Dec. 14, 1965 H. V. BECKER 3,223,436

METHOD OF BINDING BOOKS AND PRODUCT THEREOF

Filed April 22, 1963 2 Sheets-Sheet 1

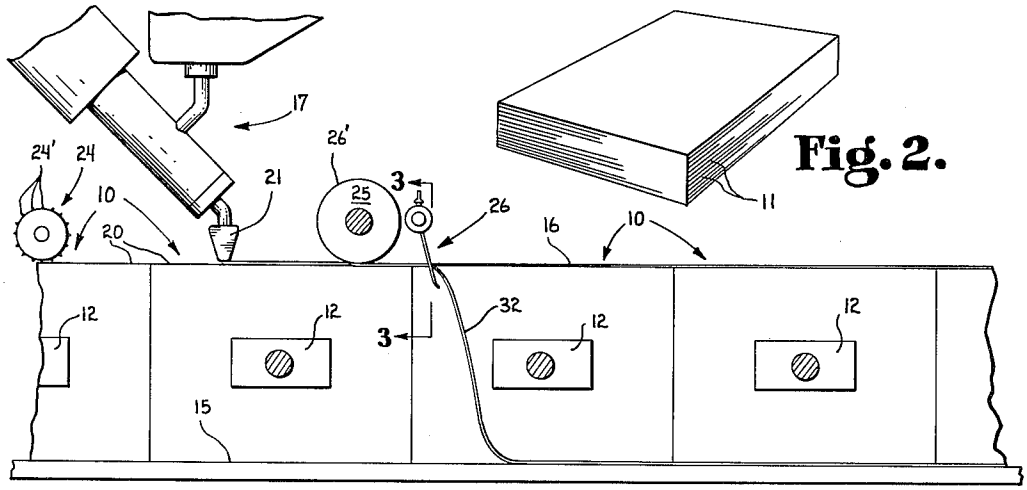


Fig. 2.

Fig. 1.

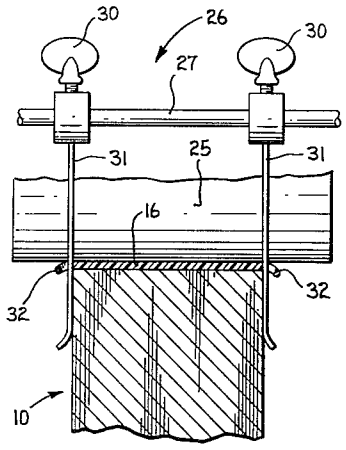


Fig. 3.

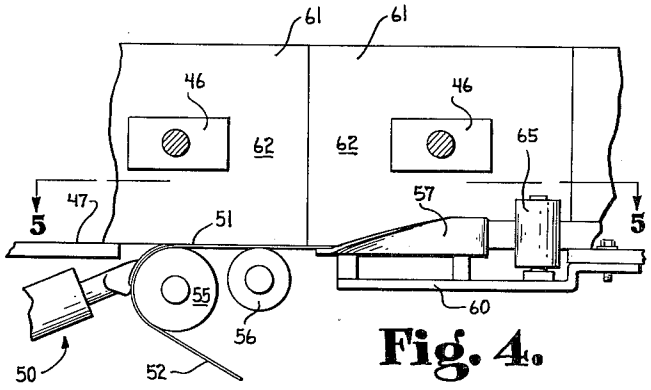


Fig. 4.

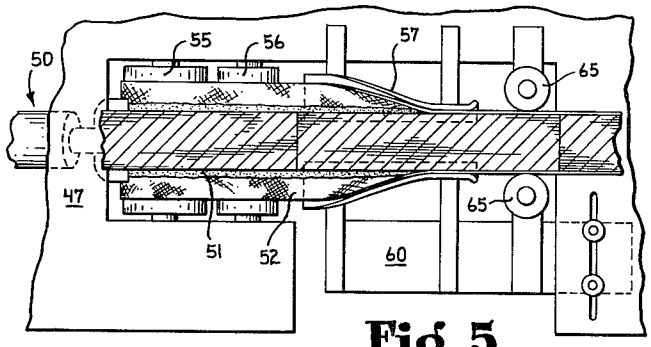


Fig. 5.

