Dec. 20, 1949 P. V. SPINNER 2,491,527

METHOD OF MAKING PLASTIC BINDERS

Filed Nov. 12, 1946

FIG. 1

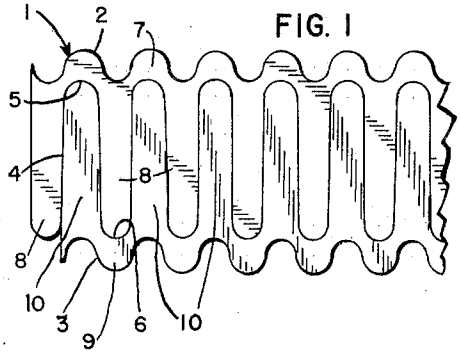


FIG. 12

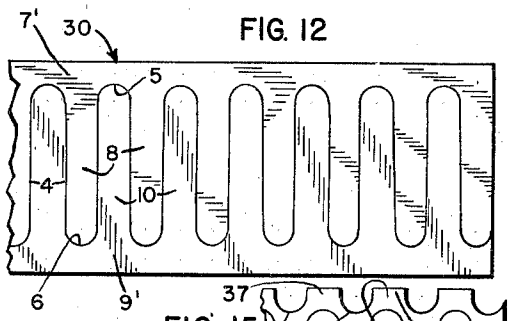


FIG. 15

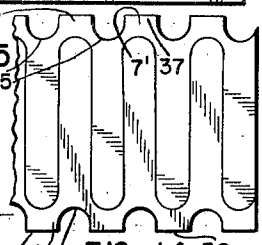


FIG. 2

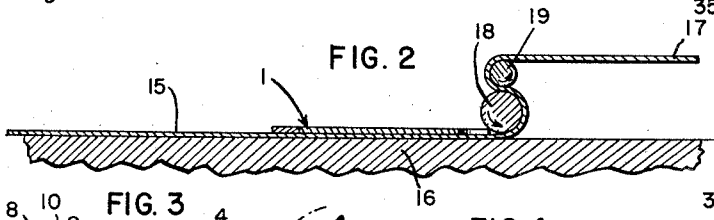


FIG. 14

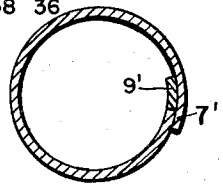


FIG. 3

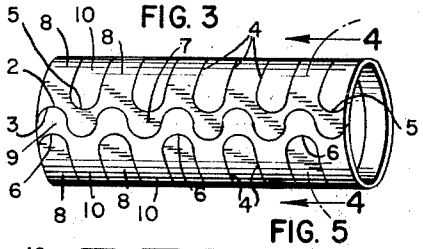


FIG. 4

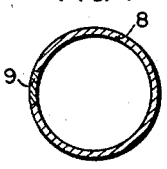


FIG. 5

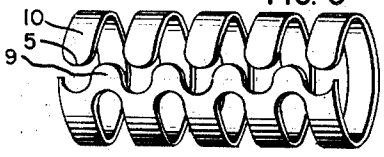


FIG. 13

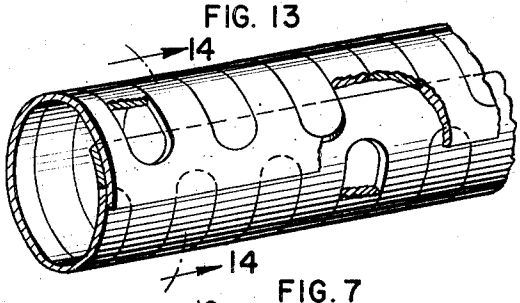


FIG. 6

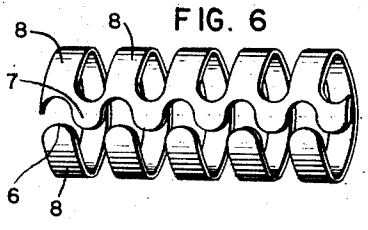


FIG. 7

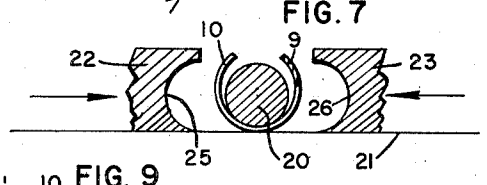


FIG. 8

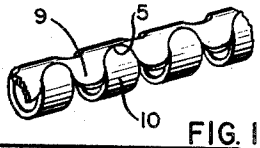


FIG. 9

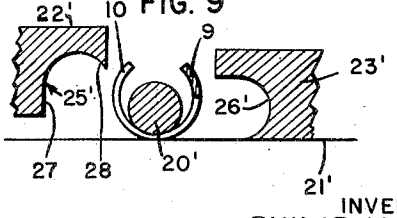
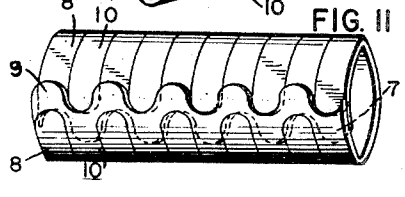


FIG. 10



FIG. 11



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METHOD OF MAKING PLASTIC BINDERS

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Application November 12, 1946, Serial No. 709,357

10 Claims. (Cl. 18—56)

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This invention relates to a method of making binders, more particularly mechanical binders of the type comprising a longitudinally extending back from which a plurality of spaced curled resilient fingers extend, the curled fingers constituting binding rings or loops which are adapted to be passed through aligned perforations in a stack of pages to bind the pages into book form.

It is one of the objects of the present invention to provide an improved method of making a binder wherein the binder is made by a series of operations which will facilitate an increased production of completed binders per hour.

It is a still further object of the present invention to provide an improved method of making a binder wherein partially rolled binders are made, two at a time, by one or more series of operations whereby two partially completed binders may be made in a period of time no greater than is now required to produce one completed binder and wherein the two partially completed binders may then be completed in a very quick and economical manner.

It is a still further object of the present invention to provide an improved method of making binders of the type aforesaid wherein spoilage in the process of fabrication is reduced and wherein the backbone is smooth and free of ridges opposite the respective teeth.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a plan view of a blank sheet which has been cut preparatory to forming a binder in accordance with the present invention;

Figure 2 is a diagrammatic view showing the manner of curling the sheet of Figure 1;

Figure 3 is a perspective view of the curled sheet of Figure 1;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3;

