Aug. 16, 1966 R. L. REEVES 3,266,710

MULTIWALL BAG AND METHOD OF MAKING SAME

Filed Dec. 12, 1961

FIG. 2

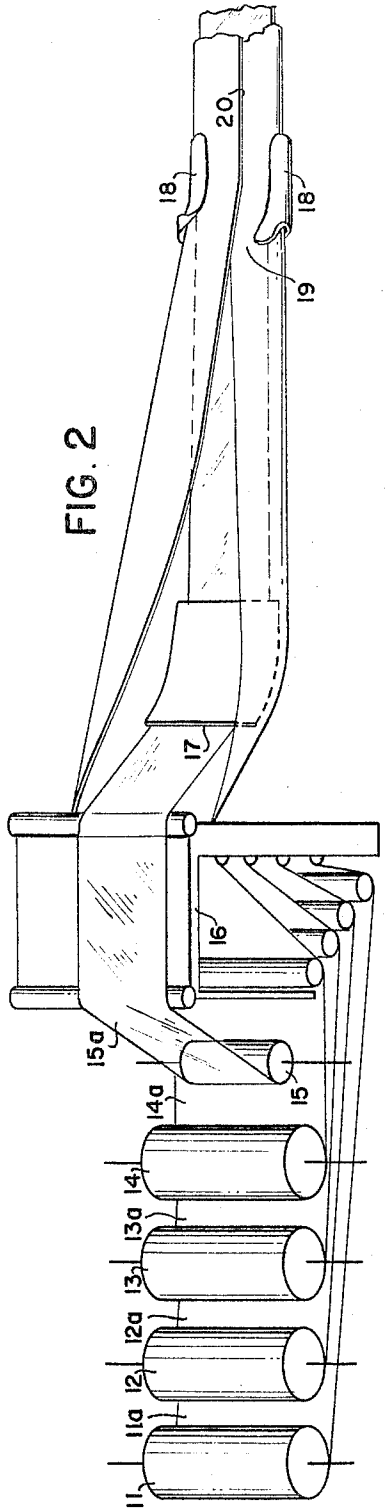


FIG. 1

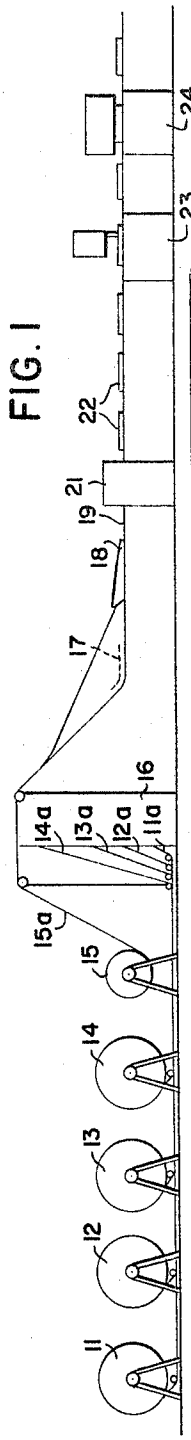
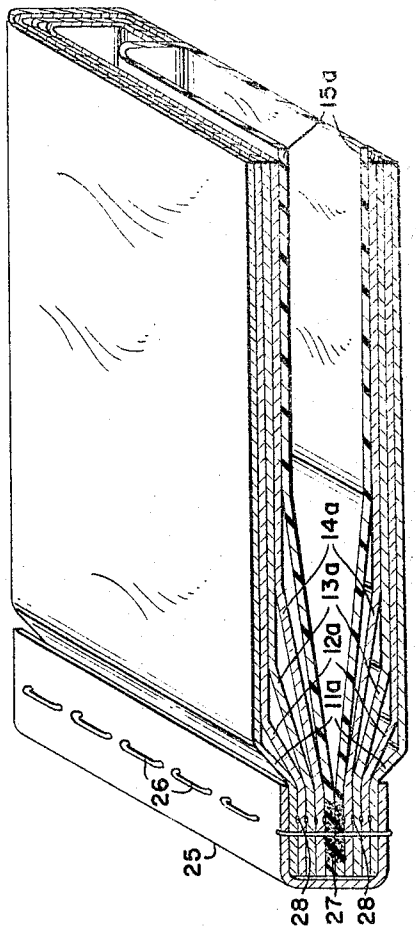


FIG. 3



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United States Patent Office 3,266,710 Patented August 16, 1966

3,266,710
MULTIWALL BAG AND METHOD OF MAKING SAME

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Filed Dec. 12, 1961, Ser. No. 158,829
4 Claims. (Cl. 229—55)

The present invention relates to the manufacture of multiwall tubing and bags. More particularly, it relates to a new and improved method of preparing multiwall tubing and bags from kraft paper and the like in which are positioned substantially free liners of plastic and, preferably, seamless plastic and the products of such method.

