

# The Many Different Kinds of Adhesive Bindings - Part 1

By Werner Rebsamen

How times have changed. Just 40 years ago, the majority of hardcover bound books were sewn through the fold (Smyth-sewn). It was considered to be a “sin” to bind and furnish such bound book blocks with an adhesive only. Nobody expected them to hold together for several readings. Even in the early 1970’s, when this author was in charge of getting the world’s first completely automatic book-manufacturing facility going - printing and hardcover binding up to 70 books a minute - we had to use a white, pigmented hotmelt to hide our “sins.” Hotmelts used in paperback bindings had a

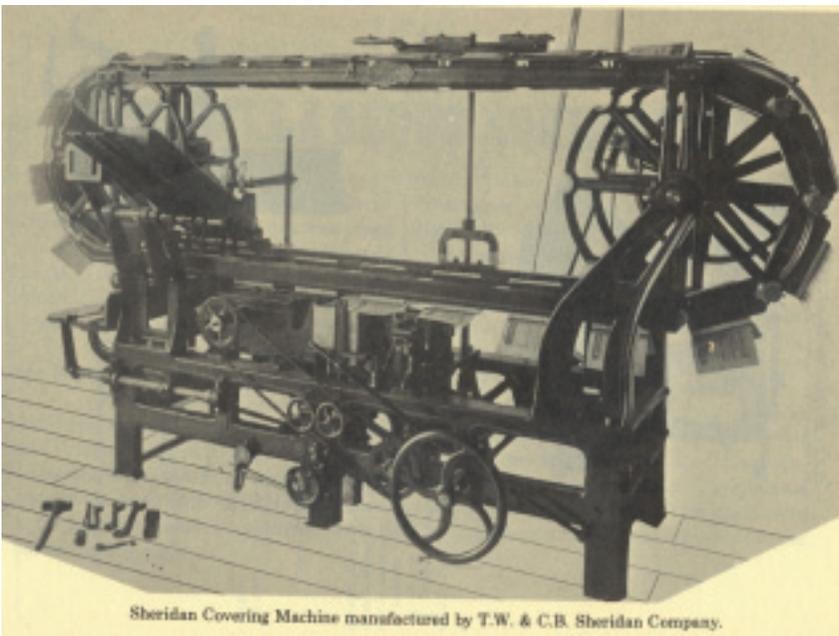
## Where did the word “perfect binding” originate?

Perfect binding is the most commonly used expression for an adhesive binding. Yet, very few people know where this technical description of a binding process started. Other words used in the trade are “patent or stitch-less” binding. Research done for a graduate thesis at RIT traced it all to a patent issued on May 11, 1887, belonging to Horace L. Arnold of Brooklyn, NY. The patent refers to “a method by which several leaves compromising a book or pamphlet are secured to each other preparatory to its receiving its cover.” The

graduate student doing this research was Dr. Richard M. Adams. He studied plants and lignin fibers for his Ph.D., but may have had difficulties finding an appropriate position in this particular discipline. This is most likely the reason he joined RIT’s Printing Management Graduate program. For his graduate thesis, Adams researched paper fibers and spine preparation methods used for adhesive bindings - a thesis which earned him great respect and kudos by experts around the world. As he investigated various types of spine preparation, Dr. Adams found the following patent description for the “perfect” binding method:

*.....Their folded edges are removed in a suitable manner. This may be done by cutting the edges away, but they will preferably be removed by tearing, so as to leave the edges in a somewhat rough and ragged condition. The back edges are then provided with a number of transverse cuts. When the volume is in this condition, there is applied to the back, which contains the cuts, a coating of tempered glue or cement, which contains in a thoroughly distributed condition a quantity of fiber which may be of a suitable kind, either hair or hemp or pieces of string or any suitable materials.*

A most interesting patent description, in a language no longer accepted using Microsoft Word! Since a strong adhesive was not available in earlier times, it looks like fibers were added to the glue to achieve a stronger bond.



Sheridan Covering Machine manufactured by T.W. & C.B. Sheridan Company.

An early picture of a “Perfect” Binder. Picture on file compliments of the late James Averill, V.P. of the former Sheridan Company.

sort of golden color. Although sewn books dominated every day of book manufacturing, this all-new system no longer allowed for this method of binding. Now, thanks to new technologies and, especially with advanced formulations of adhesives, the majority of all books bound are using various kinds of adhesive binding methods. In fact, there are so many types of adhesive bindings it is a difficult task to know them all. The purpose of this article, in two parts, is to sort out the various kinds of adhesive bindings without going into details or specifics.

