UNIT 10  BINDING OPERATIONS

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10.0 AIMS

In this unit we shall tell you about the process of book binding. Though nowadays machines have taken over the larger scale binding operations, small editions of books published are still bound by hand. It is important to understand the various steps in binding as the process in hand and machine binding is more or less the same. By going through you will understand the importance of each step in the process of binding so that you can control the quality if ever you are called upon to oversee the binding work. The unit will also make you familiar with certain terms which are used in binding operations.

At the end of the unit you will be able to

- Describe the various operations required to bind a book
- Appreciate the importance of each of the steps in the process
- Explain various terms used in the process of binding operations
- Detect the faults in a bound book.
10.1 INTRODUCTION

In this unit we have tried to introduce the various materials that are used for binding a book. Binding is a chain with paper at the centre. The strength of the chain lies in its weakest link. If any of the material used is not of proper quality suitable for a particular of binding, it will be a weak binding and will fall apart after some use. The information of materials used in binding will complement and support your understanding about bookbinding.

10.1 BINDING OPERATIONS

The ultimate unit on which a book is printed is a sheet of paper. These printed sheets form the basis of binding operations. After the binder has received the printed sheets for binding, these sheets, having separate signatures, are arranged and piled separately.

A signature is a single sheet of paper printed on both sides and which when folded and trimmed becomes a set of consecutive leaves and pages. When a sheet printed on both sides and folded once it gives two leaves and becomes a four page signature. Similarly where such a sheet is folded twice or three times it gives four leaves and eight leaves and becomes eight page and sixteen page signature respectively.

Before starting the binding operations one sheet from each pile is gathered folded and arranged in running continuous sequence and a dummy is prepared to assess the book bulk and to ascertain that all the signatures required for binding have been received. The dummy will also help in calculating the cover material needed as well as size of boards required for the case of the binding.

10.3 BOOK BLOCK

Some operations like folding, tipping, gathering collating etc. are common, irrespective of the kind of binding. Some later operations are eliminated and give place to other operations characteristic to a specific kind of binding. In hard cover binding the process is divided into two groups of consecutive operations. The operations like folding, gathering, collating and sewing are collectively called ‘Sheet work’, and the rest of the operations like gluing, trimming, rounding backing and attaching the case etc. are called ‘forwarding’.

The sequence of operations in a hard cover (case binding) book is as follows:

1. Folding
2. Bundling
3. Tipping
4. Gathering
5. Collating
6. Sewing
7. Nipping and Pressing
Activity 1

Explain the term ‘signature’ in relation to binding operations.

(Check your answer with the hints given at the end of the unit)

10.4 FOLDING

Folding is an important aspect of binding. If folding is not done in order, the pages will not run consecutively. Folding depends upon the imposition or lockup style in which the pages have been printed. Folding can be done by hand or by buckle folding machine. The size of the publication is derived by folding a broadside sheet into the required number of folds.

As already explained in the preceding paragraphs, if a broadside sheet is folded once it will produce two leaves and four pages. The second fold would produce four sheets and eight pages (Quarto). Third fold would produce eight sheet (Octavo) and sixteen pages. Sometimes, if the paper used is of double the normal sheet size and also of very thin quality, another fold is given to acquire sixteen sheets (sixteen mo) and thirty two pages.

Care, therefore, needs to be taken while folding the printed sheets. Folding is generally done by the following methods:

10.4.1 Folding to Paper

In this method sheets are folded exactly at the centre. The print may or may not register properly on the pages facing each other. This is also known as edge to edge folding as a sheet is folded exactly in half. Difficulty in registration is a common drawback with this kind of folding. This is usually done for cheap books. In this kind of folding margins may not remain uniform because of irregular registration.

10.4.2 Folding to Print

This is done by laying one printed edge against the printed edge on the opposite side of page to ensure that page3 are folded in exact registration. Exactness of margin is also taken into account. Unlike folding to pages (edge to edge) the edges of folded sheet may not fall exactly on each other. Any difference in margins is corrected at the time of trimming of the book. This method is also known as ‘folio to folio’ or ‘typographical folding. The method is time consuming if done by hand but gives quality results and is used for prestigious and costly publications.
10.4.3 Limp Folding

When more than one sheet is folded together or when four pages forms are collectively folded especially for covers and end papers, it is called limp folding.

