Product Design Project - II

DESIGN OF STAMP CANCELLING DEVICE FOR INDIA POST

By

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Project Guide
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Submitted in the partial fulfilment of the requirement of the degree of

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Approval sheet

The Product Design Project II titled "**Design of Stamp Cancelling device for India Post**" by **Nagsen P. Nandurgekar** (Roll No. 07613008) is approved as a partial fulfilment of the requirement for **Master of Design in Industrial Design**

Project Guide : _____

Chairperson : _____

Internal Examiner : _____

External Examiner : _____

Date : _____

INTRODUCTION:

Since long back India post is using hand stamp for stamp cancellation, automatic machines are also available for cancellation. Only at the head post offices, GPO's machine cancellation is done. One of the reasons is cost and necessity of electricity for using them. CPMG (Chief Post Master General) Mr. Rajan Malappuram insisted on having a new method or mechanism for stamp cancellation which should not be dependent on electricity and should improve the existing design.

India post is a 153 year old organisation. It is the largest postal network in the word with 155,333 post offices. On an average, a post office served an area of 21.13 sq km and population of 6,623 people. It serves daily delivery of post at the doorstep of every customer anywhere in the country and collection of letters from letter boxes. India post has 234,187 regular employees who worked up to the sub post office level. Mail was collected from 601,319 letter boxes in the country. This was processed by a network of 455 railway mail service offices, and conveyed by road, rail and airlines all over the country. Post had prioritized the processing of different categories of mail and parcels according to the time and technology sensitivity of the customer, for example, e-post, e-bill, speed post, express parcel service etc.

DESIGN OBJECTIVE:

To improve the design of stamp cancelling device, for better efficiency and less human efforts by using appropriate Technology….

India post a 153 year old organisation uses the same old device for cancellation, so considering development in design and technology modification in existing method is required for good printing quality and efficiency in work using appropriate technology.

A new design/mechanism which will have good cancellation speed as compared with the existing method.

DATA COLLECTION:

History of stamp cancellation:

Started collecting data with history of stamp cancellation to get the journey details of cancellation.

- Post office reaches every nook and corner of the country.
- Reaches largest possible number of people
- Lord Clive first established the postal system in the country in 1766
- I P O was recognized as a separate organization of national importance and was placed, for the first time
- Under the unitary control of a Director General of the Post Office in India on October 01, 1854.
- Both Posts and Telegraph departments started in 1854
- It completed over 150 years of its operations.

WHAT IS CANCELLATION?

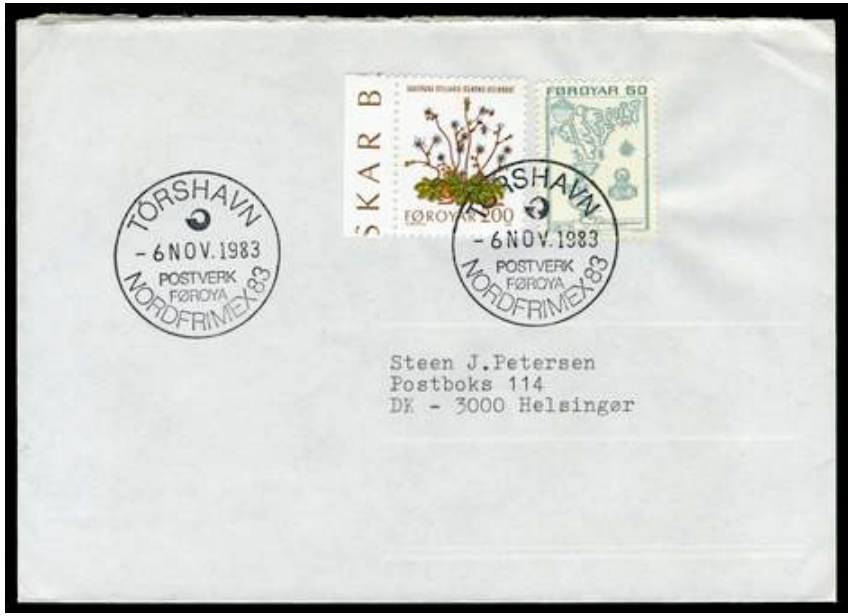
On mail, a **cancellation** is nothing but a postal marking applied to a postage stamp or postal stationary indicating that the item has been used. Modern cancellations are often applied simultaneously with a postmark, for efficiency, and commonly the terms "cancellation" and "postmark" are used interchangeably, if incorrectly. (The confusion arises because of the practice of some postal administrations of applying the postmark directly on the stamp, at the cost of legibility.)

The term "**killer**" is sometimes used as a more vivid synonym.

A cancellation intended solely to prevent reuse of a stamp is sometimes called obliteration.

STAMP CANCELLATION:

- postal marking applied to a postage stamp
- indicating that the item has been used
- To avoid the re use of stamps
- Also shows some details such as date & location
- Stamps are to be pasted on top right corner.



TYPES OF CANCELLATION:

To get clear exposure, study on different types of cancellation is done. Another reason was to observe the changes in the different ways of cancellation from long back till today.

Pen cancellation

This type of cancellation was used for cancelling oldest certificates with ink pens generally though officer’s name.