Having done some research on the history of binding techniques, this writer is of course familiar with processes used before the invention of the “perfect” binding process. The large, printed sheets were folded. Prior to the last fold, a string was pierced through the bind fold from the inside out with the string showing on the inside being approximately 4 inches long. After the individual signatures or sections were gathered, a person holding the book block on the fore edges shook it so that none of the strings remained between the folded signatures. Thereafter, the book block was inserted into a clamp and forwarded to a gluing station, which most likely contained animal or vegetable glue. A rotating brush then directed the sticky strings to the left and right. Covering followed, creating the very first commercial adhesive bound paperback books. Bear in mind, those were folded signatures. The patent issued added spine preparation and, as a result, created the “perfect” binding. As we all know, perfect binding was anything but perfect until the late 1960s, most likely due to the lack of a good, bonding adhesive.

### **Adhesives used for the binding processes**

In order to understand all aspects of adhesive binding, we first need to familiarize ourselves with some of the adhesives used. We will no longer discuss gelatin (animal) or vegetable glues as they are being used only in rare instances like phone books - that is on items which must be able to be recycled 100 percent.

**Hotmelt** is a wax-like adhesive. Similar to a candle, if the wax is heated, it will turn into a fluid. If the heat is taken away, it will coalesce. If a candle is dripping its liquid wax onto a cold surface, the solidification is then almost instant. That is how hotmelt works. The average temperature is approximately 360 degrees Fahrenheit, enough to burn your skin if not handled with caution. Of course, there are many different formulas for hotmelts. Some adhesive companies have informed this writer that they easily number into a thousand different kinds! Bookbinding is only a small market for them. Take, packaging, for example. For this, all hotmelts must be formulated for specific

processes. In print-finishing or bookbinding, hotmelts may be used for high speed magazine and catalog bindings. In addition, they must be designed for a specific adhesive application, that is for the machinery or system used, for example, application via a glue pot or extrusion nozzle. Hotmelt sets or returns into an almost solid state within 2 to 25 seconds.

**PVA** is an abbreviation for Poly Vinyl Acetate. It is a water-based, cold emulsion adhesive, similar to the familiar “Elmers” glue. Again, there are many different formulas. In adhesive binding processes, some are being used as primers in combination with hotmelt or as a straight one or two shot application of PVA’s in the production of quality bindings. Other, high quality PVA formulas are being used for the double-fan process in library binding - adhesives which must meet the tough ANSI /NISO/ LBI Library Binding Standard, Z39.78-2000 specifications.

There are two different kinds of PVA adhesives: homopolymers and internally plasticized co-polymers. Sometimes, the two are mixed together, depending how and for what they are being used. These water-based adhesives take a long time to dry and therefore are not suitable for the high-speed production of books and magazines.

**PUR** adhesives represent a new generation which has solved many problems when binding difficult, glossy papers. These polyurethane adhesives require an expensive application system as some of the fumes generated



*Adhesive binding of softcover and hardcover books in an office environment made easy. Example shown - the Fastbind system.*

*But be careful, do your homework. Supplies such as the pressure-sensitive binding materials needed for a hardcover binding may cost more than a professional binding done by a certified library binder.*

are slightly toxic. However, once the PUR adhesive coalesces, cools and returns into a solid state, the danger is gone. The results are strong and durable bindings. PUR's work very much like a hotmelt but it takes much longer to set. When should PUR's be used? This rather



*Fastbind Desk-Top Adhesive Binder*

expensive adhesive is ideal for glossy papers covered with solid inks or toners. PUR adhesives prevent ink solvent migration. One good example of this is the National

Geographic magazines which used to be side-stitched with heavy wires. PUR conforms to the National

Geographic philosophy that none of their magazines will ever come apart and must be able to be recycled. If the magazines are recycled, the PUR will wash out of the pulp like wire staples. PUR's aging characteristics are 500 years plus.

In summary and valid for all three adhesives discussed, they are used with the following application techniques:

- Pre-applied hotmelt tapes and covers (Desktop systems only.)
- One shot, which means a simple application, using only one glue pot
- Two shot, which means the use of two different glue pots - one usually being a primer
- Extrusion which means application through a nozzle

### **Desktop binding systems**

There are many different kinds of desktop binding systems, the majority of which use hotmelt in one form or another. Attractive assortments of covers which have a strip of hotmelt already extruded into the spine area can be purchased. The sheets to be bound are inserted into the pre-scored covers. The desktop binding system will then reactivate the hotmelt and fuse the sheets and cover together. Other systems similar to the ones used on the DocuTech use a strip of paper or cloth which is coated with hotmelt. The problem with these systems is that for all the

various bulks (thickness of item to be bound), different sizes of covers or strips will be needed. This problem can be solved by using thin sheets of hotmelt. The strips required are cut to size, inserted into the cover, and reactivated with heat. The fusion is the same. Powis, [www.powis.com](http://www.powis.com), describes its hotmelt strip system for a new automated Stitchfree™ Binding machine as "No messy glue pots to clean and maintain."