This work in these days done by machines. The first folding machine was invented by William Black in 1850. The present machines can fold eight thousand sections of sixteen pages per hour.

10.5 BUNDLING AND SMASHING

When sheets are folded certain air is trapped into the folded leaves making the folds fluffier than the front edges. The folded forms are therefore smashed in a press to flatten the folds. After all the sections are smashed, all the forms are bundled separately and piled.

10.6 TIPPING, WRAPPING AND INSERTING

Tipping means insertion of additional printed sheets to already printed material or separately printed leaves pasted or tipped into a book. It is easier to paste pages on to the outside of a signature but pasting them in the middle like an illustration separately printed is a difficult and time consuming job. Tipping is done by applying glue and pasting edge to 1/8” inside running the length of the page.

Sometimes, a book is not printed in complete sections. A single leaf or a four page section is required to be pasted over the rest of the pages to complete a section. Such an insertion is called Wrapping.

Enlarging a section by four or more pages by inserting them into a signature in the middle or elsewhere is called Inserting.

No matter how many extra pages are added to the main section by whichever description, they are properly guarded so that they do not come off with slightest pull while handling. Guarding is a method of securing plates with the help of a guard which is usually a slip 3/4 inch wide of paper sewn as any other section and plates are pasted on it.

10.7 GATHERING

In this operation all the printed folded formes are kept on a long table in a reverse sequence. The last forme is kept in the beginning and first forme at the end of the table so that when these formes are gathered in that order, the gathered book appears in a correct sequence of pages. In hard binding, the job of gathering is done with great care. Any mistake in gathering would result incomplete binding. Either one signature would be missing or there would be two signatures with same page numbers.

10.8 COLLATING

The process of gathering the folded signatures and merging them in a sequence to determine the completeness of the book to be bound is called collating. This is done by placing a mark by the printer on the back of the fold of each signature to be gathered in a book. The marks are placed in such a sequence that a missing signature may be easily identified by the gap in the sequence of marks.
The importance of collating in the process of binding cannot be under-estimated. It is this operation which helps the binder to detect that there is nothing defective, duplicate or missing in a book as an incomplete book is of no value or use.

10.9 SEWING

The essence of edition binding is sewing. This is done by thread, and other stitching materials like silk laces or nylon etc. The thread is carried through the back of the signature at three or four places depending upon the length of the section. Cotton, linen or lining cloth is used for tapes which are sewn along with the back of the spine of the book block. The thread, after passing through a section, is taken across to the next section by a 'kettle stitch'. The term only refers to a traditionally sewn book. This is the stitch that links one section to the next. It is found at the top and bottom of the spine and is hidden by the spine liner.

The thread is carried up and down across the entire book.

This kind of stitch is done for cased in binding. In cased in binding, the case is prepared separately and the sewn and trimmed book is cased with it. In library binding when the book is taken away from sewing frame one or two inches of tape are left projecting from either side of the book and later pasted or inserted into the boards that forms the cover or case of the binding.

The two common ways of sewing are (1) hand sewing (2) machine sewing.

10.9.1 Hand Sewing

This is done with the help of a sewing frame. The frame consists of a bed with two uprights and cross bar which can be heightened or lowered by turning of a nut or screw. The sections of a book are placed in the frame. The sewing is done through saw cuts derived by ordinary carpenter's saw. These cuts should be sharp but not deep. If the cuts are deep and not neat the grip of the thread will remain weak and there is a possibility of glue filtering down when gluing and rounding off is done in the process of binding. Thickness of the thread should be in accordance with the saw cuts and thickness of section. The thread is passed through in saw cut in and out along the spine of the signature and taken out to pass through the second signature from the opposite side of the spine and the operation continues till the last signature has been sewn.

10.9.2 Machine Sewing

The first thread sewing machine was patented in 1878 by David Smyth. To sew larger quantities, faster machines are used for sewing. Machine sewing also works on the principle of hand sewing except that the sewing is made up of a series of separate components each with its tape and two kettle stitches.

The most common ways of machine sewing are:

- **Saw in Sewing:** In this, sewing is done by thin cord which fits into saw cuts, not leaving any projection at the back.