Punch cancellation

In this type two holes were punched in officers' signatures

Also holes were punched through corporate seals

Hole cancellation

It includes very large punch cancellations which removes large pieces of paper.

Quarter-inch holes or larger diamond- or rectangular-shaped holes.

Pin hole cancellation

Pin hole includes series of tiny holes, usually spelling details such as a word or date.

Stamp cancellation

Cancellation by rubber stamps. Usually, spelled words "cancelled" or "void.“

Red and purple inks were commonly used

Cut “Hammer” or “Knife” Cancellation

This cancellation includes Hitting of Hammer & razor Blades.

This kind of cancellation is almost impossible to detect in photographs because the paper remains visually intact

Cut-out cancellation

Very large amounts of paper were removed, normally by slicing triangular pieces out of the officers' signatures.

Wipe cancellation

This type includes cancellation with a rag soaked in dilute red ink.

POSTAL SYSTEMS IN INDIA

The use of the Scinde Dawk adhesive stamps to signify the prepayment of postage began on 1 July 1852 in the Scinde/Sindh district, as part of a comprehensive reform of the district's postal system.

The economic growth and political stability under the mauryan empire(322–185 BC) saw the development of impressive civil infrastructure in ancient India. The Mauryans developed early Indian mail service as well as public wells, rest houses and other facilities for the common public.

Common chariots called *Dagana* were sometimes used as mail chariots in ancient India.

Systems for collecting information and revenue data from the provinces are mentioned in Chanakya's Arthashtra (ca. 3rd century BC).

In ancient times the kings, emperors, rulers, zamindars or the feudal lords protected their land through the intelligence services of specially trained police or military agencies and courier services to convey and obtain information through runners, messengers and even through pigeons. The chief of the secret service, known as the postmaster, maintained the lines of communication ... The people used to send letters to [their] distant relatives through their friends or neighbors.

Early stamps of India were watermarked with an elephant's head.

In South India, the Wodeyar (1399 - 1947) of the Kingdom of mysore used mail service for espionage purposes thereby acquiring knowledge related to matters that took place at great distances.

By the end of the Eighteenth century the postal system in India had reached impressive levels of efficiency. According to British national Thomas Broughton, the Maharaja of Jodhpur sent daily offerings of fresh flowers from his capital to Nathadvara (320 km) and they arrived in time for the first religious Darshan at sunrise. Later this system underwent complete modernization when the British Raj established it's full control over India. The Post Office Act XVII of 1837 provided that the Governor-General of India in Council had the exclusive right of conveying letters by post for hire within the territories of the East India Company. The mails were available to certain officials without charge, which became a controversial privilege as the years passed. On this basis the Indian Post Office was established on October 1,1837.

STUDY OF STAMPS:

To get the detailed information about how postal stamps are? What are the changes occurred in it till today? How the print quality, representation is done? A detailed study is done. Every postal stamp has some pictures/visuals which get disturbed after cancellation.

JOURNEY OF STAMPS:

First stamps valid for postage throughout India were placed on sale in October, 1854

They were without perforations or gum

Designed and printed in Calcutta.

Costs 1/2 anna, 1 anna, 2 annas, and 4 annas

East India Company started with East India Postage in 1856

High value stamps (2, 3 & 5Rs) introduced in 1895

Existing designs reprinted in colours in 1900

Twentieth Century stamps

New series of stamps in 1902

They were depicting King Edward VII

High value stamps were available up to 25 Rs.

In 1911 - Stamps with picture of King Geroge V introduced

1926 the watermark changed to a pattern of multiple stars.

The first pictorial stamps appeared in 1931

They were showing the fortress of Purana Qila, Delhi and government edifices

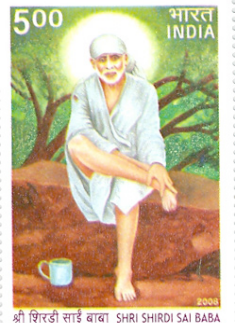
Marking government's move from Calcutta to New Delhi

POST INDEPENDENCE 1947:

- **First Stamp of Independent India** was issued on the 21st of November, 1947
- Depicting Indian Flag with Jai Hind
- A memorial to Mahatma Gandhi was issued 15 August 1948
- definitive series appeared, depicting **India's broad cultural heritage**
- **technology and development** theme in 1955,
- series all showing the map of India in 1957

TWENTY FIRST CENTURY:

- Indian Postal Service serves the public from 155,000 post offices
- Most widely distributed system in the world
- China has 57,000, Russia 41,000 and the United States 38,000 offices
- small savings banking and financial services
- computer-generated patterns and stamps of different shapes



TYPES OF STAMP CANCELLATON:

Pen cancellation

Earlier Pen cancellation was used to cancel stamps.

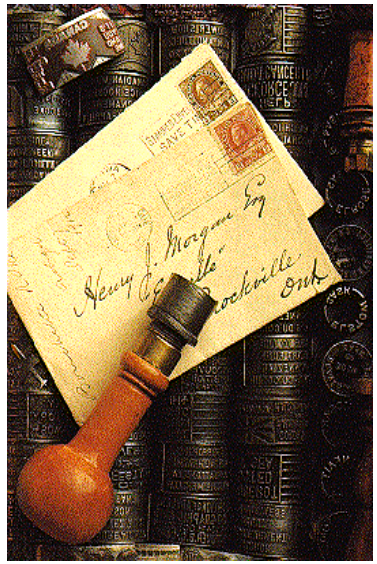
Many early cancellations were pen cancels, simply the use of a writing pen to deface the stamp, but before the days of ball-point pens, these took longer to apply than a hand stamp, and most postal administrations required the use of cancellation devices, either supplied by the administration, handmade by the postmaster, or purchased from specialized suppliers. Handmade cancels were typically carved from cork and are known in a bewildering variety of creative designs, collectively known as fancy cancels.

