My invention relates to a bag of paper or similar material, preferably a valve bag closing automatically, and it concerns more particularly a bag having walls composed of several layers and being closed at one or both ends by means of so-called cross bottoms. It is well known that such cross bottoms are formed by folding and pasting the ends of the bag walls one over the other, thus wholly closing the end of the paper tube which is used for manufacturing the bag.

It has already been proposed to reinforce such cross bottoms by pasting upon a strip of paper or the like, creating thus two connections capable of transferring the tension force from one wall of the bag to the other side, viz.: the direct junction of the two wall ends pasted together and the indirect joint of them by means of the reinforcing strip.

If, however, the walls of the bag are composed of a plurality of layers, the latter form also a plurality of tension ties, but only the outer layers and the inward-one of one side are joined across the bottom of the bag; as before described; the interior layers of the walls missing such connection across the bottom are unable to transfer tension force from one side to the other, and as the bottom of the bag has to endure the maximum of straining, it must be thought uneconomical to compose the walls of a plurality of paper layers, when there is only a limited number of connections in the bottom.

It has, indeed, already been proposed to make the reinforcing strips of stronger stuff, but this is of little advantage, as the strip is fastened but on the outward layers and cannot be secured to the interior-ones.

My invention affords the possibility to transfer the tension force acting in each of the layers composing the bag wall across the bottom from one side to the other, and for this purpose I provide the single layers of each wall connected with each other by pasting, sticking, sewing, riveting or the like. A further improvement according to my invention contemplates the forming of the valve opening and various other objects and novel devices that will be described in the following specification.

My invention also concerns a method of making bags of the type hereinbefore mentioned, which method consists in connecting the single layers forming the wall of the bag by pasting, sticking, sewing, riveting or the like before forming a tube in the well-known manner or afterwards, then clipping bag-lengths of said tube, folding the ends of them to cross bottoms, sticking these, and pasting reinforcing strips upon said bottoms, preferably the connecting of the different layers of the bag wall may be limited on single zones or dots, and at one corner of the bag the reinforcing strip may be lengthened, this lengthening being folded to a tongue tucked into the valve opening.

The invention is illustrated in the accompanying drawings wherein,

Figure 1 represents a plan view of a tubular blank for the bag;

Fig. 2 is a similar view, showing the opposite ends of the tubular blank folded in accordance with the first step of manufacture;

Fig. 3 is another plan view, showing the opposite ends further folded to produce the crossed folds;

Fig. 4 is a further plan view, showing reinforcing strips pasted on the crossed folds;

Fig. 5 is a view in elevation and perspective of the completed bag;

Fig. 6 represents a part diagram and section, taken on the line 6—6 of Fig. 5;

Fig. 7 is a cross section, taken on the line 7—7 of Fig. 5.

Fig. 8 is a cross-section through the bottom or non-valved end of a four-ply bag.

Fig. 9 is a cross section through the bottom or non-valved end of a three-ply bag, showing the crossed folds connected by spots of adhesive and seams;

Fig. 10 is a cross section through the bottom of a non-valved end of a five-ply bag, showing the crossed folds connected by spots of adhesive only; and

Fig. 11 is a part perspective and part sectional view of the top or valved end of a five-ply bag, showing the arrangement of the adhesive spots.

For manufacturing bags according to my invention, I provide the bag material wound on a series of supply rollers from which I draw strips in a well known manner to form the different layers of the wall. Before leading together these strips, I brush with gum or paste over those flanks of them that are to meet with flanks of neighbouring strips in order to connect all layers of each wall with one another when the tag tube is flattened.

In order not too much to stiffen the wall of the bag by the gum or paste spread between the layers, I preferably paste only single parts or dots of every strip and these parts or dots may be thus displaced on the different layers that nowhere the bag is pasted throughout the whole wall.
Besides, I put clasps or pegs between the paper strips before joining them, the points of these clasps or pegs piercing several strips and getting pressed down by the rollers flattening the bag tube which is to be preformed as well known.

