

July 9, 1946.

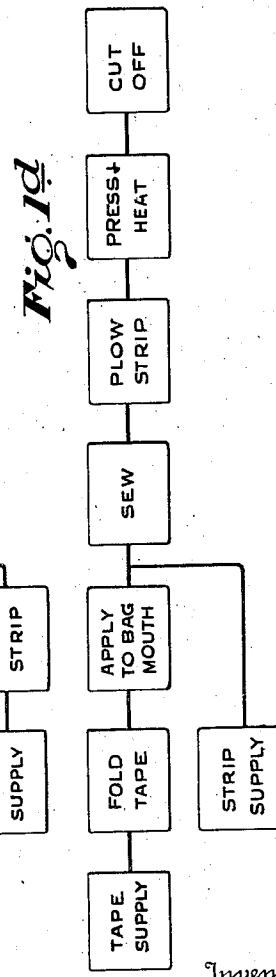
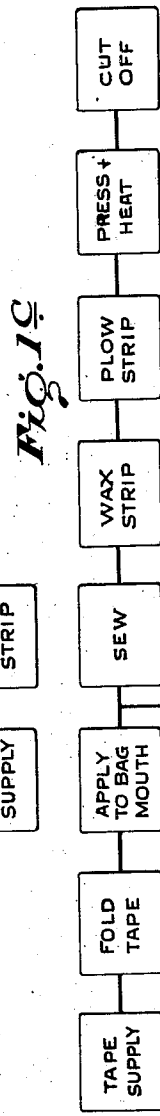
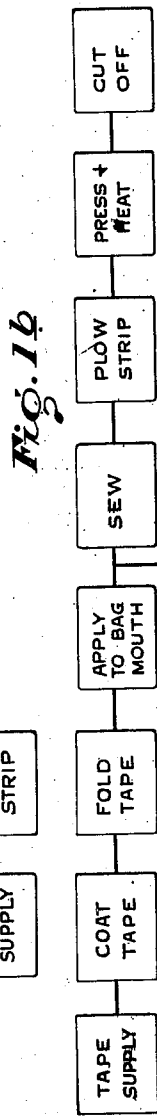
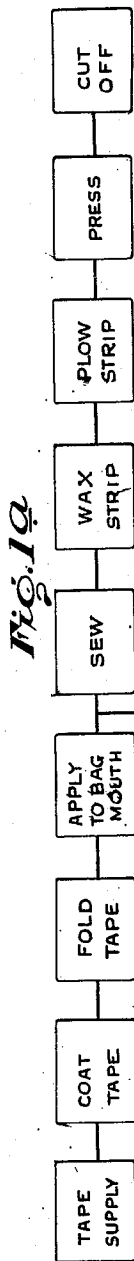
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2,403,756