Rubber stamps for cancellations

Stamps were made using rubber seals and were used for cancellation.

Hand stamps

Further hand stamps came into existence; they were having required details casted in metal and are fixed over wooden handle. Changing date was possible in this case.

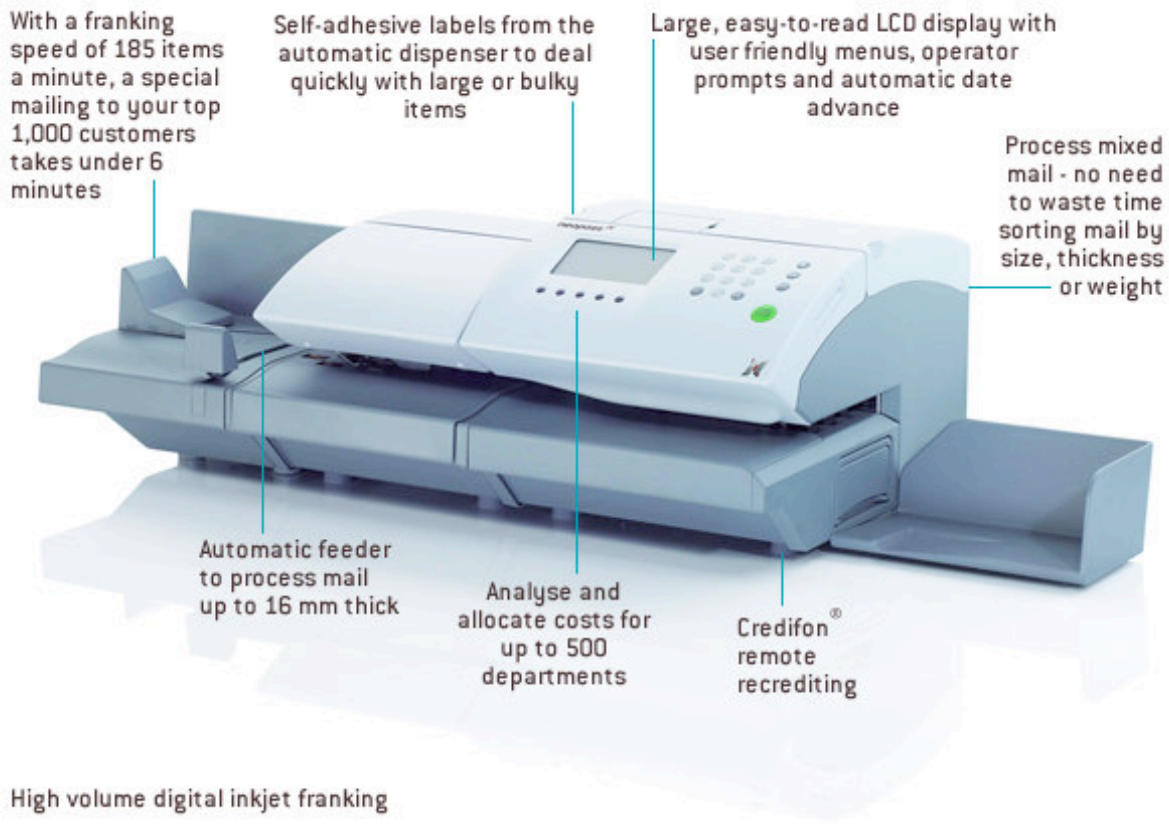


Machine cancellation

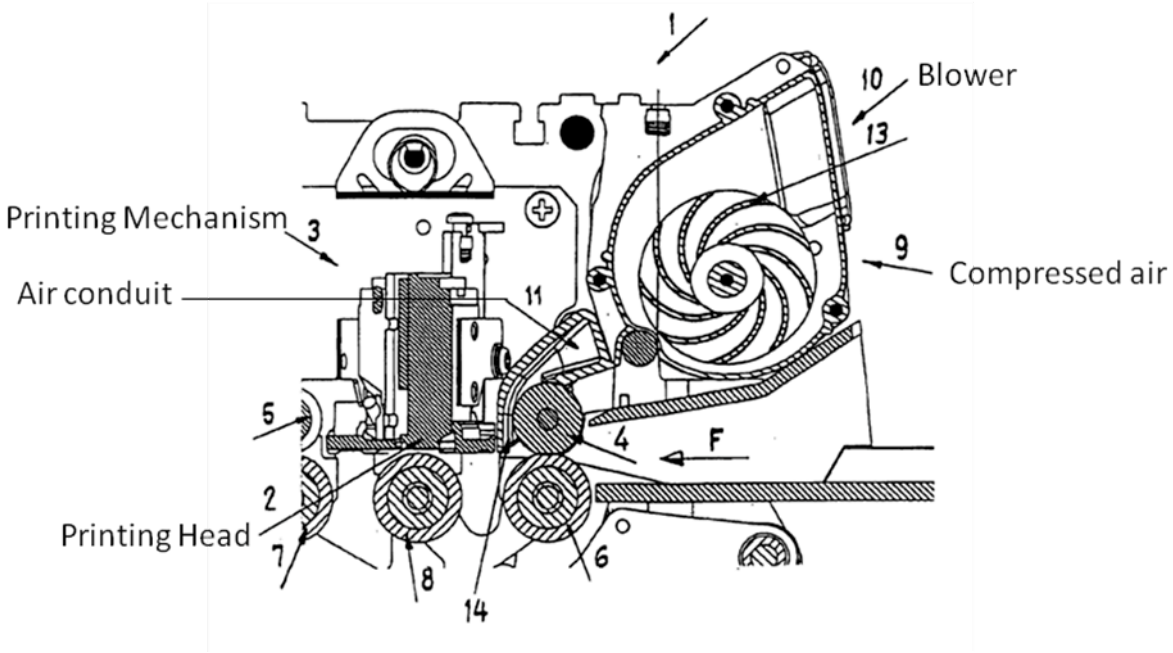
Change in technology brought in machine cancellation. Automatic machine for cancellation was made, which increased speed of cancellation and quality of printing.

One of the latest cancellations includes franking machines. Some details are shown below

United States Franking Machine



High volume digital inkjet franking


1
10
Blower
13
Printing Mechanism
3
9
Compressed air
Air conduit
11
5
4
F
2
Printing Head
7
8
14
6

TYPE OF OFFICIAL CANCELS:

A lightly cancelled stamp would have the postmark on a corner or small portion of the stamp. As lightly cancelled stamps are in general more valuable than heavily-cancelled (exceptions, discussed below, may be bulls-eye cancellations and special or rare postmarks), collectors have at times rubber-stamped (or handwritten) "philatelic mail" or the like on their covers to get the postal clerk or mail processor to cancel the stamps lightly. (It was perhaps from concern that a conventional cancellation device would damage some of Tonga's early foil stamps that a rolling cancellation device was employed.)

A bulls-eye *cancellation* is a readable postmark which entirely or almost entirely is on the postage stamp. They are favoured by stamp collectors because one can see the time, date, and location where the stamp was used. The prevalence of bulls-eye cancellations varies considerably by country and time period.

Pictorial cancellations

In addition to everyday cancellations there are **pictorial cancellations**, which as the name suggests contain pictures or images associated with the commemoration of an event or anniversary.