- **Flexible Sewing:** In flexible sewing there are no shallow saw cuts. The thread passes through the cords duly encircling them. When set of two cords are used for such sewing and the thread passes through each cord, one by one, encircling each of the cord, it is called double flexible sewing - It is the strongest method of sewing the sections of a book.
Tape Sewing: When tapes are used instead of cords it is called tape sewing.

**Activity 2**

What is collation and what is its importance in binding?

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(Check your answer with the hints given at the end of the unit)

### 10.10 NIPPING AND PRESSING

When the sections are sewed, they are given a heavy rapid squeeze to force out all air trapped into the folds of sewed sections. Because of trapped air, the folded edges swell and the back of the book block becomes thicker. The book block is placed between two metal plates (called *jaws*) of the nipping machine to reduce the swelling caused by the stitching and to make the sewn sections easier to handle during subsequent operations. The process of ejecting air from the stitched sections to make the book block of uniform thickness is called nipping. In order to make books solid, that is, to make the leaves lie evenly and closely to one another, it was formerly the custom to beat the book on a "stone" with a heavy hammer. This process has been superseded by the presses.

There are many kinds of presses by which great pressure can be applied, some working by various arrangements of cog-wheels, screws, and levers, others by hydraulic pressure.

### 10.11 GLUING

After the book has been sewn it is kept in between a pair of straw boards and held firmly in a laying press. The spine is knocked square. A coating of flexible glue is applied to the spine at this point so that the gap between the sections is also filled and the entire book block is held firmly.

The *Gluing* operation needs to be done with care. If the glue is thick it may not run between the sections and if it is too thin it will pass through the saw cuts made for sewing the sections and spoil them. The book should be taken out of the laying press only after the glue has properly dried up. Any crimp or twist at the gluing stage will make it difficult to mend. The quality of glue should be such that it may not crack or peel off while rounding and backing.

### 10.12 TRIMMING

The book is now trimmed from the three sides. The machine used to cut the edges of the leaves is called 'Guillotine' or 'plough'. Generally one side at a time is cut. A three knife trimmer, cutting the three sides in one go, is also available.

The work of trimming the book is done with great precision otherwise it may not be possible to acquire specified length and breadth. Moreover, the cutting may not
be in a straight line thereby making the margins of the book look uneven. It is a common practice to trim a sample copy to see that blades of the machine are falling at the required points. Adjustments, to see that the edges are cut at right angle and printed lines are not in a slant, are made if necessary. The order of trimming should be fore edge first, followed by tail and head in the last. While cutting edges care is taken to achieve absolute squares.

10.13 Rounding and backing

The thickness of the back of each section increases after sewing. The spine, therefore swells and become, thicker than the fore edge side. The purpose of rounding is to remove any swelling in the back caused by sewing. The back of the book is first knocked flat covered with thin glue. Before the glue is completely dried, the back is tapped with a wooden or synthetic hammer until it is rounded and acquires a convex shape and the fore edges take a concave shape.

After this, backing is done again with a hammer. The book is held between wedge shaped backing boards in a laying press. The back of the book is raised about 1/8" from it. Over the edge of these boards the back of the sections are tapped and fanned out evenly. The side sections are then hammered over on each side. Outside sections are beaten first followed by the more central sections. A groove is formed on both the sides.

As a result of tapping, edges of the joint become slightly higher than the total bulk of the book plus the thickness of the boards. The groove thus created is called French groove or French joint. The groove accommodates the covering material and facilitates the opening and closing of the book after binding without putting any pressure on the binding.

10.14 Lining

Lining is sometimes attached to strengthen the paper, mull, leather or any other material so that binding can withstand the pressure caused by frequent and numerous opening and closing of a bound book. It also helps the book lie flat when opened. While lining up a coat of glue is applied to the spine and on it is placed a strip of cloth or gauze extending almost the length of the spine and about 1" over each side. Another coat of glue is applied on the gauze and a strip of strong paper cut to the size of the back is pasted on it. On heavier books, stronger or double layer of gauze is applied. The extending portion of the gauze or mull is pasted on the board (cover) and beneath the end paper.
At this time headbands—a decorative strip of coloured cloth that protrude slightly at the back on top and bottom—are applied. These bands are placed in between the gauze and paper used in lining up a book. Headband is not only a decorative strip but it also protects the book from insects getting inside the back of the book and supports the head and tail of the spine.

### Activity 3

What is nipping?