SEWED BAG CLOSURE

Filed Feb. 1, 1943

2 Sheets-Sheet 1



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July 9, 1946

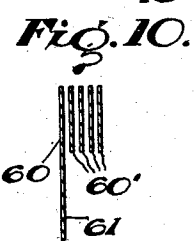
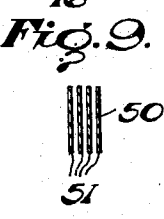
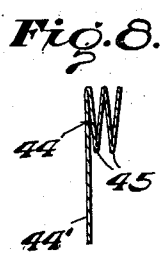
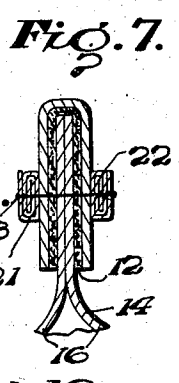
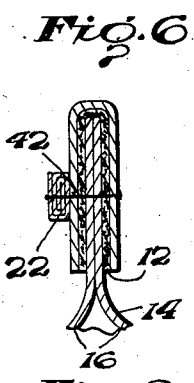
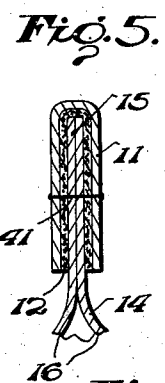
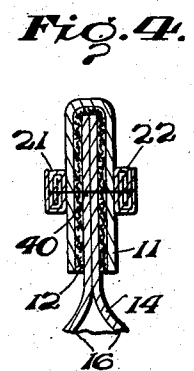
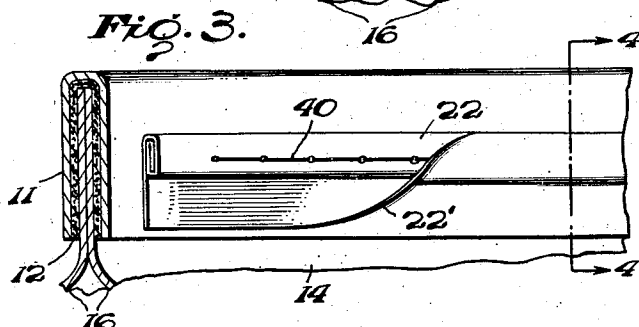
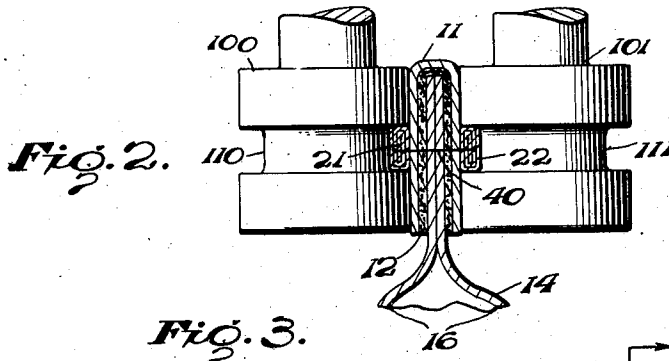
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SEWED BAG CLOSURE

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2 Sheets-Sheet 2



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2,403,756

SEWED BAG CLOSURE

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Application February 1, 1943, Serial No. 474,367

6 Claims. (Cl. 229-62)

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This invention relates to paper tubes or bags, and more particularly to closures therefor.

A type of paper bag widely used in commerce has a closure in the formation of which a line of stitches is sewed through and across the bag at the closure end thereof. For bags of 50# or more capacity, the stitches are usually reinforced to prevent tearing through the paper. This type of closure has many advantages, but where an airtight or even a highly sift-proof closure is necessary, stitching alone will not suffice because of the needle openings.

It has been proposed, heretofore, to fold a tape over the closure end of the bag and then make the line of stitching across said end through both the tape and the bag. It also has been proposed to first make the line of stitching across the closure end of the bag, and then fold and glue a tape upon said end of the bag so as to cover the stitching. In the first instance, the needle holes extend through both the bag and the tape, and while sifting or leakage of material between opposed closure end portions of the bag is largely prevented, substantial sifting or leakage does occur through the needle holes. In the second instance, it is necessary to hold wet glued tape in folded position over the closure end of the bag until the substantial area of glue can "set" or dry sufficiently to secure the tape on the bag. For high rates of production this requires large and expensive machinery, particularly in forming such closures on filled bags which are subjected to immediate handling.

An object of this invention is to provide a way of overcoming the above and other disadvantages heretofore encountered in the formation of sewed type closures for paper tubes or bags.

Another object is to provide methods of making a sewed type paper tube or bag end closure of my improved type.

Another object is to provide a sewed type tape covered end closure for a paper tube or bag, which is airtight, leak-proof and does not require drying of glue in order firmly to secure the closure tape over the end of the tube or bag.

Another object is to provide a sewed type paper tube or bag closure having a folded bag end closing tape coated with an adhesive which will fill the stitch openings when the sewed seam penetrates the tape.