The term "pictorial cancellation" is sometimes used, loosely and perhaps technically incorrectly, for slogan cancellations, which contain some sort of commemorative phrase in addition to the regular format of the cancellation.

A 1929 pictorial cancellation promoting the use of airmail.

Pictorial cancellations may, though more commonly in other countries than in the United States, form the day-to-day cancellation of a station. For example, there are a number of permanent pictorial postmarks in India and Great Britain.

Cancelled to order

Cancelled-to-order stamps, known as CTOs, are official cancellations of stamps that are not postally used. The CTO cancellations are easily identified as the stamps still retain their original gum. Authorities often use the same canceller for all C.T.O.s, and apply it very neatly in the corner of four stamps at one time. Some postal authorities cancel stamps to sell them at a considerable discount to the philatelic community. The authorities can do that profitably because they no longer need to provide the postal services that the stamps were meant to pay for.

STAMP CANCELLATIONS IN INDIA:

Cancellation in India is generally done using hand stamp, though big post offices in big cities uses automatic machine cancellations such as Head Post offices, GPO's etc. An automatic machine costs a lot, so majorly hand stamp is used.

Some of the details of number of letters and post offices are given below:

Village 400 - 500 letters/day

Cities 25,000 – 30,000 letters/day

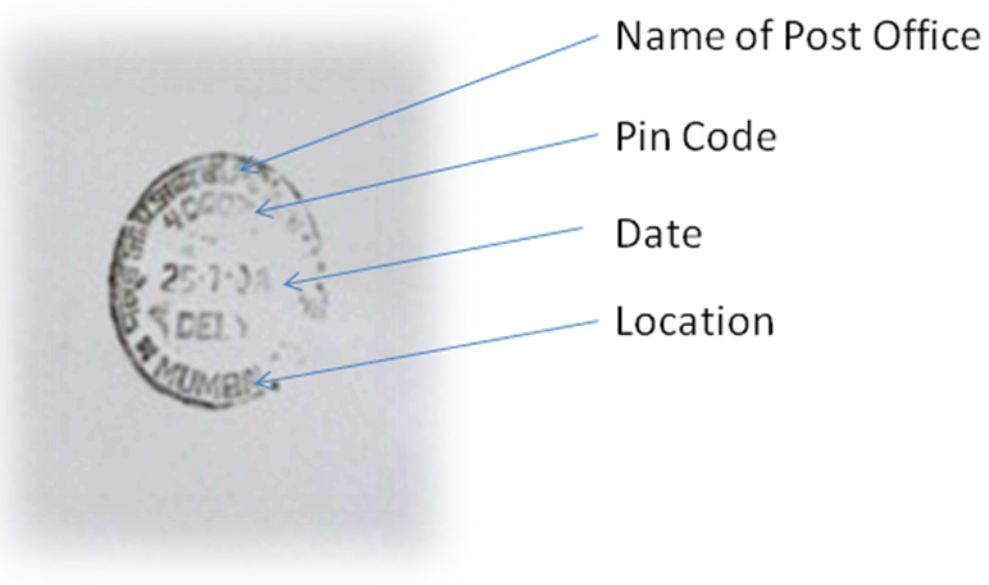
One person stamps about 300 – 400 letters once and about 2,000 letters/day

	No. Of Post Offices
Country	155,516
Rural areas	139,120
Urban areas	16,396

DEATAILS ON CANCELLATION:

Cancellation stamp should have primary details such as name of post office, pin code, date and location.