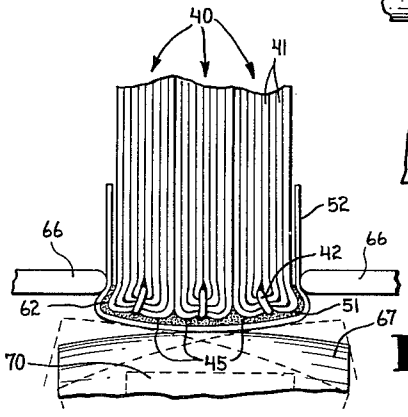


Fig. 6.

INVENTOR.
HOLLIS V. BECKER

BY

Lockwood, Woodard, Smith & Weikart
Attorneys

Dec. 14, 1965 H. V. BECKER 3,223,436

METHOD OF BINDING BOOKS AND PRODUCT THEREOF

Filed April 22, 1963 2 Sheets-Sheet 2

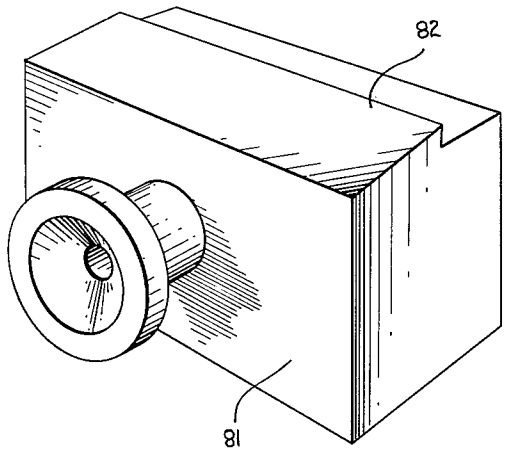
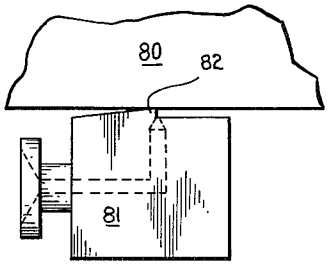


Fig. 7.

Fig. 8.



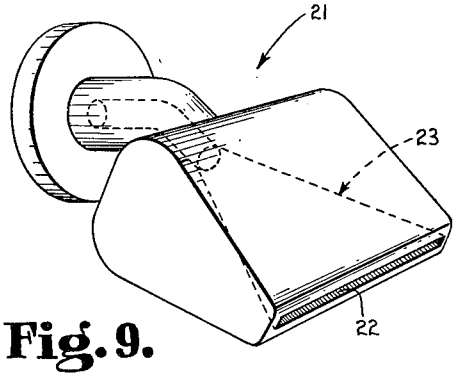


Fig. 9.

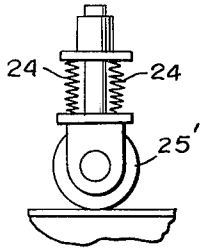


Fig. 11

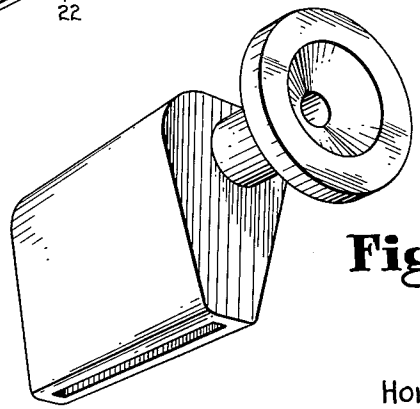


Fig. 10.

INVENTOR.
HOLLIS V. BECKER

BY
Lockwood, Woodard, Smith & Weikart
Attorneys

United States Patent Office 3,223,436
Patented Dec. 14, 1965

3,223,436
METHOD OF BINDING BOOKS AND PRODUCT THEREOF

Hollis V. Becker, 2253 N. Graham St., Indianapolis, Ind.
Filed Apr. 22, 1963, Ser. No. 274,440
2 Claims. (Cl. 281—21)

This invention relates to a book binding construction and method.