These and other objects will appear from the following description, and in order to more clearly understand the invention reference may be had to the accompanying drawings forming a part of this specification and in which:

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Figure 1—*a* is a diagram illustrating the steps of my preferred method of manufacturing bags;

Figure 1—*b* is a diagram of an alternative sequence of bag manufacturing steps;

5 Figure 1—*c* is a diagram illustrating the application of my method to the closing of filled bags;

Figure 1—*d* is a diagram illustrating my preferred method of forming my closure on filled

10 bags;

Figure 2 illustrates the general principles of heating and pressing as applied in my method;

Figure 3 is a fragmentary perspective view of one stitched type bag closure embodying the invention, a portion of the reinforcing strip being shown unfolded in order to more clearly see the stitching;

Figure 4 is a transverse vertical sectional view on the line 4—4 of Figure 3;

15 Figures 5, 6 and 7 are views similar to Figure 4, showing other stitched type bag closures embodying the invention; and

Figures 8, 9 and 10 are cross sectional views showing alternative forms of reinforcing strips.

25 Although the closure applied to the mouth of the filled bag is usually identical with the closure applied to the bottom of the bag during manufacture, the two closures are formed under very different circumstances and face extremely different treatment. Bags of the class here considered are formed by drawing a number of webs of paper into a continuous tube from which consecutive bag lengths are severed. These bag lengths are, of course, in flattened condition. The bag lengths are placed on conveyors which move them in the direction of their width, usually while lying in a horizontal plane. As the bag lengths are advanced by the conveyor a sealing tape is folded over one end, after which the bag end, carrying the tape with it, passes through a sewing head. In the prior art the presser foot of the sewing head acts to guide a reinforcing member which supports and strengthens the stitching and, of course, lies outside the sealing tape. The sewing head operates continuously, as does the tape applicator and the tape reinforcing member, and the line of stitches connect one bag with the next. After the sewing operation the bags are cut apart.

50 Substantially the same operation occurs in closing the open mouths of filled bags, but the conditions under which the operation occurs are radically different. The bag body is distended instead of being flat; it is in the vertical plane

55 instead of the horizontal; the operation is carried

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out at lower speed and is subject to frequent interruptions. More important yet from the standpoint of effective sealing is the fact that the folded bags are almost immediately handled, as by conveyors or trucks, and are stacked either in warehouses or freight cars. In the manufacturing process the flat bags are merely stacked and there is ample time for any sealing medium to set without being subject to disturbance of the tape.

My closure is designed so as to lend itself to the use of the most efficient methods, both for manufacturing and for the filled bag closing operations. Because the details of the closure are essential to an understanding of my improved methods of forming the closure, the closure itself will be dealt with first.

Bags 14, as herein shown, have walls 16, which, for simplicity of illustration, are shown as single thickness. In practice, however, the bags will usually have walls of from 3 to 6 plies. The bags may, of course, be closed at both ends during manufacture in which case they would be provided with valves suitably located.

Figures 3 and 4 illustrate the fundamental elements of my improved closure. A bag 14 has its walls 16 collapsed together at one end. Over these collapsed walls 16 is folded a tape 11. A layer of thermoplastic material 12 is interposed between the tape 11 and the walls 16. A pair of reinforcing strips 21 and 22 are applied, one on each side of the tape 11 and a line of stitches 40 is sewed through the reinforcing strips 21 and 22, the tape 11, the thermoplastic material 12 and the walls 16. The reinforcing tapes 21 and 22 are formed from strips of paper so folded or prepared that a portion of the width of the reinforcing strip is of multi-ply construction, while the remainder is of single-ply construction. Obviously, however, the requirement is for a differential of thickness and the so-called single-ply portion might comprise two or more plies. In Figure 3 the single-ply portion is indicated as 22'.

Following the formation of the line of stitches 40, the single-ply portion 22' is folded over the multi-ply portion of the strip 22 so as to cover the stitches 40 and is secured in such position by adhesive, preferably of the thermoplastic type. I have referred to the layer of thermoplastic material 12 as being interposed between the tape 11 and the walls 16. In practice, however, this layer 12 will usually be applied as a coating on the tape 11. In any event, the material of the layer 12 will, by means of heat, be brought to a plastic condition such that, under pressure, portions of the material 12 will flow to plug or seal the needle holes produced incident to the sewing of the seam 40.