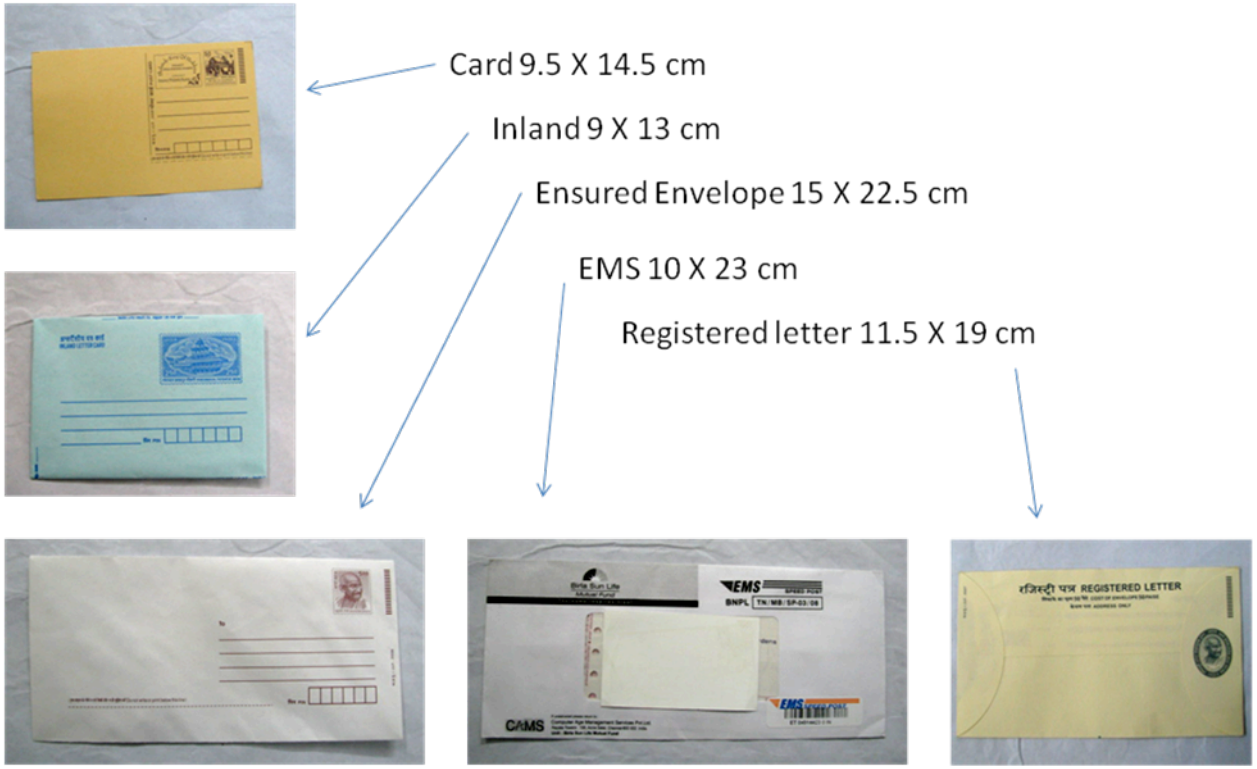
Following picture shows the arrangement of above mentioned details



TYPES OF LETTERS:

Letters are available in various sizes, some of the government letters with details are shown below.

Stamps are to be pasted on top right corner of the post cards.