One problem present in the binding of books is the providing of a structure in which the back or spline of the book is securely attached to the pages and in which the back or spline is flexible. It is desirable that the back or spline be flexible in order that the pages can be easily separated for viewing the various pages and in order that the separation of the pages does not crack the binding. When the book becomes warm, there is danger with certain proposed bindings that the attachment of the pages to the back or binding will loosen or become deformed. When the book becomes cold, there is danger with certain proposed bindings that the binding will crack.

Consequently, one object of the present invention is to provide an improved book binding and method of making the same, said binding remaining flexible at low temperatures and retaining its highly adherent nature and physical strength at high temperatures.

Another object of the invention is to provide a method of book binding which is relatively convenient and easy to use and which produces a superior product.

Related objects and advantages will become apparent as the description proceeds.

One embodiment of the book construction of the present invention might include a book having a plurality of pages. A web of polyethylene is adhered to the edges of the pages and defines a binding for the book.

One embodiment of the method of binding of the present invention might include the steps of extruding a web of heated plastic such as polyethylene directly onto the edges of a plurality of pages, placing a layer of scrim over said plastic, firmly gripping the plurality of pages adjacent and parallel to said edges by means of a pair of pressure plates, and rocking a roller against said scrim and pages to work the plastic into firm adhesion with said pages.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a side elevation of a plurality of groups of pages and also of apparatus used in the method of the present invention.

FIG. 2 is a perspective view of one of the groups of pages of FIG. 1.

FIG. 3 is an enlarged vertical section taken along the line 3—3 of FIG. 1 in the direction of the arrows.

FIG. 4 is a side elevation similar to FIG. 1 but showing an alternative method of the present invention.

FIG. 5 is a horizontal section taken along the line 5—5 of FIG. 4 in the direction of the arrows.

FIG. 6 is an enlarged section of one of the groups of pages of FIGS. 4 and 5 showing a further step in the method of the present invention, the step of FIG. 6 being subsequent to the step of FIGS. 4 and 5.

FIG. 7 is a perspective view of a die used in a further alternative method of applicant's invention.

FIG. 8 is a view similar to FIGS. 1 and 4 showing one of the steps of the method of FIG. 7.

FIGS. 9 and 10 are perspective views showing further possible or alternative dies usable in connection with the present invention.

FIG. 11 is a fragmentary view similar to FIG. 1 of an alternative embodiment of the invention.

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawing and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring more particularly to the drawings, the present invention may be practiced with either the "patent" type of binding or with the "Smyth" (spline sewn or backbone sewn) type of binding. In FIGS. 1 and 3, the invention is shown as being practiced with the "patent" type of binding in which the backing of the book is secured directly to the individual pages of the book. In FIG. 1, there is illustrated a plurality of groups **10** of pages or signatures **11**. The signatures are made up of single pages which are folded a number of times to produce pages of the size desired in the book. The four edges of the signature are cut off leaving a plurality of pages which are unconnected to one another. A plurality of such signatures are assembled or stacked as illustrated in FIG. 2 and are then gripped between pressure members **12** for movement along the surface **15**. It can be seen that the groups **10** of pages are contiguous to one another so that the layer **16** of binding material is deposited on the groups and there is no excess between the groups.

An extruder **17** is provided for extruding the layer **16** of plastic directly onto the edges **20** of the pages. The extruder **17** is conventional with the exception of its head **21** and may be, for example, 1¼ inch Thermoplastic Extruder, 16:1 L/D Ratio with polyethylene screw manufactured by the Frank W. Egan & Company, S. Adamsville Road, Somerville, New Jersey, or may be a 1½ inch Extruder for Thermoplastics, Model #55, 20:1 L/D Ratio with an A109–PT Series polyethylene screw manufactured by the National Rubber Machinery Company of Akron, Ohio.

A suitable extrusion head for use with the extruder **17** is illustrated in FIG. 9. It can be seen from FIG. 9 that the head **21** has a long, flat, slot-like orifice **22** through which the layer **16** of plastic is extruded. The orifice forms the terminal end of an extrusion passage **23** which initially has a circular cross section and tapers into the long slot-like orifice **22**.

