

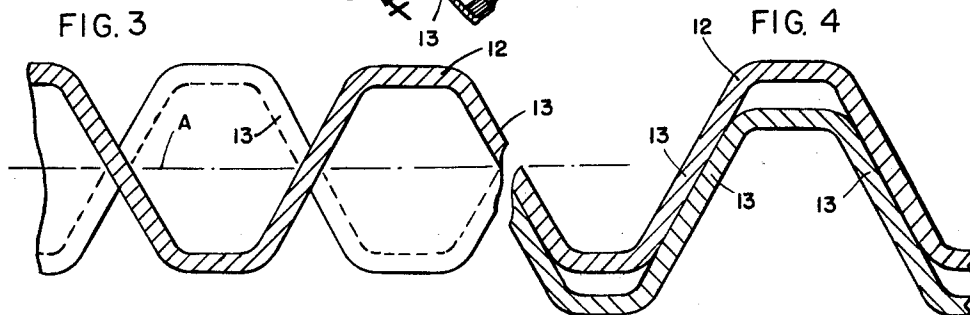
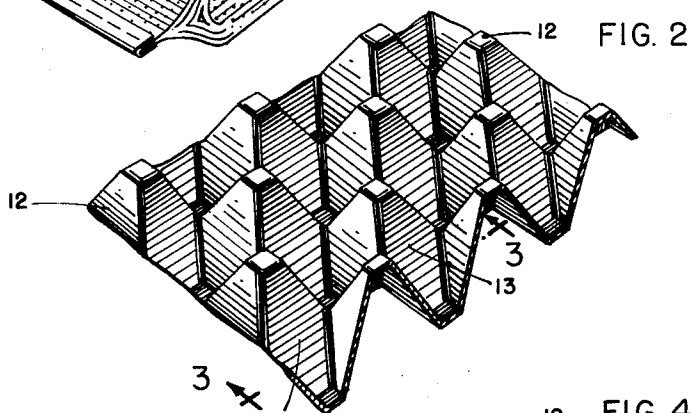
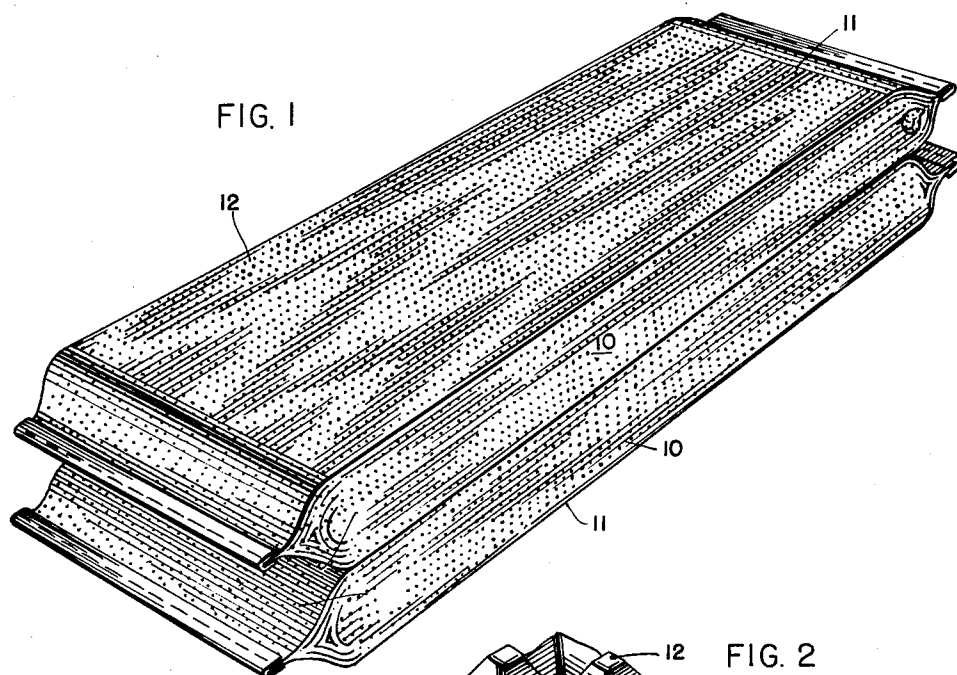
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NON-SLIP BAG

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NON-SLIP BAG

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This application relates to bags made of paper or other flexible sheet material and more particularly to such bags having a treated outer surface for minimizing slippage between the surfaces of filled bags when stacked upon each other for storage or transportation.

Heretofore, great difficulty has been experienced in stacking filled bags, such as bags made on non-porous flexible sheet material and utilized for containing grain, feed, cement and the like, to sufficient heights to afford efficient warehousing and portage because of the fact that these bags having comminuted or granular contents, are characterized by rounded sides and there is a tendency for the bags to slip relative to each other when stacked to any appreciable height. This factor is of great importance where materials handling is effected mechanically and pallets or skids are employed. Attempts have been made in the past to remedy this condition by roughening the surfaces of the bags, or by corrugation, to increase the coefficient of friction and thereby diminish the possibility of slippage. These attempts have been unsuccessful for many reasons, among which is the reason that the contiguous surfaces of the stacked bags do not interlock in all directions and the coefficient of friction of the material of which the bag is made may vary directly with the humidity of the surrounding atmosphere.