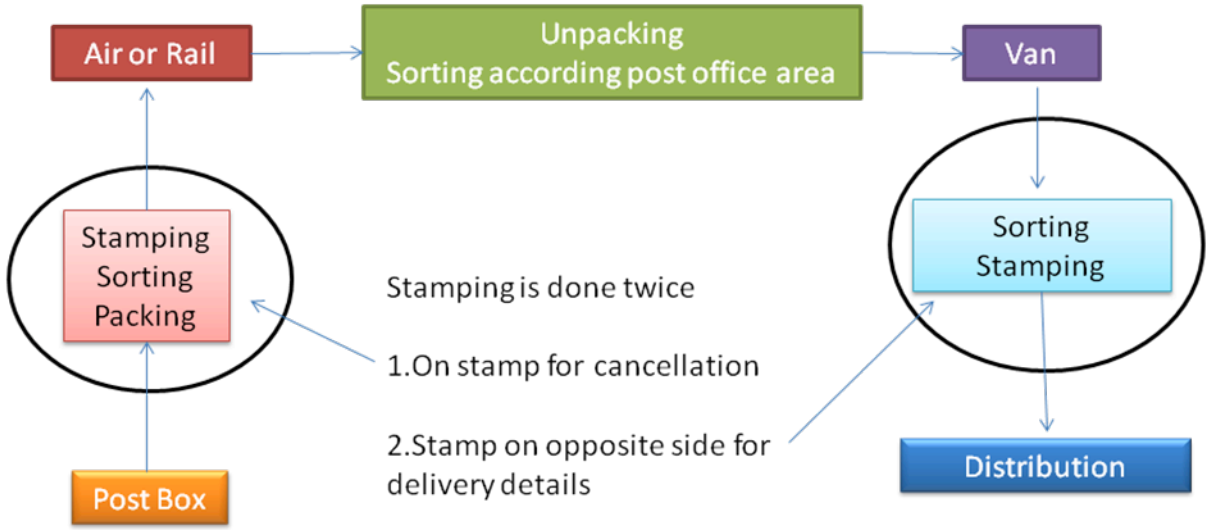


POSTAL WORKING NETWORK:

Letters from the post box are collected, further they are sorted as per specified post offices and locations. Then they are stamped means cancellation as post stamps are done. After cancellation they are packed and transferred by means of aeroplane or railways to various post offices.

Further packed letters unpacked and are sorted and distributed to various post offices in that area using post office van. These letters again are stamped on back side. This is to give details of date of delivery. Then they are distributed to the various addresses by the postman.

Following flowchart will give some details....



EXISTING METHOD:

Today hand stamps are used for cancellation, various hand stamps of various sizes are used for different purposes. It includes round hand stamp, rectangular hand stamps..

Some of them are shown below.

A person doing stamp cancellation can be seen.

Details of hand stamp:

It is an assembly of wooden handle and metal head having negative impression of details. It also has provision for changing dates.

Type sets are used for changing dates.

The details are shown below..

Metal with threads is fitted on wooden handle, casted block after inserting date is locked on the threads.

DESIGN NEED:

-To increase efficiency

-Automatic cancellation machines are very few

-Stamping with hand stamp consumes lot of time

-Uniform stamping not possible because of pressure difference

- Ink distribution is not uniform
- Excess ink may disturb the information
- Improper indentation

-Less ink may lead to half print

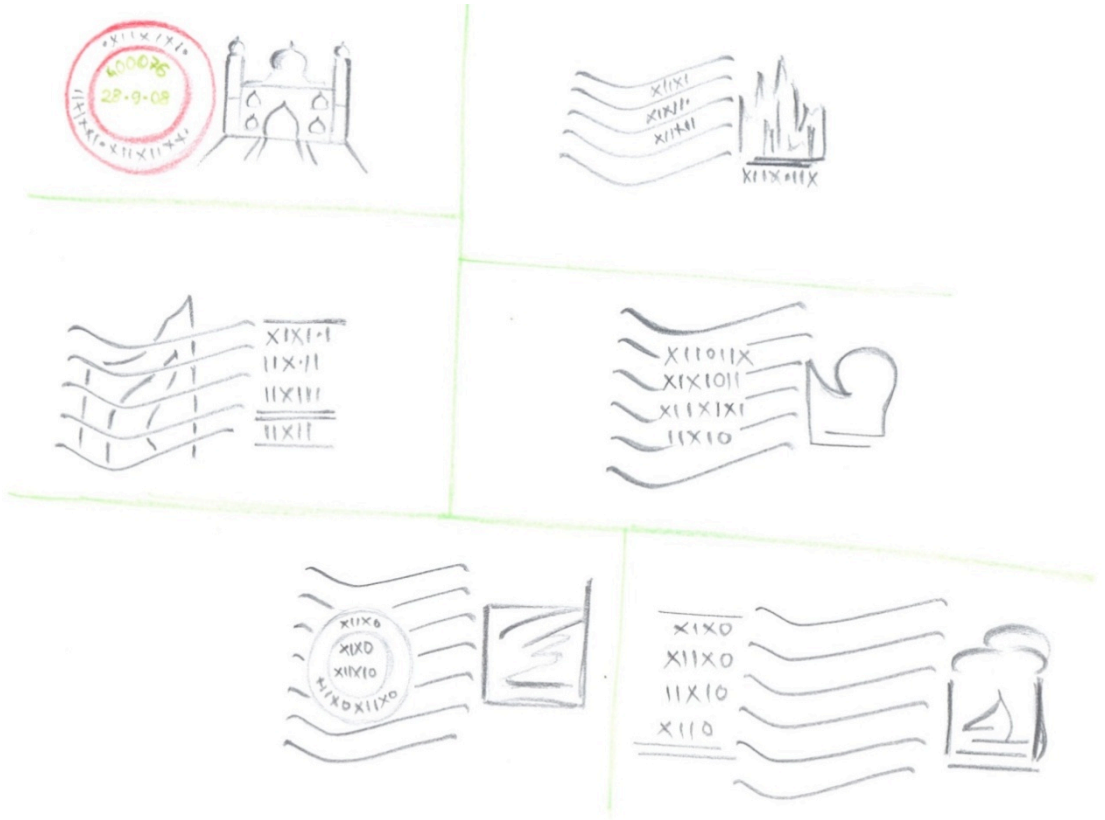
-Regular assembly and disassembly for date change

Human factors:

Generally stamping done in standing position, causes pain in legs

Regular hand movement causes wrist pain, elbow pain, back ache, pain in vertebras etc.