Figures 5 and 6 are perspective views of two incomplete binders which result from the separation of the cut rolled blank of Figure 3;

Figure 7 illustrates, diagrammatically, the manner of completing the binder of Figures 5 and 6;

Figure 8 is a fragmentary perspective view of a completed binder;

Figure 9 is a fragmentary view corresponding to Figure 7 and showing an alternate method of completing the binder of Figure 5 or 6;

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Figure 10 is a sectional view through the binder completed by the process of Figure 9;

Figure 11 is a view corresponding to Figure 3 and illustrating a modified construction;

Figure 12 illustrates an alternate way of cutting the blank;

Figure 13 is a view corresponding to Figure 3, of the blank of Figure 12 rolled to produce another binder;

Figure 14 is a view taken along the line 14—14 of Figure 13; and

Figure 15 illustrates still another way of cutting the blank.

Reference may now be had more particularly to the drawings wherein like reference numerals designate like parts throughout.

In Figure 1 I have shown, at 1, a blank from which the binder of the present invention is made. The blank is formed of a sheet of Celluloid, cellulose acetate, pyroxylin, Vinylite or other plastic resilient material which when heated may be formed to the desired shape and which retains its shape thus formed upon cooling. The blank 1 of Figure 1 is of a generally rectangular shape the opposite longitudinal edges of which are cut along sinusoidal lines 2 and 3 and the intermediate portions of which are cut along uniformly spaced apart lines 4 joined by curved lines of cut 5 and 6, thus forming two binder blanks one of which includes a backbone 7 from which project fingers 8—8 and the other of which includes a backbone 9 from which project fingers 10—10. The blank 1 is cut along the lines aforesaid but the two cut parts are not separated from one another so that the blank 1 still remains in sheet form. In order to hold the two cut blanks together in sheet form certain few spaced apart short lengths of the lines of cut 4, 5 and 6 may be made to go through only a part of the thickness of the blank, leaving short connecting portions, the lines of cut going through the entire thickness of the blank along the rest of the lines of cut. The connecting portions may be exceedingly short in length and where the line of cut fails to penetrate the entire sheet 1 it does penetrate the sheet for part of the thickness. This permits an easy separation of the cut-apart blanks. It is preferable that the point of remaining juncture between the two blanks shall be at the tips of certain of the fingers 8 or 10 and not along the lengths of the fingers.