In the embodiment of the invention shown in Figure 5, the bag 14 has its closure end 15 covered by tape 11 folded and secured on said end as above described. In this case, however, no reinforcing strips are provided. The bag is closed by a line of stitches across the bag through its closure end 15 and the tape 11. One of these stitches is indicated at 41 in Figure 5, and at the closure end of the bag portions of the thermoplastic material 12 are forced into the needle openings to fill and seal them. This closure has the virtue of economy in eliminating the reinforcing strips, while at the same time, by virtue of the thermoplastic material on the sealing tape, it preserves a very high degree of sift-proofness. Where strength requirements are not severe, as in pack-

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aging high bulk materials such as carbon black, this closure has particular merit.

In the embodiment of the invention shown in Figure 6, the bag 14 has its closure end covered by tape 11 folded and secured on said end as above described. In this case, only one reinforcing strip 22 is provided. A line of stitches across the bag through its closure end 15, the folded tape 11, and the reinforcing strip 22 make up the closure. One of these stitches is indicated at 42 in Figure 6. Portions of the thermoplastic material 12 are forced into the needle openings to close and seal them. This closure probably has the greatest all around utility. The reinforcing strip supplies strength on the needle side of the stitching, and it is well known in the industry that the looper side of the stitch requires little, if any reinforcement. For almost all uses except those in which the most extreme strength, plus the most extreme tightness of closure is desired, this closure will be sufficient.

In the embodiment of the invention shown in Fig. 7, the bag 14 has its closure end covered by tape 11 folded and secured on said end as above described. In this case, reinforcing strips 21 and 22 are applied to both sides of the folded tape 11. A line of stitches is sewed across the bag through its closure end 15, the folded tape 11, and the reinforcing strips 21 and 22. One of these stitches is indicated at 43 in Fig. 7. Portions of the thermoplastic material 12 are forced into the needle openings to close and seal them. This closure is somewhat cheaper, both as to cost of material and as to the cost of the closing operation, than is the closure of Fig. 4. This is due to the elimination of the sealing or covering ply of the reinforcing strips. It is, however, equally as strong as the closure of Fig. 4 and should be used wherever exceptional strength is required without a concurrent requirement of exceptional tightness.

In Fig. 8 I show a reinforcing strip 44 having a multi-ply section built up of accordion type folds instead of convolute as in strips 21 and 22. In Fig. 9 I show a reinforcing strip 50 made up of simple laminations 51. In Fig. 10 I show a laminated strip having a single-ply section made up of laminations 60'.

Any of these reinforcing strips may be formed at the time of use, or may be supplied in pre-formed condition. Similarly, the strips may be coated or impregnated, or both with thermoplastic material before being formed to the condition illustrated.

While, of course, the same material could be used both for coating the sealing tape and sealing the last ply of the reinforcing strip, the optimum characteristics of the material for each particular purpose are rather different and, therefore, the best results will be obtained by the use of specialized materials. The thermoplastic material applied to the sealing tape must not only be moisture-proof and have the ability to flow under heat and pressure, but fundamentally should have adhesive characteristics, with the adhesive characteristic enjoying at least equal importance with the qualities of moisture-proofness and flowability. With the reinforcing strip, on the other hand, the adhesive quality may be sacrificed to some extent.

Since the material on the sealing tape may be fairly plastic at the time the needle goes through it, there is some danger of gumming and overheating the needle. This may be overcome by mixing a lubricant such as paraffin with the

thermoplastic material on the sealing tape. Such admixture, however, tends to reduce the desired adhesive properties of the material. In the reinforcing strip, however, it is possible to use wax or paraffin alone and the needle and thread in passing through the reinforcing strip may readily be sufficiently lubricated to dispense with or, at any rate, to minimize the effect of any admixture of lubricating material on the sealing tape.

My arrangement of sealing tape and reinforcing strips has certain special advantages. In the first place, this arrangement provides a complete hermetic seal for the mouth of the bag while, at the same time, permitting use of the familiar rip cord for opening the sewed package. The rip cord is inserted in the looper side of the stitch and despite the overlying ply of the reinforcing strip on that side may easily be removed if a proper thermoplastic, such as wax or paraffin, has been used with the reinforcing strip. Upon removal of the rip cord the reinforcing strip on the looper side may be pulled off, carrying with it the looper stitches and leaving the bag ready to be opened so far as the sewing is concerned. When, as previously described, a tape is sealed not only over the mouth of the bag but also over the stitches, it precludes the use of the rip cord and, therefore, loses considerable utility in the packaging of certain commodities.