Various cancellation prints:



VISIT TO MANUFACTURER:

As one of the problem was printing oriented, to get the better solution several industrial visits were made, to understand what other possibilities are there using suitable technology.

Godrej – Prima Division

Vikhroli, Mumbai – 400079.

Discussed with Milind Dukle, and Pranav Kumar from design deptt regarding required print quality. I Showed there concept presentation so that they can understand the requirement properly. As one of the concept was reciprocating, indentation was the important factor and prima division works on typesets and its assembly.

Flexon Engineers Private Limited.

Manufacturer of flexo printing press and converting equipment.

Mira – Bhayender Road, Mumbai – 401104.

Had a discussion with the Director Mr. P. P. Mehta regarding the printing technology and print processes they carried out. Also I gave short introduction of my project and expected print qualities and requirement. Flexon works for roll screen printing and this visit was for the second concept having roll mechanisms.

Dolphin Inks Pvt. Ltd.

214,Devendra Industrial Estate, Lokmanya nagar, Thane(West)

Mumbai 400606.

Discussed with Mr. H. S. Talwar and studied roller print mechanisms which they were manufacturing.

LITERATURE REVIEW - PRINTING TECHNOLOGY

To understand various printing processes, a study on printing technology is done. Machines from past to recent are studied.

DIFFERENT TPYES OF PRINTING MACHINES:

Most modern printing presses transfer ink from a cylindrical printing surface to moving sheets or rolls of substrate. Presses that print on rolls, or webs, can achieve speeds of 600–900 m (2000–3000 ft) per minute. Presses that print on sheets are generally slower than web presses but can print on thicker substrates, such as bristol board and sheet metal.

Since the 1960s, advancements in photography and electronics have had a profound effect on the manufacture of printing surfaces. Light-sensitive materials such as diazonium resins and photopolymers make it possible to produce durable printing surfaces photographically rather than mechanically. Computer-based systems allow the rapid production of the films used to transfer images to printing surfaces. Some printing surfaces can even be prepared directly by machines employing computer-controlled laser beams or diamond styluses. Images generated on computer systems and stored in databases can now be transferred directly to printing surfaces without any intermediate steps. Taken as a whole, these changes have been called the prepress revolution.

LITHOGRAPHY

By far the most important and versatile printing process today is offset lithography. The underlying principles were established at the end of the 18th century by a German map inspector, Aloys Senefelder (1771–1834), who was experimenting with methods of producing limestone relief printing surfaces using an acid etching process. Senefelder found that a wet limestone surface would repel an oil-based printing ink, and that an image drawn on the surface with a grease pencil would repel water and attract ink. Any drawing on the stone surface could be reproduced by bringing a damp sheet of paper into contact with the freshly inked image. This cycle could be repeated several hundred times before the drawing could no longer be faithfully reproduced.

The process, called chemical printing by Senefelder, quickly became a popular art medium because it enabled artists to produce multiple copies of freehand drawings. By the late 19th century, multiple stones were being used to transfer as many as 30 separate colors to a single sheet of paper to produce exquisite color lithographs that resembled fine watercolor paintings. Modern color lithography uses only four inks for a wide range of natural colors.

The Offset Principle.

In the early part of the 20th century, it was discovered that ink could be transferred from the lithographic surface to an intermediate rubber surface and then to paper. The rubber intermediate, called a blanket, can transfer ink to paper and to a wide variety of materials that cannot be printed directly, including plastics and metals. Because the soft blanket conforms to the texture of the surface to be printed, lithographic image quality is unrivaled.

Offset Lithography Today.

The function of the original stone printing surface is now served by thin aluminum plates, although other materials, such as stainless steel and plastic, can also be used. The plates are wrapped around the circumference of the printing cylinder and make direct contact with the rubber blanket cylinder. Rubber rollers carry ink and water to the plate surface. The ink is transferred first to the blanket cylinder and then to the paper.

Lithographic plates are the least expensive printing surfaces available today, and this fact has contributed greatly to the success of the process. Aluminum plate materials have a thin surface coating of light-sensitive material, such as a photopolymer, that undergoes a solubility change when exposed to an intense source of blue and ultraviolet light. Images are transferred to the surface by exposing the plate through a film positive or negative. Some materials can be exposed directly, as in a graphic-arts camera or by a computer-controlled laser beam, thereby eliminating the expense of film and speeding up the platemaking process.

Modern offset lithographic presses range in size from small sheet-fed duplicators—used for small, single-color jobs such as brochures and newsletters—to massive web presses capable of printing millions of copies of magazines, catalogs, mailing pieces, and packaging materials in full color. No other process has such a broad range of applications.

RELIEF PRINTING

Relief printing processes work on the same principle as a rubber stamp. Ink is applied to the raised portions of the printing surface, and is then transferred by pressure to paper or some other substrate. Two forms of relief printing—letterpress and flexography—are currently in use, distinguished by the physical characteristics of their printing surfaces and inks. Letterpress printing is accomplished using a hard metal or plastic printing surface and a highly viscous ink. Flexography employs a soft rubber or plastic printing surface and a fluid ink.

Letterpress Printing.