One of the important features of the present invention is the use of polyethylene as the plastic layer binding the book or forming the back thereof. Thus, the layer **16** may be formed of polyethylene which is rolled into the edges of the pages by a pressure roller **25**. The roller **25** may be rotatably mounted a fixed distance from the surface **15** or may be mounted by springs **24** (as shown in the mounting or roller **25'** in FIG. 11) to exert a

constant force against the layer **16** and groups of pages. Preferably, prior to the deposition of the layer **16** upon the groups of pages, there is accomplished an abrading operation upon the edges **20** so that the polyethylene layer is more firmly adhered to the pages. This abrasion may be accomplished by any conventional means or by a powered roller **24** having sharp projections **24'** on its outer periphery. The roller **25** is heated and has an external surface **26'** of highly polished chrome to inhibit any sticking of the plastic to the roller. Adjacent the roller **25** is mounted a trimming structure **26**. This structure includes a transversely extending rod **27** having mounted thereon by thumbscrews **30** a pair of depending elements **31**. The elements **31** trim the excess material **32** from the sides of the layer **16** as the groups **10** of pages are moved rightwardly as viewed in FIG. 1 by the pressure members **12**.

The groups of pages are bound together by the above procedure. If desired, subsequent steps such as attachment of a hard case or soft cover can be accomplished.

Referring to FIG. 4, an alternative embodiment of the invention is illustrated, said alternative embodiment including the use of scrim to reinforce the binding and also including the use of a Smyth binding.

Referring to FIG. 6, the signatures **40** each include a plurality of pages **41** which are connected together by saddle stitching **42** in conventional manner, said stitching being along the edges **45** of the pages with the other three edges of the pages free and unconnected. The groups of signatures are held in adjacent relation in similar fashion to that above described by pressure members **46** and are moved rightwardly across supporting surface **47**. Below the supporting surface **47** is mounted an extruder **50** positioned to extrude a layer **51** of plastic upon a web **52** of scrim. As the scrim passes over a heated roller **55**, plastic is extruded onto the scrim. The scrim with the plastic layer thereon is supported by a roller **56** prior to the passage of the scrim into a guide or die **57** mounted on supporting structure **60**.

The movement of the scrim **52** is coordinated with and equal to the movement of the groups **61** of signatures **40**. As the scrim and plastic move into the guide **57**, they are forced against the outer surfaces **62** of each group in the manner shown in FIG. 6. Rollers **65** mounted on the structure **60** insure that the longitudinal edges of the plastic and scrim are thoroughly adhered to the surfaces **62** of the groups **61**.

After the steps illustrated in FIGS. 4 and 5 have been accomplished, the various groups of pages move on to be gripped by pressure plates **66**. A roller **67** having a barrel shape is mounted for rotation beneath the moving groups **61**. The roller **67** is mounted in such a manner that it rocks between the dotted line positions illustrated in FIG. 6. The roller is also heated so that as it rolls and rocks across the outer surface of the scrim **52**, the plastic is worked into firm adhesion with the signatures **40**. The machinery of which the pressure plates **66** and the roller **67** are a part is conventional and is manufactured, for example, by Smyth Manufacturing Company of Bloomfield, Connecticut. Model No. M–38 is suitable for this application. It should be pointed out, however, that suitable heating means will be incorporated in the roller **67**. Such a heating means is indicated in FIG. 6 by the fragmentary rectangle **70**.

Subsequent to the above described steps of the alternative method, a further step might include the attaching of a cover to the groups **61** by conventional methods.

The above described alternative processes included direct extrusion of plastic to the upper edge of groups of pages and extrusion of a web of plastic onto a roller which carries the web to the book spline. A third alternative method of the present invention can be identical to either of the above described methods except for the differences illustrated in FIG. 8. In the alternative method of FIG. 8, the plastic is extruded directly onto the bottom of the groups **80**. A die **81** is so formed that the groups **80** wipe against upwardly projecting portion **82** of the die.

One important feature of the present invention is the extrusion of plastic directly onto a plurality of pages or signatures to form a book binding. This plastic can be any of the following: polyethylene, modified polyethylene, other polyolefins and modified polyolefins, vinyl-derived homo- and copolymers, vinylidene-derived achieving intimate adhering contact with the paper stock. polymers and copolymers and other thermoplastic resins, or other thermoplastic material.