The blank 1 is then curled lengthwise to tubular form. The curling may be accomplished in any desired manner as, for instance, by means of a machine such as shown in the United States

patent to C. B. Nelson and I. Spinner, No. 2,211,744, issued August 13, 1940. The rolling process is indicated, diagrammatically, in Figure 2. The binder 1 is placed on a flexible sheet 15 of paper, fabric or the like, which is on a heated flat table top 16. The end 17 of the sheet 15 is held fixed, and the opposite end is held taut as, for instance, by means of a weight. The sheet is curved around an arbor 18 and a roller 19. The arbor 18 and the roller 19 are rolled together, as a unit, in a direction leftward as seen in Figure 2, the arbor 18 and roller 19 turning in a counterclockwise direction. As a result of this action the blank 1 is rolled around the arbor 18 and is subjected to heat by the heated table 16 which raises the temperature of the blank 1 an amount insufficient to cause it to become tacky but sufficient to give the blank a permanent set around the arbor 18 when the blank has cooled. The arbor 18 is a circular rod of such a circumference that when the blank 1 is rolled thereon it forms a complete cylinder as shown, for instance, in Figure 3, so that the sinusoidal curve 2 fits into the similar sinusoidal curve 3. When the thus formed circular cylinder on the arbor 18 has cooled it is removed from the arbor.

Thereafter the curled cylindrical form is separated into two parts such as illustrated in Figures 5 and 6. This forms two identical incomplete binders each of which has a backbone from which extend the curled fingers forming almost but not quite a closed loop. The spaces between the free ends 5 of the fingers 10 and the backbone 9 in Figure 5 are exactly equal to the width of the backbone 7 of the incomplete blank of Figure 6, and the spaces between the free ends of the fingers 8 of the backbone 7 of Figure 6 are the spaces that were occupied by the backbone 9 of Figure 5. There is thus produced two substantially identical binders each of which is incomplete in that there is a gap between the free ends of the fingers thereof and the backbone. The binders of Figures 5 or 6 may then be completed in the following manner: Inside the incomplete binder is placed a cylindrical rod 20. The rod is of smaller diameter than the diameter of the incomplete binder. The rod with the binder thereon is then placed in a machine which includes a table 21 and the two heated dies 22—23 which are movable towards and from one another and which include heated concave semicylindrical surfaces 25—26. The dies are then moved towards one another and toward the arbor 20. The die surfaces 25 and 26 force the fingers 10 and the backbone 9 towards one another. The diameter of the rod 20 chosen and the radii of the curved surfaces 25 and 26 are so related to the specific size of the blank that when the dies 22—23 are brought together the free ends 5 of the fingers are moved into a position exactly abutting the backbone 9. This results in the production of a binder such as shown in Figure 8, wherein the binder is of circular cylindrical shape and the edges of the free ends of the fingers 10 abut against the edges of the outside of the backbone 9.

