material, aggregates of cement and so forth it is very much a fluid process in the bagging of such material.

Therefore the bag (14) must have a degree of aeration otherwise during the filling process of the contents (22) into the bag (14) the dust of the product being bagged becomes a significant hazard.

While the bag (14) simply could have included a series of perforations on the ply of high density porous paper as introduced above in the problem which this invention addresses, there needs to be a way in which the bag (14) can also keep the contents (22) of the bag (14) free from moisture.

Therefore the application of the hydrophobic biodegradable material (20) which in this instance is on the external surface (23) of the inner ply of high density porous paper (18) as droplets (19) rather than a continuous film or sheet means that the spacings (21) in between the droplets (19) will allow the required degree of aeration to allow air to pass through the spacing (21) as required during the filling of the bag (14) with its contents (22).

As the hydrophobic biodegradable material (20) has been applied as droplets (19) there is the ability to alter the size of the droplet (19) which can affect the available spacings (21) for aeration. What this means is that different bags (14) can have different size droplets (19) and spacings (21) relative to the degree of moisture insulation as opposed to aeration and vice versa.

Certain contents on filling may require a higher degree of aeration which means that the droplets (19) can be of reduced dimensions relative to the spacings (21) when applied and adhered to the high density porous paper.

Alternatively some contents may require an improved moisture barrier and so the diameter of the droplet (19) can be increased to reduce the spacings (21) which allow air to pass therethrough.

Nonetheless the application of the hydrophobic biodegradable material (20) as shown in the embodiment for FIGS. 1A and 1B is just one way in which spacings can be created so as to provide the necessary degree of aeration in amongst the adhered hydrophobic biodegradable material.

As will be discussed in further preferred embodiments in connection with FIGS. 2 and 3 below, spacings have been established in the embodiment for FIGS. 1A and 1B through the application of the hydrophobic biodegradable material (20) as droplets (19).

Nonetheless the hydrophobic biodegradable material (20) can be applied for example in columns or rows across or along the bag (14) separated by columns or rows which are free of any of the hydrophobic biodegradable material (20). In these kinds of preferred embodiments it will be the spacings between the rows and columns of the hydrophobic biodegradable material that provided for the aeration.

It also needs to be recognised that the hydrophobic biodegradable material (20) need not only be adhered to the inner ply of high density porous paper (18).

It could have also been adhered as droplets (19) on the outer ply of high density porous paper (16) to either the external or internal surface of that outer ply of high density paper (16).

The embodiment shown in FIG. 2 focuses on the requirement that in some locations the bag (24) could be subjected to rough treatment. For example the bag (24) may need to be shifted around through the use of a forklift, be dropped onto pallets and even move along conveyor belts where impact and rough handling may be common place.

In these instances the hydrophobic biodegradable material (28), (30) has been located and adhered to the ply of high density porous paper in the areas where rough treatment is expected.

While the hydrophobic biodegradable material (28), (30) shown in FIG. 2 has been adhered as droplets (27) to create spacings (29) which is consistent with the aeration requirement shown in the preferred embodiment in FIG. 1. The general spacing (32) between the two sides of the hydrophobic biodegradable material (28) and (30) also provides a location where aeration is possible.

Hence the spacings (29) created by existing in between the droplets (27) of the hydrophobic biodegradable material (28) and (30) which was applied to the bag (24) can also be achieved by having column (32) such as shown in FIG. 2 to assist in the required aeration that one would expect to come from a ply of high density porous paper.

In the embodiment shown in FIG. 2 the application of the hydrophobic biodegradable material (28), (30) as it also acts as a reinforcement to strengthen the bag (24) in places where is subjected to a greater degree of stress when being handled.

FIG. 3 shows the bag (36) where hydrophobic biodegradable material (38) (40) could be layered on to the high-density porosity paper to create indicia that one would normally equate with labeling of product onto the external ply of these conventional paper bags. While spacings (41) in between the droplets (43) provide aeration points, so to does the spacings (42), (44) and (46) around and within the hydrophobic biodegradable material (38) (40).