It is known to manufacture multiwall tubing and bags from rolls of paper with machines largely continuous and automatic in their operation. It is also known to supply such tubing and bags with captive liners of plastic or specially treated papers by using, as the inside ply of the tubing or bags, a material comprising a paper substrate to which the plastic has previously been laminated or the specially treated paper. Such liners are called for particularly when the materials sought to be contained in the bags are, for instance, deleterious to paper or need to be shielded from ambient moisture by more than paper.

Use of captive liners in multiwall tubing and bags has certain disadvantages. First and foremost of these is the seam in the liner which is necessarily introduced as the tubing is formed about a tube former. Coming as it does on the inside of the tubing, it is not easy to perfect in production or to maintain in use and, when it is less than perfect, it provides or can provide a weakness in the tubing, or the bags made therefrom, throughout its length and immediately adjacent the material sought to be contained or insulated thereby. Special pastes or glues and care at the tube former also present problems.

It is known to manufacture multiwall tubing and bags from rolls of paper with machines largely continuous and automatic in their operation and to provide the bags with substantially free liners of plastic or specially treated paper largely by hand or manually. These liners can be seamless along their lengths, at least when plastic is employed, or they can be seamed along their lengths with particular care, so as to avoid the above-noted problem, but, because their introduction into the bags is manually accomplished, it is both time-consuming and expensive.

It is, therefore, an object of the present invention to produce by mechanical means and in a continuous fashion multiwall tubing and bags having substantially free liners.

It is a further object to provide kraft paper multiwall tubing and bags having plastic, preferably seamless, or specially treated paper, but substantially free liners.

It is still another object to provide novel and improved closures for multiwall bags having substantially free liners of a plastic such as a polyolefin.

In accordance with the present invention, at least one and as many as six or more plies of a sheet material such as kraft paper are continuously passed from rolls thereof beneath a tube former and are folded overlappingly upon themselves along opposing sides thereof to form a multiwall tube. The tube is completed by the application of fastening means such as paste between the overlapping portions. As this is done, a tubular liner member, which can be supplied flat from a roll and is preferably seamless, is continuously passed between the bottom of the tube former and the uppermost ply of sheet material in the same direction of travel that the several plies of sheet material are travelling, so as to be enveloped by the multiwall tubing. The two steps of the operation can, therefore, be simultaneous.

In a preferred embodiment of the method of the present invention, the several plies of sheet material have paste or glue applied by conventional means at intervals along their lengths and on their upper sides. This can be done before they are advanced to the tube former. The pattern of pasting is optional, but it generally lies across the path along which the plies are moving. Such pasting, of course, serves to position more or less permanently the plies with respect to one another. It also serves to position the tubular liner member with respect to the uppermost ply and, therefore, with respect to the multiwall tubing as a whole. It does not, however, make the liner member captive to the uppermost ply and multiwall tubing and does leave it substantially free therein.

In connection with this preferred embodiment, the relative dimensions of the enveloping multiwall tubing, the enveloped tubular liner member, and the tube former can be critical under certain circumstances. The types and weights of the materials making up the tubing and the liner member and the tensions at which they are passed beneath the tube former, as well as the degree of freedom it is desired to confer on the liner member within the tubing, are among the factors giving rise to such circumstances. For this reason, the present invention comprehends forming the enveloping multiwall tubing so as to give it an inside width greater than the width of the tube liner member. It also comprehends employing a tubular liner member having a smaller width than the tube former so as to avoid a destructive pinching of the member between the enveloping multiwall tubing and the tube former along its sides. Again, it contemplates the use of a tube former shorter at its discharge end than the average tube former, particularly when a plastic liner member is being employed. The purpose of such a shorter tube former is to avoid having the cross-pasted, overlapping portions of the uppermost ply come down on the former, there to be retarded in their forward progress and to cause unwanted stress on the pasted union of the member and the tubing underneath the former, rather than on the upper surface of the member as it passes from beneath the former.

After the tubular liner member and the enveloping multiwall tubing leave the tube former, the web that they constitute can be cut into predetermined lengths transversely to its line of passage and such lengths can then be supplied with closure means at one or both ends. The aforementioned cross-pasting can form an element of such closure means, but its inclusion therein is critical only in particular cases.

Typical lengths fall in the range of from about 18 to 77 inches and they can be brought off the line at a rate of at least 7500 to 900 per hour when at least two and as many as six rolls of kraft paper ranging in width from about 21 to 61 inches and a flattened, seamless liner member of polyethylene having a width of from about 9.5 to 29.5 inches are fed past a tube former of from about 10 to 30 inches to give substantially freely lined tubing measuring in width from about 10 to 30 inches on the outside of the tubing and from about 9⅞ to 29⅞ inches on the inside of the tubing. It will be understood, however, that such rates depend in good part on many factors such as the number and size of the kraft paper rolls or the like from which the multiwall tubing is formed, the frequency with which such rolls have to be replaced with new ones,

and the time which is lost in splicing in such new ones.