If it is desirable to produce a binder wherein the fingers overlap the backbone, from an incomplete binder such as shown in Figure 5, it is merely necessary to use a cylindrical rod 20' which is of somewhat smaller diameter than the rod 20, and to use corresponding dies 22'—23', the curved surfaces 25' and 26' of which are also of somewhat smaller radii than the radii of the corresponding curved parts of the dies of Figure 7, as illustrated in Figure 9. In this case the cylindrical rod 20' around which the blank of Figure 5 is placed is held stationary, and the heated die 23' is first moved towards the cylindrical rod 20'. This forces the backbone of the binder into intimate contact with the rod 20', the surface 26' being of a radius greater than the radius of the rod 20' by the thickness of the blank. Thereafter the die 23' is retracted and the heated die 22' is moved to the right of the position shown in Figure 9 and then moved downwardly. The die 22' is moved to the right until the straight part 27 of the die has forced the finger 10 against the rod 20'. At this time the upper right hand part of the curve 25' has forced the finger 10 over and above the backbone 9. The right hand end of the curve 25', indicated at 28, is at a height above the rod 20' by an amount slightly more than necessary to clear twice the thickness of the blank material. Thereafter the die 22' is moved downwardly thereby forcing the last 90° of the fingers 10 into a circular shape with the ends of the fingers in firm contact with the portions of the backbone overlaid thereby. Thereafter the die 22' is first raised and then retracted. The rod 20' with the curled binder thereon is removed from the machine and, after cooling of the binder on the rod the binder is removed from the rod. This results in the production of a binder of a cross section such as shown in Figure 10, wherein the fingers 10 overlap the backbone 9.

The binders of Figures 8 or 10 may be made from the incomplete binder of Figure 5 without the use of the apparatus described in Figures 7 and 9, if desired. This result may be obtained by rolling the incomplete binder of Figure 5 on a rolling machine such as shown in Figure 2, but employing a smaller arbor than the arbor that was used to roll the tube of Figure 3, that is, an arbor which is of a circumference in relation to the binder corresponding to the circumference of the rods 20 or 20', as hereinabove described. This undersized arbor is placed in the blank of Figure 5 and then the arbor with the incomplete binder thereon is placed in the machine in the same manner as is the arbor 18 of Figure 2. Thereafter the arbor with the incomplete binder thereon is rolled to the left on the sheet 15 as in Figure 2, carrying the rod 19 with it. This closes the gap in the blank and may produce the binder of Figure 8 or the binder of Figure 10, if a correspondingly smaller arbor is used. This rolling operation may be formed rapidly because the binder is already almost completely formed when the operations commence.

A binder of the type shown in Figures 8 and 10 may be produced from the blank of Figure 1 without use of the steps described in Figures 7 and 9. This may be accomplished by rolling the blank of Figure 1 in the manner illustrated in Figure 2 but using an arbor 18 of a somewhat smaller diameter so that in the rolling action the blank 1 is curled through an angle greater than 360° by such an amount that there is an overlap of the backbone 7 with respect to the backbone 9. For a binder blank 1 of a given width the amount of overlap will be determined by the diameter of the arbor used. If the overlap is exactly equal to the width of the backbone, as shown, for instance, in Figure 11, then the product resulting when the rolled tube is separated into two parts as in Figures 5 and 6 will be two binders such as shown in Figure 8, differing therefrom only in that in one binder the free ends of the fingers will be displaced

radially outwardly of the backbone an amount equal to the thickness of the blank and in the other binder the free ends of the fingers will be displaced radially inwardly of the backbone an amount equal to the blank. In many uses of the binder such displacement is not objectionable.

When it is desired to produce a binder wherein the fingers overlap the backbone then the blank of Figure 1 need not be provided with the outer sinusoidal curves 2—3, the outer edges of the blank being then left straight, as illustrated by the blank 30 in Figure 12. The blank 30 is in other respects the same as the blank of Figure 1. The outer edge of each backbone 7' and 9' is straight. This blank is curled in the manner illustrated in Figure 2 through an arc exceeding 360° by an amount almost equal to twice the width of a backbone, thereby producing two binders, illustrated in Figures 13 and 14, in each one of which the fingers overlap the backbone thereof through an angular extent almost equal to the width of the backbone. These two binders may then be manually separated to provide two binders known in the art.

In Figure 15 I have shown a cut blank which is a combination of the blank of Figure 1 and Figure 12. In that case the straight edges of Figure 12 have been cut to provide curves 35 in the backbone 7' and similar curves 36 in the backbone 9', the adjacent curves 35 being joined by straight portions 37 and the adjacent curves 36 being joined by straight portions 38. This blank may be fabricated in the manner described for the fabrication of the binder of Figure 8. When this blank is curled it is curled to form a cylinder with the straight lines 38 in alignment with the straight lines 37. Thereafter the two blank parts are separated and the fabrication of the binder is completed in the manner previously described.