1. A recyclable bag for dry particulates such as grains, powders or aggregates, the bag including at least one ply of high-density porous paper foldable into a closable bag shape to provide a paper-based receptacle, wherein:
   a. at least one of the plies has an adhered layer of a hydrophobic biodegradable material on a face thereof, the layer being defined in areas spaced about the face,
   b. the spaces between the areas are configured to allow air to escape through the face within the spaces, whereby air may escape from the spaces during filling of the bag with powders, grains, particulates or aggregates.
2. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material is a polymer.

3. The recyclable bag of claim 2 wherein the hydrophobic biodegradable material is a wax.

4. The recyclable bag of claim 1 wherein the face within the spaces has greater permeability to air than the areas on the face having the hydrophobic biodegradable material adhered thereon.

5. The recyclable bag of claim 1 wherein the adhered layer is applied to the face of the ply as droplets.

6. The recyclable bag of claim 5 wherein the droplets are applied to the face of the ply as a spray.

7. The recyclable bag of claim 1 wherein the adhered layer is defined as droplets of the hydrophobic biodegradable material spattered about the face of the ply, wherein spaces which lack the hydrophobic biodegradable material are defined between the spattered droplets.

8. The recyclable bag of claim 7 wherein the spaces lacking the hydrophobic biodegradable material occupy more of the area of the face of the ply than the spattered droplets.

9. The recyclable bag of claim 1 wherein the areas of hydrophobic biodegradable material are defined by spaying the hydrophobic biodegradable material about the face, whereby one of:
   a. the material-bearing areas, and
   b. the spaces between the material-bearing areas, is finely dispersed within the other at a frequency of several per square centimeter.

10. The recyclable bag of claim 1 having outer and inner plies of high-density porous paper having adjacent faces, wherein the hydrophobic biodegradable material is adhered to at least one of the adjacent faces.

11. The recyclable bag of claim 1 having outer and inner plies of high-density porous paper, wherein the hydrophobic biodegradable material is adhered to an external face of the inner ply.

12. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material has a color different from that of the face of the ply upon which the hydrophobic biodegradable material is adhered.

13. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material is adhered to an external face of an outermost ply of high-density porous paper in a pattern defining alphanumeric indicia.

14. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material is adhered to selected areas on the face of the ply defining one or more of:
   a. the bottom of the bag;
   b. smaller sides of the bag defined between larger sides of the bag.

15. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material is adhered to selected areas on the face of the ply defining opposing sides of the bag, with the selected areas being spaced by regions lacking the hydrophobic biodegradable material.

16. The recyclable bag of claim 1 wherein the hydrophobic biodegradable material rests atop or beneath at least a major portion of the area of the bag.

17. The recyclable bag of claim 1 defining a closed bag having an internal volume, wherein at least a major portion of the internal volume is filled with dry particulates.

18. A recyclable bag for dry particulates such as grains, powders or aggregates, the bag including a ply of high-density porous paper which:
   a. extends across at least a major portion of at least one side of the bag, and
   b. has opposing faces, at least one of the faces bearing hydrophobic biodegradable material defined in areas spaced about the face, wherein the spaces between the material-bearing areas have greater permeability to air than the material-bearing areas.

19. The recyclable bag of claim 18 wherein the spaced areas of hydrophobic biodegradable material occur at a frequency of several spaced areas per centimeter across at least a portion of the face.

20. A recyclable bag for dry particulates such as grains, powders or aggregates, the bag being formed of one or more layers of high-density porous paper, each layer having opposing faces, wherein at least one of the layers has hydrophobic biodegradable material defined on at least one of the faces thereof as spattered droplets of the hydrophobic biodegradable material, wherein spaces which lack the hydrophobic biodegradable material are defined between the spattered droplets.

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