Some of these binding systems are now suitable for binding hard covers and photo books. To get an idea of all the desk-top binding possibilities, including hard cover binding, visit [www.fastbind.com](http://www.fastbind.com).

Although still rare, some desk-top systems are now available using PVA cold emulsion adhesives. One new German invention by Ribler, [www.ribler-gmbh.de](http://www.ribler-gmbh.de), called the "Junior" binder is coming into the market this fall (Graph-Expo in Chicago). This does feature cold-emulsion, PVA extrusion. The advantages to this are no heat, no smell, a superior lay-flat binding, and best of all, it requires no cleaning up of glue pots. All the operator has to do when finished for the day is wipe off the extrusion nozzle with a moist cloth.

It should be noticed, that, with some exceptions, like premium models of Fastbind and others, most desk-top adhesive binding machines or gadgets do not feature any spine preparation. This may be fine if the paper stock to be bound is uncoated. If slippery, coated papers covered with ink or toners are being bound, this could spell trouble. The new German invention making its debut this fall has an optional, patented spine preparation station to cope successfully with such problems. Since it requires a lot more machinery, the price of the binding machine is almost double. This is the initial investment. What counts afterwards

is the quality produced. In other words, before investing into any such desk-top binding devices, know exactly what you intend to bind. Be careful before you invest. Some mediocre “spine-preparation” systems are simply razor cuts and will not expose the paper fibers like the more expensive systems.

### **Small, one shot adhesive binding systems**

Whereas the desk-top binders are used in office or small in-plant printing environments, the mostly single or multiple-clamp, one shot binders are floor models which already allow some production in small bookbinding environments. These may include library binding facilities which are often asked to bind some soft cover books. Virtually all, without exception, feature spine preparation. The folded signatures are milled in the spine area, the paper fibers are exposed, and often, notches are milled into the spine as well. The prepared book block then automatically moves over a single glue pot which contains hotmelt adhesive at a temperature of approximately 360 degrees Fahrenheit. The covers may be fed into the perfect binding machine manually or the machine is equipped with an automatic feeding device. After adhesive application, the clamp moves the book block over the cover station. The cover, precisely aligned and in register, then moves upward and is pressed onto the spine of the book block which is covered with the adhesive. Two cover breaker blades then nip the sides to assure a uniform, square back. The bound items are then ejected from the perfect binder and, thereafter, are trimmed smooth on three sides.

The very latest options, although still rare for such binding machines, are the use of PUR adhesives. This again, copes with difficult to bind papers, most often heavily coated with solid ink and toners.

### **Commercial adhesive binding machines**

In this category are a huge variety of binding systems. Since the industry binds a variety of items like paperbacks, catalogs, magazines, phone books, text books, and travel guides, all of these products must be bound in a competitive fashion. For example, small



*The all-new Junior adhesive binder does feature an exclusive, patented spine preparation. Note the exposed paper fibers. A unique PVA adhesive extrusion application requires no cleaning-up. A binder ideal for high quality hard- and softcover bindings. (Ribler)*

size paperback books are printed and bound 2-up, which means two books are bound at once.

If a binder is capable of running at a speed of 15,000 books, this will result in a production of 30,000 paperback books every hour! For magazines and catalogs, there are adhesive binding systems which bind up to 18,000 an hour. These heavy duty adhesive binding machines vary, all depending on the work a particular binding facility. Some smaller binding establishments are satisfied with a production speed of just a few thousand per hour. Others invest in mid-range adhesive binding systems, allowing a production of up to 10,000 books per hour, and yet others, invest millions into sophisticated adhesive binding systems capable of a variety of binding styles and high speed productivity.

What kind of adhesive bindings can all these systems offer? In Part Two of this article, to be

## Adhesive Bindings

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featured in the next issue of *ShelfLife*, the following will be explored: spine preparation techniques, one and two shot bindings, the production of book blocks for hardcover bindings with appropriate reinforcements, lay-flat bindings like Otabind, RepKover, Libretto, Swissbind, deep-notch bindings, Burst and Perfo-punch bindings and, of course, double-fan adhesive bindings.

In any industry, technology moves at an extremely fast pace. These binding styles are more evolutionary than revolutionary; however, they do offer constant improvements. All this to enhance the end-use requirements of a product we all love so much—Books! 

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