(Check your answer with the hints given at the end of the unit)

### 10.15 CASE MAKING

The process of case making includes preparation of dummy-book bulk, arranging for the cover material, cutting of boards for cover and pasting of end papers.

#### 10.15.1 Preparation of Dummy

The work of case making is done simultaneously with other operations discussed above. An efficient binder will not wait for the binding operations to reach the lining up stage to start working on case making. Since the dummy of the book provides details of measurements of the spine and other dimensions of the book, the work of preparing the case or cover is taken in hand along with other operations so that the case is ready by the time the book block is ready for casing in.

#### 10.15.2 Casing Materials

The most commonly used materials for case making are boards for the cover on sides, paper or pulp for the spine and from paper to plastic for the covering material. The qualities and varieties of materials for binding including cover are discussed separately.

Case is the cover and backbone of a hard bound book: Also known as casing which is wrapped ‘around and affixed to book’s contents. The process of attaching the case to the book block is called casing in.

#### 10.15.3 Board Cutting

Cover boards are cut according to the size of the book. Boards should be cut according to the height of the book plus 1.4" and width of the book less 1/8". By this way, when placed on each side it provides a projection of the size of 1/8" approximately.

This over hanging of the board beyond the book proper is called squares. Squares are projections of the boards beyond the edges of the leaves. Generally squares are kept as deep as the thickness of the board. Squares provide protection to the bound book from getting into direct contact with the surface while in use or storage. The back strip or spine is made slightly wider than the paper bulk or bulk of pages to allow swing or flare at the joint.
The covering material which may be paper, fabric rexine, leather is also cut 1/4" (3 cm) more than the height of the boards and 1/4" (3 cm) more than the width of the boards and back strip so that extra cover material is well folded and pasted back on the inside of the boards.

Case making can also be done on machines with pre-cut pieces on sheet fed case maker or on a web fed case maker. The cover material and back strip paper is used in rolls.

In a sheet fed machine the material is glued on its inside surface, the boards and back strip are dropped on the wet glue in the proper position and small rollers push the turn is over and press them down to complete the cover.

In a web fed case making machine, the material passes over a glue roller under a hopper which holds the boards. The back strip is mechanically cut off a roll and placed on to the glued material. Boards are also mechanically dropped in their respective position. As the web moves along the corners are cut to the required length and the edges are turned in.

### 10.15.4 Pasting of Endpapers

The case is now complete ready to be attached to the book block. In casing in the book rides spine side up. It is at this stage end papers are applied to cover the inside of the cover board to give a smoother look.

Endpapers are two heavy leaves of thicker paper one at the beginning and the other at the end of the bound book, connecting the covers to contents and function as hinges. One half of each leaf is pasted to the front and back cover. These are also called End leaves or Fly leaves.

Endpapers serve as a lining and cover the turn-ins of the covering material. After the end papers covered with glue or adhesive are pasted, the whole book is squeezed together from both sides so that the glue sets in and binding becomes dry and durable.

### 10.16 FINISHING AND TOOLING

The art of lettering and decorating the cover of a bound books by means of gold or silver leaf with hand tools is called finishing or tooling. This can be conveniently done on leather bound books rather than cloth bound books. This is also the most difficult part of the bookbinding process. This was done when books were collector's items and were considered prized possession of a selected few.

The desired result is achieved by giving a coat of glair before laying the letter or design impression. The design is transferred on the leather cover with a warm tool with a gold or silver leaf. The surplus leaf is than cleaned off with greasy cloth or rubber leaving the gilt impression of the tool on the book covers.

The most commonly used tools for finishing or tooling for basic designs of straight lines and curves are called pallets, fillets, and gouges. Pallets are used for short lines across the spine of the book. Fillet is a brass wheel set in a wooden handle by which longer lines can be drawn. Gouges are segments of circles resembling the curved chisels and are use in making curves in a geometrical pattern. The essence of gold-tool design is that patterns are made up of repeats of impressions of tools, and that being so, the tools must be so designed that they will repeat pleasantly.
Mass production of books and machines for binding have thrown this art in the background. These days the front and back of the book are usually left blank. As the book is stacked on the racks, the front and back are not visible, only the spine is visible in display. The jacket or book cover has now taken place of finishing part of the process.

**Activity 4**

What are end papers? What purpose do they serve in the binding process?