A further special advantage of my type of reinforcing tape is that in overlying the stitches the sealing ply of the reinforcing strip provides a lock which, in the event of the failure of one or more stitches, prevents unraveling of the seam as a whole. While the fullest protection is, of course, provided by complete sealing on both sides, sealing of either side by means of the reinforcing strip supplies a very substantial degree of protection.

My closure is the first to make possible a hermetically sealed package for heavy duty use enjoying the strength and advantages of the sewed closure. In short, for the use of this closure the inner ply of a multi-ply bag can be coated with an impervious thermoplastic material and this material, extending to the edges of the ply, will engage and merge with the thermoplastic material applied to the sealing tape so as to avoid any discontinuity of impervious surface throughout the entire interior area of the bag. This is easily accomplished where the thermoplastic is applied to the tape in molten condition. If the tape is precoated and the same effect is desired, it will be necessary either to reheat the thermoplastic material or to apply a solvent, preferably highly volatile, to at least the central portion of the tape so as to effect the merger between the impervious material on the tape and the impervious material on the inner surface of the inner ply.

Figs. 1—a and 1—b are diagrammatic representations of methods of forming my closure which are particularly adapted to the manufacture of bags as distinguished from the closing of filled bags. In each of these cases the treatment of the sealing tape is based on coating the tape with a molten thermoplastic just before the tape is applied to the bag mouth and then carrying out the sewing operation after the thermoplastic material has cooled below the point of fluidity but while it is still sufficiently plastic so that the pressure exerted between the feed dog and the presser foot of the sewing machine will cause the thermoplastic material to flow and thus to plug

or seal the needle holes in the collapsed end of the bag. At the same time, the coating and folding operations should be correlated so that the thermoplastic material is fluid when the tape first comes in contact with the bag mouth. Such fluidity assures adhesion between the tape and the walls of the bag. It also permits the thermoplastic material to engage the edges of the bag walls and thus, in effect, to plug the mouth of the bag. The folding operation is carried out by conventional means comprising an ordinary guide so shaped as to take the tape from flat condition and bring it to U-shaped condition. The bag ends pass through this guide and receive the tape as they move.

The control of the thermoplastic material is based on the speed of movement of the tape and the characteristics of the thermoplastic material itself. The material, whatever its particular characteristics, must be brought to a temperature such that in the time intervening between the coating operation and the engagement of the taped bag mouths with the sewing head the requisite change from fluidity to plasticity will take place. The coating should be so applied as to leave the margins of the sealing tape free of thermoplastic material and thus to avoid contamination of the exterior of the bag by extrusion.

The functions of the sealing tape with its associated thermoplastic material are, first, to prevent egress of the bag contents between the walls of the bag; second, to prevent egress of the bag contents through the needle holes; and, third, to afford a measure of reinforcement for the stitches. As was discussed in connection with Fig. 5, for relatively light loads this reinforcement may be sufficient in itself. At any rate, in the processes as diagrammed in Figs. 1—a and 1—b the sealing tape has received complete treatment at the time it leaves the sewing head.

The primary function of the reinforcement strip is purely a contribution of strength. Bags filled with pulverulent material, particularly when such material is relatively free flowing, behave much as though the contents were a liquid. If a bag thus filled is dropped, there is a tendency for the contents to flow along lines at right angles to the direction of impact and this frequently results in a spreading force tending to separate the bag walls at the closure. This spreading or separating force is resisted directly by the stitches. The thread used in the stitches is of small diameter and under shock loading of this sort would tend to cut through the sealing tape and the bag walls. The reinforcing strip is intended to resist this force and itself to sustain any damage incident to the application of the force and thereby to prevent such damage occurring to the bag walls. This function has been well recognized in the prior art, which also recognizes that the greatest strain occurs on the needle side of the stitch and that the looper side of the stitch inherently affords the support of the looper thread to absorb strains on the stitch and to act very largely as a reinforcing strip. For this reason it is not always necessary to provide extra support for the looper side of the stitch, a point which has been discussed heretofore in connection with Fig. 6.