Now I provide some cutting arrangement to clip bag lengths from the tube; Fig. 1 represents such a tube blank A. For preforming the bag, I fold both ends B of one side of the blank A securing the clipped edges by means of rivets C and seams D sewn across the whole breadth of the tube blank A, and then I flatten down the corner packets E raising when the blank ends B are folded, so that the shape of the blank illustrated in Fig. 2 is formed.

These edges of the blank are now folded again and passed on one another whereat in one corner of the bag the opening F is let to form the valve in the well known manner. See Fig. 3.

To reinforce the cross bottoms of the bag thus formed I provide gummed strips that are pressed upon the bottoms as shown in Fig. 4. At the closed side of the bag this strip G is a little shorter than the breadth of the tube and covers but the folded edges; on the opposite side, however, one end of the strip H is lengthened, this prolongation being tucked into the valve opening F to strengthen the valve border and the neighbouring portion of the bag bottom.

Moreover, rivets K and a seam L are disposed to join the whole bundle of layers and the strip at this spot. Instead of lengthening the strip the end of which is to be tucked into the valve opening, a separate strip inserted in this opening may be stuck with the exterior reinforcing strip.

The finished bag is perspectively illustrated in Fig. 5 especially for perceiving the valve opening F, while Fig. 6 shows a longitudinal section of it in which for better to recognize the details, only the inner and outer layers of each wall are represented. In the enlarged cross sectional illustration of Fig. 7, it will be seen that in producing the end of the bag, the inner end portions of the opposite multi-layer walls are overlapped one upon the other for a relatively short distance, making a relatively short lap-joint and leaving by far the larger areas of the end portions unstiffened and untrammled one by the other, so that the end of the bag will be capable of ready flexing.

In order to provide for ready flexing without impairing strength, the multi-layers of the end portions, which are bent from the side walls, may be connected at spaced intervals by any suitable adhesive material or gum, and this adhesive material, instead of covering the whole surface of the layers, is applied in spaced apart spots as indicated by the reference character M. As shown in the drawings, these adhesive spots are, in my invention, to alternate or staggered, that is to say, the adhesive spots between the innermost layer of the overlapping end portion and the outermost layer of the lapped end portion are so applied that open spaces appear on either side thereof, the purpose obviously being to produce the lap-joint without impairing the flexibility thereof.

It will further be noted that the outer and inner reinforcing strips H are connected in place by adhesive spots M adjacent to which there are open spaces for free flexing.

As the lap-joint is relatively narrow and as it is located in the center of the relatively large flexible areas, the entire end of the bag from one side wall to the other is freely flexible. Owing to the alternation or staggered system of adhesive spots between the multi-layers of each end portion, between the layers of the lap-joint itself and as well between the reinforcing strips and the layers, the flexibility of the end of the bag is not impaired. Under this system and mode of construction the end of the bag is readily responsive to the shocks which it receives when being filled with material and when being transferred or tumbled from one point to another; it being readily flexible outwardly with respect to the side walls, this bag end will not burst from the sudden shifting of the material or from the compression of air forces within it, when the bag is thrown upon the floor or upon a pile, or when other similar bags are dumped upon it.

Fig. 3 shows the cross section of the opposite bottom of another bag, this bottom having obviously no valve opening and the reinforcing strip securing but the outermost layers of both walls, because the end of the strip cannot be tucked into the interior of the bag. The walls of this bag contain but four layers each, which are also connected by gummed zones M as well as by clasps N, but no sewing nor riveting is provided.

On the contrary, the bundles of only three layers forming the walls of the bag illustrated in Fig. 9 are only sewed by means of threads O throughout all layers and gummed as before.

At last, the layers of the bag which is to be seen in Fig. 10, are connected exclusively by pasting.

In all these figures, the gum or paste spread between the layers is represented by patched zones.

Of course, the invention is not limited to these devices but the single features of it may be arranged in every adapted manner; to connect the different layers of the bag, any other means may be used instead of those hereinbefore mentioned.

Also the method of making bags herein described is to be taken merely as an example and not in any sense as limiting the steps of the operation, for obvious modifications will occur to a person skilled in the art of manufacturing bags.

Keeping the main features of my improvement, various changes in the details may be made without departure from the principle and scope of my invention as defined in the following claims.