With this in mind, therefore, a primary object of the present invention is to provide a bag of the stated type wherein the confronting surfaces of the stacked bags are formed to interlock each with the other effectively in all directions to preclude lateral displacement of the bags with respect to each other under all conditions of handling.

A further object of the invention is to provide a bag of the mentioned character in which the interlocking of contacting surfaces is effected in such a manner that a positive frictional pressure is brought to bear upon formed faces disposed at an angle to each other and to the plane of the bag material.

Another object of the invention is to provide a bag of the type described in which the outer surface of the side walls is embossed to form outwardly projecting nodules for interlocking engagement with correspondingly formed depressions or female nodules projecting inwardly in the same direction from the plane of the side wall of an adjacent bag.

A still further object of the invention is to provide a bag of the stated kind which is characterized by ease of manufacture, durability and effectiveness over long periods of time and under adverse handling conditions.

A specific embodiment of this invention is shown in the accompanying drawings in which:

Figure 1 is a view in perspective of stacked or superimposed bags made in accordance with the present invention;

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Fig. 2 is a greatly enlarged fragmentary perspective view of the side wall surface of one of the bags shown in Fig. 1 illustrating the improved formation thereof.

Fig. 3 is a greatly enlarged elevational view, in section, taken substantially on line 3—3 of Fig. 2; and

Fig. 4 is a similar enlarged vertical sectional view showing the side walls of adjacent bags in the position they assume when stacked and interlocked.

Referring now to the drawings and more particularly to Fig. 1 there is shown two superimposed bags 10 which have opposed side walls 11 embossed with nodules 12 for interlocking engagement of the surface of one bag with a corresponding surface of an adjacent bag. These nodules may take the form of hemispherical embossments projecting from one or both sides of the plane of the paper, or embossments of rectangular configuration arranged in a similar manner. The material of which the bags are composed is desirably flexible and impervious, such as paper or the like but may also be a film of plastic, such as polyethylene, cellophane, glassine or the like.

According to the present invention, however, these embossments desirably take the form of truncated pyramidal nodules 12, of rectangular section, extending outwardly from each side of the plane of the paper, indicated by the dot-dash line A, as shown in Figs. 2 and 3. As illustrated in these figures, the nodules 12 projecting from the plane of the paper in one direction are spaced each from the other both laterally and longitudinally, and joining these nodules are similarly formed nodules extending in the opposite direction from the plane of the paper. This particular configuration was selected because of the fact that it was determined that by so forming the nodules the surface friction of the bags would be increased to the optimum extent without destroying the physical properties of the paper, as by tearing or the like. In particular, the presence of angularly disposed faces 13 which are engaged by similar faces on the mating nodules of an adjacent bag precludes relative displacement of the bags in any direction regardless of the direction in which the contained materials may flow as a result of vibration or handling of palletted bags. In addition, it was found that this conformation had a tendency to retain its shape over long periods of time under all conditions of use and atmospheric humidity variations.

It was also discovered that embossments of a particular dimension and angularity resulted in the optimum coefficient of friction without unduly weakening the paper. In particular, the depth of embossment for optimum operating condition is approximately $\frac{3}{4}$ of an inch in each direction from the plane of the paper. In other words, the total distance from the bottom of one embossment to the top of the adjacent embossment should be in the neighborhood of $\frac{3}{2}$ of an inch. It is also desirable that the nodules be in the order of $\frac{3}{32}$ inch square in their mean dimensions, that is, in the plane of the flat sheet. In addition, it is preferred that the distance between the nodules at their mean dimensions be $\frac{3}{32}$ inch and that the inclination of the nodule side walls be substantially 60° from the plane of the flat sheet.

Referring now to Fig. 3, it will be seen that the nodules 12 are provided with side walls which are preferably formed to lie at an angle to the plane of the paper of approximately 60° . Since the paper has a tendency to spring back to some extent after leaving the embossing process, the angle of the side walls is initially formed at approximately 70° from the plane of the paper. In this figure the nodules or embossments are shown in their normal and preferred form. Also, as shown, the corners

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of the meeting faces 13 of the nodules 12 are desirably rounded to eliminate sharp edges that would otherwise have a tendency to tear or break in the process of formation, or crush and wear during the course of use. To this end also, the pyramidal nodules are truncated, as shown clearly in Figs. 2, 3 and 4.

In Fig. 4 is illustrated the embossments in the position they assume while in use and the manner in which they cooperate each with the other to preclude relative slippage. In this position, the side walls of the embossments of one bag flatly engage the walls of mating embossments over a relatively large area thereby providing a maximum friction area. Thus when the nodules are interlocked as shown, the confronting side walls positively engage each with the other to afford a firm frictional grip as well as an interlocking engagement. In this pyramidal form of nodule any deformation from the idealized truncated rectangular pyramidal configuration as shown in Figs. 2 and 3 is limited to a restricted area. Because of this fact a nodule of this type is capable of retaining its shape despite relatively large crushing loads and rough and continued usage.