So far as my reinforcing strip is concerned with the function of contributing strength, its structure is important as increasing the efficiency of the job. The multi-ply character of my reinforcing strip gives greater strength per unit weight of strip than does a single-ply reinforcing

strip, for the same reason that a bag made up of a number of relatively light plies has greater strength than a single-ply bag of the same total basic weight.

In Figs. 1—*a*, 1—*b* and 1—*c* the reinforcing strip is supplied as a roll of paper of fairly substantial width. The paper is drawn from the roll and passes through a conventional folder which brings the strip into the condition illustrated at the left side of Fig. 3 or into the condition illustrated in Fig. 8. The folded strip is then guided so as to overlie one or both sides of the sealing tape, with the multi-ply section of the reinforcing strip underlying the line of stitches. The bag then passes through the sewing head, the needle of which penetrates not only the bag mouth and the sealing tape, but also the reinforcing strip or strips, as the case may be. If only a single strip is used it will, of course, always be placed on the needle side of the stitch.

As illustrated in Fig. 1—*a*, the bag then goes through a waxing device which applies molten wax or other suitable thermoplastic material to the reinforcing strip so as to cover the multi-ply portion and the stitches. The bag then encounters a folder of any suitable type which turns up the free edge (22' in Fig. 3; 44' in Fig. 8) so as to cover the line of stitches. The reinforcing strip is then subjected to sufficient pressure to cause a firm engagement of the free edge with the thermoplastic material.

In Fig. 1—*b* the strip in the supply roll has already been coated or impregnated with wax or other suitable thermoplastic material. It is folded to the desired form, applied to the bag mouth and sewed through. The free edge of the reinforcing strip is then plowed or folded up so as to cover the line of stitches and the strip is then subjected to a combination of heat and pressure which serves simultaneously to soften the thermoplastic material or strip and to bring about firm engagement of the free edge.

In Figs. 1—*c* and 1—*d* the treatment of the sealing tape is altered. Here the tape is supplied already coated with thermoplastic material. It is folded over the bag mouth and sewed through and is then subjected to heat and pressure to soften the thermoplastic material and cause it to flow so as to plug the needle holes in the bag end. This avoids the necessity of maintaining a vat of molten thermoplastic material for application to the sealing tape. This is a highly desirable feature if the operation of the unit is to be subject to interruptions, which is frequently the case in closing filled bags. The treatment of the reinforcing strip illustrated in Fig. 1—*c* is precisely the same as that illustrated in Fig. 1—*a*. In Fig. 1—*c* the waxing of the reinforcing strip, while necessitating the maintenance of a vat of molten wax, serves the purpose of providing pre-heating of the reinforcing strip and thus facilitates the final heat and pressure stage so far as penetration of the heat to the thermoplastic of the sealing tape is concerned. Where the material used to coat the reinforcing strip is a "wax," the objections to interrupted operation are less severe than in the case of a thermoplastic which, on cooling, has considerable adhesive properties.

In Fig. 1—*d* I illustrate my method as it may be carried out with the minimum of equipment. Here both the sealing tape and the reinforcing strip are supplied already coated or impregnated with the requisite thermoplastic material. In addition, the reinforcing strip has been preformed to the condition illustrated in Figs. 8 and 10 and

at the left side of Fig. 3. The sealing tape is folded over the bag mouth, the reinforcing strip is applied alongside and sewing takes place through all the members. The free edge of the reinforcing strip is then plowed or folded so as to cover the stitches and the whole combination is subjected to heat and pressure which simultaneously bring about sealing of the needle holes in the bag mouth through flowing of the thermoplastic on the sealing tape and firmly secures the free edge of the reinforcing strip in place over the stitches.