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(Check your answer with the hints given at the end of the unit)

### 10.17 Faults of Binding

As we have seen, there are several ways by which a book or document can be bound and each variety of binding style involves a certain number of operations. Unless a proper check is maintained on the stages through which a book passes during the process of binding one can not expect a desired quality of binding.

The common faults that appear in a carelessly done binding irrespective of its style are as follows:

#### 10.17.1 Careless or Unimaginative Folding

As already discussed, the printed sheets are first of all folded so that pages run in a continuous sequence. If folding to paper does not register the print on pages facing each other, folding should be done by the other method i.e. folding to print. This will prevent wrong alignment of running heads and provide uniform back margins which are sometimes difficult to achieve if folding is done carelessly or unimaginatively.

#### 10.17.2 Mis-collation or Imperfection

This is a very common fault in any kind of binding. This fault would creep in if collation is not properly checked by examining the collation marks on the back of the folded and gathered sheets. Any miss will result in either missing of a signature or duplicate signature instead. In both the cases it will be considered as imperfection and the binder will be held responsible for that. He will not only lose money for the wrong binding but also lose his reputation as a good binder.

#### 10.17.3 Sawing In

The cuts derived with a saw to make sawing trenches across the back of the sections, should not be very deep. It should only be deep enough to fit the cord snugly. Deeper cuts will result in leaving projections in the back and ridges will be visible on the spine even after it is covered.
10.17.4 Wire Stapling

In saddle stitch or side stitch binding styles the stitching is done by wire. The wire being much harder than the paper, the pages usually come off the stitches. The wire gets rusted in humid conditions and damage the paper and binding.

10.17.5 Unsuitable Adhesive

In limp unsewn binding or perfect binding, fast drying glue is applied on the spine of the book and later cover is attached to the book. As discussed earlier, in order to get the desired flexibility two shots of glue need to be applied. In tropical countries like India the binding which appears strong enough at the beginning become weak because the adhesive looses binding force and pages fall apart.

An adhesive reacts differently on different paper surface. Open and fibrous papers go very well with adhesive binding. If paper used in the book is of mixed quality and thickness, there is less likelihood of glue sticking well for a long time. Such binding will remain weak. Extra care needs to be taken while trimming the three sides of the adhesive bound book. If trimming is not perfect the opposite pages will not be in one alignment.

10.17.6 Glue Seepage

In limp sewn or flexible binding nipping follows the sewing of sections. If nipping and smashing is not done properly and the back is not adequately flattened the glue will seep through from the back of the needle holes and pages stick together when book is opened. Seepage of glue also occurs because of inadequate lining. The same holds good for case binding also.

10.17.7 Hollow Back

In a hollow back bound book, the space between the book block spine and inside of the case remains hollow. The covering material does not touch the spine and when the book is opened one could see down between the back of the book and back of the board. In the hollow back book, the strain of opening is thrown over the joint and not distributed over the whole spine.

Activity 5

Mention the some common faults of binding.

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(Check your answer with the hints given at the end of the unit)

10.18 SUMMING UP

In this unit we have described the process and steps by which a book is bound. You have been given information on various operations and their importance. Most of the large scale work these days is done by machines. For each binding operation, machines have been developed.
It has been highlighted that the process of hard cover binding is divided into two groups of consecutive operations. The operations like folding, gathering, collating and sewing are collectively called ‘Sheet work’, and the rest of the operations like gluing, trimming, rounding backing and attaching the case etc. are called ‘forwarding’. The unit has also provided information on the faults of binding so that you can distinguish between a good and badly bound book and prevent those to happen if you were to supervise a binding operation.

10.19 AIDS TO ANSWERS

Activity 1

A signature is a single sheet of paper printed on both sides and which when folded and trimmed becomes a set of consecutive leaves and pages.

Activity 2

The process of gathering the folded signatures and merging them in a sequence to determine the completeness of the book to be bound is called collating. It helps the binder to detect that there is nothing defective, duplicate or missing in a book.

Activity 3

The process of ejecting air from the stitched sections to make the book block of uniform thickness is called nipping.

Activity 4

Endpapers are two heavy leaves of thicker paper one at the beginning and the other at the end of the bound book connecting the covers to contents and function as hinges.

Endpapers serve as a lining and cover the turn ins of the covering material.

Activity 5

Careless folding, Sawing in, Glue Seepage and Hollow back.