Prior to the formation of the bag and after any desired printing operation the web of material of which the bag is made is fed through embossing rollers the surfaces of which are formed with truncated pyramidal nodules that are spaced both longitudinally and circumferentially. Between these nodules are similarly formed cavities for reception of the truncated pyramidal nodules on the companion roller. The roller nodules have substantially flat surfaces defined by marginal edges which are rounded to preclude tearing or cutting of the paper as it passes between the rollers.

The faces of the roller nodules are desirably disposed at an angle of approximately 70° so that the nodules formed in the side wall of the bag are initially disposed at this angle. But, since there is a tendency for the bag material to resist deformation the material is inclined to spring back and return to a repose position in which the angularity of the formed nodule surfaces becomes approximately 60° from the plane of the paper, which angle we believe to be the optimum for maximum efficiency.

Thus, the bag of the present invention is provided with an outside surface which precludes relative sliding movement between adjacent superimposed bags containing granulated or comminuted material and the configuration of the nodules on the surface of the bag side walls effectively and efficiently withstands the crushing loads normally encountered during handling and stacking of the filled bags. In these pyramidal nodules flat surfaces are presented for engagement with corresponding surfaces of a superimposed bag with the result that a positive frictional interlocking engagement is afforded and inadvertent displacement in any direction in a horizontal plane passing through the juncture of mating nodules is prevented. The arrangement of the nodules in a checkerboard pattern, so that the meeting nodules assume a male and female relation, contributes substantially to this result.

Although but one specific embodiment of this invention is herein shown and described it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims:

We claim:

1. A non-slip bag made of sheet material comprising a casing having outer side walls, each of said side walls having the major portion of its outer surface area comprising a plurality of embossments in the form of truncated pyramidal nodules extending outwardly in alternately opposite directions from the plane of the sheet material in a checkerboard pattern and adapted to be received in similarly formed mating embossments on the surface of an adjacent bag to maintain said bags in a

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predetermined position when filled and superimposed one upon the other.

2. A non-slip bag for containing flowable comminuted or granular materials comprising an exterior casing of flexible sheet material having an overall surface configuration comprising side walls, each of said side walls having a plurality of laterally and longitudinally spaced embossments extending outwardly in one direction from the plane of the side wall and a plurality of alternate laterally and longitudinally spaced embossments extending inwardly in the opposite direction from the plane of the side wall, said embossments being in the form of truncated pyramidal nodules adapted to mesh with a correspondingly embossed surface of a superimposed bag for preventing inadvertent relative displacement therebetween.

3. A non-slip bag for containing comminuted or granular materials comprising a casing of flexible sheet material having side walls, each of said side walls having a plurality of laterally and longitudinally spaced embossments extending outwardly in one direction from the plane of the side wall and a plurality of alternate laterally and longitudinally spaced embossments extending inwardly in the opposite direction from the plane of the side wall, said embossments being in the form of truncated pyramidal nodules having side surfaces disposed at an angle of substantially 60° from the plane of the side wall.

4. A non-slip bag for containing comminuted or granular materials comprising a flexible casing having side walls, each of said side walls having a plurality of laterally and longitudinally spaced embossments extending outwardly in one direction from the plane of the side wall substantially $\frac{3}{4}$ inch and a plurality of alternate laterally and longitudinally spaced embossments extending inwardly in the opposite direction from the plane of the side wall substantially $\frac{3}{4}$ inch, said embossments being in the form of truncated pyramidal nodules having side surfaces disposed at an angle of substantially 60° from the plane of the side wall.

5. A non-slip bag for containing comminuted or granular materials comprising a casing having side walls of flexible sheet material, each of said side walls having a plurality of laterally and longitudinally spaced embossments extending outwardly in one direction from the plane of the side wall a maximum distance of $\frac{3}{4}$ inch and a plurality of laterally and longitudinally spaced embossments extending inwardly in the opposite direction from the plane of the side wall a maximum distance of $\frac{3}{4}$ inch, said embossments being in the form of truncated pyramidal nodules arranged in checkerboard pattern and having side walls disposed at an angle of substantially 60° from the plane of the side wall, said nodules having mean cross-sectional dimensions of at least $\frac{3}{32}$ inch in the plane of the side wall.

6. A non-slip embossment for the outer surface of a bag-like container made of flexible sheet material capable of being formed, comprising a plurality of alternately raised and depressed nodules arranged in a checkerboard pattern, each of said nodules comprising a truncated rectangular pyramid projecting from the plane of the sheet material and having side surfaces inclined at an angle of substantially 60° from the said plane, said raised nodules being contiguous with adjacent depressed

nodules.

7. A non-slip embossment for the outer surface of a bag-like container made of sheet material capable of being formed, comprising a plurality of alternately raised and depressed nodules arranged in a checkerboard pattern, each of said nodules comprising a truncated rectangular pyramid projecting a maximum distance of $\frac{3}{4}$ inch from the plane of the sheet material and having side surfaces inclined at an angle of substantially 60° from said plane, said raised nodules being contiguous with adjacent depressed nodules, and all of said nodules

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having a mean transverse dimension of at least $\frac{3}{32}$ inch
on each side.

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