As has previously been mentioned, it is possible to supply the reinforcing strip completely folded which will be convenient in some instances. In such case there would be a folding step between the strip supplied in Fig. 1—*d* and the point at which the strip is applied to the bag. This folding step would simply peel off one or two plies of the reinforcing strip and bring the strip into the condition illustrated in Figs. 3, 8 and 10.

Naturally, in forming closures such as illustrated in Fig. 6, all of the reinforcing strip plowing or folding steps would be eliminated and the reinforcing strip would consist simply of a multi-ply structure which could be given the convolute form of Fig. 6, the accordion form of the upper portion of Fig. 8, or the laminated form illustrated in Fig. 9.

Fig. 2 shows press rolls 100 and 101 acting upon the closure of Fig. 4. These rolls or equivalent would be used at the heating and pressing stations in Figs. 1—*b*, 1—*c* and 1—*d*. The rolls may be grooved at 110 and 111 respectively to equalize the pressure applied to the reinforcing strip with that applied to the sealing tape.

The application of heat and pressure after the sewing operation may be carried out by means of press rolls, as indicated in Fig. 2, or where the heat must be applied for a considerable time, the closure may be passed between heated caterpillar treads which would have the effect of maintaining heat and pressure for as long as desired, depending on the speed of the bags and the length of the caterpillar. The heat may be applied in any of a number of ways and the heating function may be divorced from the pressure function, that is, the closures may be preheated and then subjected to pressure while cooling. Where the heat and pressure are combined, inductive heating of the metallic pressure units will probably be most convenient but where preheating is desired, resort may usefully be had to the use of infra-red light properly focused to supply maximum heat at the depth desired.

In designing equipment for carrying out the various processes, certain of the steps which have above been described individually and as occurring in sequence would be performed simultaneously. I do not, therefore, intend to be limited to any particular sequence of steps except as such sequence is expressly made a limitation in the subjoined claims.

What is claimed is:

1. A paper bag comprising a tube having a collapsed end, a strip of material folded over said collapsed tube end, a reinforcing strip overlying said folded over strip, stitching through said reinforcing strip, folded over strip and collapsed tube end, and a portion of said reinforcing strip folded and adhesively secured over the stitching.

2. A paper bag comprising a tube having a collapsed end, a strip of material folded over said collapsed tube end, a reinforcing strip over-

lying said folded over strip, stitching through said reinforcing strip, folded over strip and collapsed tube end, a portion of said reinforcing strip folded and adhesively secured over the stitching, said reinforcing strip being positioned on the needle side of the stitching whereby the bobbin thread of the stitching may be readily removed and said folded over material, reinforcing strip and stitching extending beyond the sides of the tube.

3. A paper bag comprising a tube having a collapsed end, a strip of material folded over said collapsed tube end, reinforcing strips overlying said folded over strip, stitching through said reinforcing strips, folded over strip and collapsed tube end, and a portion of said reinforcing strips folded and adhesively secured over the stitchings.

4. A paper bag comprising a tube having a collapsed end, a strip of material coated with thermoplastic material folded over said collapsed tube end, a reinforcing strip overlying said folded over strip, stitching through said reinforcing strip, folded over strip, thermoplastic material and said collapsed tube end, and a portion of said reinforcing strip folded and adhesively secured over the stitching.

5. A method of making a closure on a collapsed

end of a paper tube which includes; folding over said end a strip coated on its inner surface with a plastic adhesive, in fluid state, arranging strip-like reinforcing means along at least one side of the folded strip, sewing the folded strip, the collapsed end of the tube and a portion of the reinforcing means together along and through the same while the adhesive is still plastic, folding the remainder of the reinforcing strip over and upon the stitches and causing a part of said plastic material while in a plastic state to flow into the needle openings produced in the complete assembly.

6. A method of making a closure on a collapsed end of a paper tube which includes; folding over said end a strip coated on its inner surface with a plastic adhesive, in fluid state, arranging strip-like reinforcing means along at least one side of the folded strip, sewing the folded strip, the collapsed end of the tube and a portion of the reinforcing means together along and through the same while the adhesive is still plastic, folding the remainder of the reinforcing strip over and upon the stitches and applying pressure to force portions of said plastic material into the needle openings produced in the complete assembly.

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