Preferably, however, the plastic extruded onto the pages is polyethylene. The possible thickness of the final web **51** or **16** is .005 to .150". Preferably, however, the thickness of this web is between .020 and .060". The thickness depends upon the following desirable properties: flexibility of hinging, strength of hinging and achieving intimate adhering contact with the paper stock. If flexibility of hinging is not extremely important, the thickness of the web might be increased, for example, to increase the strength of hinging. In like manner, other variations in thickness of the web might be effected in order to emphasize desired ones of the above properties.

As mentioned, the preferred plastic for use in the present invention is polyethylene. This is true because of the desired property in polyethylene whereby it is flexible at low temperatures and remains firmly adherent at high temperatures. The density of the polyethylene can vary between .915 pound to .940 pound per cubic inch with a preferred range of .915 to .926 pound per cubic inch. The melt index of the polyethylene can vary between 1 and 50 but is preferably between 1.5 and 35. The density and melt index of the polyethylene are selected according to the following considerations. The polymer melt should have low viscosity under application conditions in order to achieve maximum contact with the pages and/or signatures and maximum penetration into the paper. The physical strength of the polyethylene under service conditions should be sufficient to resist sag (creep under load at moderately elevated temperatures). The polyethylene should not be brittle at low temperatures and should remain flexible as above mentioned. It has been found that the above ranges accomplish these desired results.

The extrusion conditions used in the above described process with polyethylene should range between a temperature of 220° F. and a temperature of 800° F. In other words, the temperature of extruded material at the point of extrusion should be between the above values. A preferred range of values, however, would be between 600° F. and 750° F. The selection of extrusion temperature is based upon the fact that at higher operating temperatures, the viscosity of the polyethylene is reduced whereby maximum contact with and around and penetration into the paper is effected. The high processing temperatures suggested as preferred also cause a partial oxidation of the polyethylene which increases the specific adhesion of the polyethylene to the paper fibers and coatings.

From the above description, it will be evident that the present invention provides an improved book binding and method of making the same, said binding remaining flexible at low temperatures and retaining its highly adherent nature at high temperatures. It will also be evident that the present invention provides a method of book binding which is relatively convenient and easy to use. It has been found that the use of the present invention with a patent type binding produces a superior product of the functional quality of a spline sewn or backbone sewn binding.

As pointed out at lines 4–12, column 4, the term plastic used at various locations throughout the application is intended to mean thermoplastic or thermoplastic material.

I claim:

1. The method of continuously binding books comprising extruding a continuous web of polyethylene having a density of from 0.915 to 0.940 pound per cubic inch and a melt index of from 1 to 50 onto the edges of a plurality of assembled pages, the extrusion temperature of the polyethylene being within the range of from 600 to 750° F., whereby partial oxidation of the polyethylene is obtained and the adhesion of the polyethylene to the paper is increased, firmly gripping each assembly of pages adjacent and parallel to said edges, and causing a roller to roll against the polyethylene and pages to work the polyethylene into firm adhesion with said pages.

2. The method of bonding books comprising extruding a continuous web of polyethylene having a density of from 0.915 to 0.940 pound per cubic inch and a melt index of from 1 to 50 onto the edges of an assembly of pages, the extrusion temperature of the polyethylene being within the range of from 600 to 750° F., whereby

partial oxidation of the polyethylene is obtained and the adhesion of the polyethylene to the paper is increased, and causing a roller to roll against the polyethylene and pages to work the polyethylene into firm adhesion with said pages.

References Cited by the Examiner

UNITED STATES PATENTS

1,858,685	5/1932	Semon	281—21
2,579,488	12/1951	Freeman	281—21
2,919,474	1/1960	Cole	18—59
2,968,336	1/1961	Martin et al.	281—21 X
3,071,819	1/1963	Harrison	11—59

FOREIGN PATENTS

1,133,453	11/1956	France.

JEROME SCHNALL, *Primary Examiner.*

LAWRENCE CHARLES, *Examiner.*