The fingers of the binders of the present invention are elastic and are adapted to be spread apart for receiving a stack of pages between them and upon release of the fingers they recurl under their own resiliency and enter aligned perforations in the stack of pages to be bound, all as described in the United States Patent to C. B. Nelson and I. Spinner, No. 2,108,136, issued February 18, 1938.

In compliance with the requirements of the patent statutes I have here shown and described a few preferred embodiments of my invention. It is, however, to be understood that the invention is not limited to the precise steps here shown, the same being merely illustrative of the principles of the invention.

What I consider new and desire to secure by Letters Patent is:

1. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines.

2. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines, the plastic sheet being rolled through an angle greater than 360° by an amount at least equal to the width of a backbone so that upon separating the two curled binders each is curled through an angle of at least 360°.

3. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines, the plastic sheet being rolled through an angle greater than 360° by an amount exceeding the width of a backbone so that upon separating the two curled binders each is curled through an angle greater than 360° and the fingers overlap the backbone.

4. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines, the plastic sheet being rolled through an angle of 360° so that upon separating the two curled binders the free ends of the fingers of each curled binder are spaced from the backbone by an amount approximately the width of a backbone.

5. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines, the plastic sheet being rolled through an angle of 360° so that upon separating the two curled binders the free ends of the fingers of each curled binder are spaced from the backbone by an amount ap-

proximately the width of a backbone, then forcing the fingers of the back of each curled binder to a position closing the loop of the curled binder and applying heat thereto in an amount sufficient to cause it to remain in said closing position after cooling of the blank, then cooling the blank.

6. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which comprises providing a resilient flat plastic sheet, blanking the sheet to form two cut apart binder blanks with the fingers of each blank extending between the fingers of the other blank, while retaining the two blanks together in sheet form rolling the sheet into a tube and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two tubular binding blanks along the blanked lines, the plastic sheet being rolled through an angle greater than 360° by an amount exactly equal to the width of a backbone so that upon separating the two curled binders each is curled through an angle of 360° with the free ends of the fingers abutting the backbone in non-overlapping relation thereto.

7. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which method comprises providing a resilient flat plastic sheet, blanking the sheet by a cutting operation to provide two binder blanks with the fingers of each blank extending between the fingers of the other blank, then while retaining the two blanks together in sheet form rolling the sheet into a tube with the opposite edges of the sheet in non-overlapping abutment and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, and then separating the two curled binding blanks.

8. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers which method comprises providing a resilient flat plastic sheet, blanking the sheet by a cutting operation to provide two binder blanks with the fingers of each blank extending between the fingers of the other blank, then while retaining the two blanks together in sheet form rolling the sheet into a tube with the opposite edges of the sheet in non-overlapping abutment and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, and then separating the two curled binding blanks, then forcing the fingers of each curled blank to a position closing the loop of the curled blank and applying heat thereto in an amount sufficient to cause it to remain in said closing position after cooling of the blank, then cooling the blank.

9. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers, which method comprises providing a flat resilient plastic sheet cut to provide two binder blanks with the fingers of each blank extending between the fingers of the other blank, then while retaining the two blanks together in sheet form rolling the sheet into a tube with the opposite edges of the sheet in non-overlapping abutment and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, and then separating the two curled binding blanks.

10. The method of making a plastic binder of the type comprising a backbone from which extend a plurality of curled fingers spaced apart a distance substantially equal to the width of the fingers, which method comprises providing a flat resilient plastic sheet cut to provide two binder blanks with the fingers of each blank extending between the fingers of the other blank, then while retaining the two blanks together in sheet form rolling the sheet into a tube with the opposite edges of the sheet in non-overlapping abutment and applying heat thereto in an amount sufficient to cause it to retain its tubular shape upon cooling, then cooling the tube, then separating the two curled binding blanks, then forcing the fingers of each curled blank to a position closing the loop of the curled blank and applying heat thereto in an amount sufficient to cause it to remain in said closing position after cooling the blank, then cooling the blank.

PHILIP V. SPINNER.

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