The bags which can be made by suppling the subject lengths with closure means on at least one end can, of course, have a wide variety of dimensions. But it has been found that those bags in which the liner member has a smaller width than the inside width of the multiwall tubing which envelops it have a surprisingly improved strength and, for instance, resistance to damage or destruction in standard drop tests, even when the closure means with which they are equipped involve no more than a simple and conventional sewing operation.

It is, in some cases, possible and preferably to strengthen such sewn bags even further by a conventional heat sealing of the liners when they are plastic along the line of the sewing or above or below such line on the bag end, but it is notable, and this is a typical example, that a bag —made in accordance with the present invention; from one ply of 60 lb. kraft paper, three plies of 50 lb. kraft paper, and a free liner of 2 mil thick and 19.5 inch wide medium density polyethylene; having an outside width of 20 inches and length of 32¼ inches; filled with about 80 lbs. of prilled ammonium nitrate fertilizer; and, closed on its end only with a tape and stitching—performs in drop tests in a manner comparable to or better than other commercially available bags made for the same purpose. It is not entirely clear why this is so, but it seems likely that a substantially free bag liner is more capable of absorbing the shocks of drop tests and of reducing the stresses and strains on its enveloping multiwall tubing and that the present invention affords a noncaptive liner with a higher degree of freedom than has been developed heretofore.

For a better understanding of the invention, reference should be had to the attached drawings in which:

FIGURE 1 shows a schematic diagram of the manufacture of multiwall tubing and bags in accordance with the present invention;

FIGURE 2 shows a schematic diagram in perspective of the operation of FIGURE 1; and,

FIGURE 3 shows a typical bag end closure made in the operation of FIGURE 1.

FIGURES 1 and 2 depict rolls of paper **11**, **12**, **13**, and **14** and a roll of flattened, seamless polyethylene tubing **15** in a line. Respective webs **11***a*, **12***a*, **13***a*, **14***a*, and **15***a* emanating from such rolls are shown passing into or over a cross-pasting station **16**, where webs **11***a*, **12***a*, **13***a*, and **14***a* are cross-pasted on their upper sides by conventional rollers or the like, and, then, being travelled so as to be brought into contact with one another at the top of station **16** and to form a single web of four plies of paper and two thicknesses of polyethylene which are adhered together at intervals by the cross-pasting. Such web is then travelled under tube former **17** with the flattened polyethylene tubular member **15***a* between the bottom surface of the former and the upper surface of the four paper plies.

At tube former **17** and with the aid of tube guides **18**, the multi-ply or layer web is folded over upon itself along its sides, i.e., edges, and about the upper surface of former **17** until such sides overlap to a desired degree. There, with the aid of the cross-pasting on the upper surface of web **14***a* and any paste or the like, which can also be applied at station **16**, along one side, i.e., edge, of such web's upper surface, a multiwall tubing **19** is formed to envelope polyethylene web **15***a*.

As seen more clearly in FIGURE 2, web **15***a* is narrower than webs **11***a*, **12***a*, **13***a*, and **14***a*. Preferably, it is less than half as wide as such webs which are of a substantially equal width. Such dimensioning allows not only for the overlap seam **20** in the multiwall tubing just discussed, but also for a margin on either side, i.e., edge, of web **15***a* between such side and the interior sides of the finished tubing.

Again, as shown in FIGURE 1, once tubing **19** is formed, it can be cut into lengths **22** at cutting station **21** and these lengths can be sewn on at least one of their ends at sewing machine **23** or otherwise provided with closure means at, for instance, heat sealing unit **24**. FIGURE 3 shows such a closure.

In FIGURE 3, webs **11***a*, **12***a*, **13***a*, and **14***a* and tubular member **15***a* are held by tape **25** and stitching **26**. In addition, tubular member **15***a* is heat-sealed at and along the juncture **27** of the stitching and the member and above and below such juncture. The closure is completed with crosspastings **28**, just below or inside of stitching **26**.

What is claimed is:

1. A multiwall bag comprised of at least two plies of sheet material (a) cross-pasted at spaced intervals; (b) enfolded about a plastic seamless tubular member, the enfolding sheet material having an inside width greater than the outside width of the tubular member; (c) cut into predetermined lengths; (d) sewn along at least one end of each such length; and, (e) sealed along such sewn end.

2. In the manufacture of multiwall tubing for bags, the step of continuously passing at least one ply of sheet material under means operable to cross-paste the upper side of each of the plies at spaced intervals; the simultaneous steps of continuously passing the cross-pasted plies beneath a tube former and continuously passing a flattened, seamless tubular member between the tube former and the uppermost ply, the tubular member having a width smaller than the width of the tube former; the step of folding the sheet material about the tubular member, the enfolding sheet material having an inside width greater than the width of the tubular member; the step of cutting the enfolding sheet material and the tubular member into predetermined lengths transversely to their line of passage; the step of sewing the lengths across one of their ends; and, the step of sealing the lengths along such ends.

3. The process of claim **2** in which the tubular member is plastic.

4. The process of claim **2** in which the sealing is achieved by applying heat.

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