I claim:

1. A bag of the character described, comprising a plurality of paper layers, the body of the bag having the form of a tube and the end of the body being crossed to provide a pair of crossed overlapping flaps each including the same number of layers as the body of the bag, adhesive connections affording and maintaining an engagement between the layers of said overlapping flaps for securing such layers together, said connections being consecutively out of alignment transversely of the bag and at their points of engagement with the layers being spaced one from
another, leaving lateral unsecured places to avoid excessive stiffness in the connected layers, and at least one through connection, connecting all of the layers of one flap with all of the layers of the other flap.

2. A bag of the character described, comprising a plurality of paper layers, the body of the bag having the form of a tube and the end of the body being crossed to provide a pair of crossed overlapping flaps each including the same number of layers as the body of the bag, adhesive connections affording and maintaining an engagement between the layers of the individual flaps for securing such layers together, said connections being consecutively out of alignment transversely of the bag and at their points of engagement with the layers being spaced one from another, leaving lateral unsecured places to avoid excessive stiffness in the connected layers, a through connection connecting all of the layers of one flap with all of the layers of the other flap, a reinforcing paper strip lapping over the outermost layers of each of the two overlapping flaps, adhesive connections connecting said strip with said outermost layers at spaced intervals, said strip also being engaged by said through connection.

3. In a multi-layer bag of the type having bottom sections thereof folded and pasted to form a lap joint, characterized by the fact that the lap joint is relatively short to leave relatively long portions of the bottom sections free of lapping engagement and thus untrammeled one by the other for flexing movement, and a flexible strip pasted to the relatively long portions of the sections and to the lap joint for reinforcing the same while preserving the flexibility thereof, the layers comprising the relatively long portions and the lap-joint being with the reinforcing strip, pasted at space isolated points which are out of consecutive alignment transversely of the sections, providing thereby as between consecutive layers, points of attachment alternating with points of no attachment.

4. In a multi-layer bag of the type having bottom sections thereof folded and pasted to form a lap joint, characterized by the fact that the lap joint is relatively short to leave relatively long portions of the bottom sections free of lapping engagement and thus untrammeled one by the other for flexing movement, and flexible strips pasted respectively to the outer and inner faces of the relatively long portions and of the lap joint for reinforcing these parts while preserving the flexibility of the relatively long portions which permit flexing of the lap joint, the layers comprising the relatively long portions and the lap-joint, being with the flexible strips, pasted at space isolated points which are out of consecutive alignment transversely of the sections, providing thereby as between consecutive layers, points of attachment alternating with points of no attachment.

5. In a multi-layer bag of the type having sections thereof folded into lapping relation to form a bottom, characterized by the fact that the lapping area of the bottom sections is relatively short to leave relatively long portions of the sections free of lapping engagement and thus untrammeled one by the other for flexing movement, securing means within the lapping area joining the layers of each section to one another, and also between the sections joining the sections themselves to one another, and flexible means for reinforcing the relatively long portions of the sections while preserving the flexibility thereof, whereby said relatively long flexible portions add to the flexing of the lapping area, said securing means comprising space isolated spots of adhesive which are out of consecutive alignment transversely of the sections, providing thereby as between consecutive layers, points of attachment alternating with points of no attachment.

6. In the method of producing in a multi-layer paper bag a flexible end formed from sections folded from opposite walls of the bag, the steps which consist in attaching the layers of each section at space separated points each of which attaches only two adjacent layers so as to leave at the remote sides of the so-attached layers, spaces intervening between them and the next succeeding layers, and then attaching the sections in overlapping relation at space separated points each of which attaches only adjacent layers of the overlapping sections so as to leave at the remote sides of the so-attached layers, spaces intervening between them and the next succeeding layers of the sections.

7. In the method of producing in a multi-layer paper bag a flexible end formed from sections folded from opposite walls of the bag, the steps which consist in attaching the layers of each section at space separated dots each of which attaches but two layers so as to leave the next succeeding layers of the group unattached in substantially the vertical alignment of such attaching dots, and then attaching relatively small areas of the sections in overlapping relation at space separated dots each of which attaches but two layers so as to leave the next succeeding layers of the overlapping groups unattached in substantially the vertical alignment of such attaching dots.

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