Letterpress, the oldest form of printing, originated with the invention of movable metal type in the middle of the 15th century and was for five centuries the only viable mass printing process. In the mid-20th century, letterpress printing, despite its superiority in the clarity of impression and in the density of ink, lost its predominance to lithography, a much faster process.

Originally, letterpress printing surfaces were prepared by assembling thousands of pieces of metal type on which individual letters or letter combinations were cast in relief to create pages of text called type forms. Ink was applied to the raised areas of the form and then transferred under pressure to paper or vellum. Woodcuts and engravings could be combined with type to produce composite pages containing both text and graphics.

Duplicate Plates.

The first letterpress printing plate was created by making a plaster mold of a type form and then casting a metal duplicate of the original, called a stereotype. Stereotyping became an extremely important technology during the Industrial Revolution because it yielded a one-piece printing surface that could be used in place of the original type form on a variety of automated printing presses. Curved stereotypes cast from papier-mâché molds were used on rotary letterpresses for printing daily newspapers until the early 1970s, when hot-metal machine typesetting was largely replaced by computer typesetting.

Another important duplicate plate, called an electrotype, was made by electroplating a thin layer of copper onto a wax impression of the original type form and then filling the resulting copper shell with type metal. Electrotypes retained more detail from the original relief surface than stereotypes and were therefore preferred to stereotypes for higher-quality letterpress printing.

Photopolymer plates.

In the late 1950s a radical new way of making relief printing surfaces was introduced; it employed a soluble plastic that hardened upon exposure to ultraviolet radiation. Since then a large number of photopolymer plate materials have been created. A thick coating of photopolymer on a metal or plastic support can be exposed to ultraviolet light through a piece of film that allows the light to pass through only those areas that will transfer ink. The photopolymer hardens, or polymerizes, in these areas, and the remaining unexposed coating is washed away with water or some other solvent. The result is a relief printing surface that can be mounted directly on a printing press.

In a variation of this process, a liquid photopolymer that solidifies when exposed to ultraviolet radiation is spread on a paper or plastic support. After exposure the unexposed liquid is blown away with air. These plates can be made rapidly and are therefore most suitable for newspaper printing, where deadlines are critical.

High-speed rotary web presses and photopolymer plates have allowed letterpress to remain competitive in some areas, such as in newspaper printing, despite the fact that lithography is now the uncontested leader among printing processes.

Flexographic Printing.

The soft plates and highly fluid inks used in flexography make the process ideal for printing on nonporous materials such as foil laminates and polyethylene. Originally, all flexographic plates were made of molded rubber, which is still the preferred material when multiple copies of the same image are needed on a single printing cylinder. Rubber plate molds are impressions of original relief surfaces, such as type forms or engravings, and are normally used to make several duplicate rubber plates. The preparation of a printing cylinder using molded rubber plates is a time-consuming process because many rubber plates are mounted on a single cylinder and each plate must be carefully positioned in relation to the others.

In the 1970s photopolymer plate materials were introduced, and the time required to manufacture and mount a set of plates was reduced significantly. This has allowed the process to enter new markets, most notably newspaper printing. In addition, water-based inks can be used in flexography, eliminating the need for toxic solvents.

Flexographic printing presses are simple in design because the fluid ink is easily distributed to the printing surface without an elaborate inking system. Printing is usually done on rolls or webs of substrate rather than on cut sheets, and the printed rolls are then converted into finished products in a separate manufacturing process.

GRAVURE

Gravure, also called rotogravure, is a high-volume printing process employing an ink transfer mechanism that is fundamentally different from that of relief printing. The printing surface is a polished metal cylinder covered with an array of tiny recesses, or cells (as many as 50,000 per sq in), that constitute the images to be printed. The cylinder, which can be 2.5 m (8 ft) or more in length, is partially immersed in a reservoir of solvent-based fluid ink. As the cylinder rotates, it is bathed in ink. A steel blade called a doctor blade running the entire length of the cylinder wipes the ink from the polished surface, leaving ink only in the cells. The ink is then transferred immediately to a moving web of paper forced against the cylinder under great pressure.

Gravure cylinders are constructed of steel with a thin surface layer of electroplated copper. The copper can be either chemically etched or electronically engraved to form the cells that will transfer ink. Once the cells have been created, the cylinder is electroplated with a thin layer of chromium to produce a hard surface for the doctor blade. Each cell transfers a tiny spot of ink to the paper. The cells can be made to vary in depth from one part of a cylinder to another, causing the darkness of the resulting ink spots to vary also. This enables gravure to print a wide range of gray tones and thus to render excellent reproductions of photographic originals.

Color printing is accomplished by using separate printing cylinders for the cyan, magenta, yellow, and black inks. Each cylinder is housed in a separate printing unit. The web is transported by rollers from unit to unit and can reach speeds of close to 900 m (3000 ft) per minute. After each color is printed, the web passes through a dryer, where the solvent base of the ink is evaporated. The solvent is either reclaimed or burned to produce energy. Some gravure printers have begun to use water-based inks. This trend is likely to continue because of health and environmental threats posed by the use of hydrocarbon-based solvents.

The expense of manufacturing a set of gravure cylinders has restricted its use to long-run jobs (millions of reproductions). Mass-circulation monthly magazines, mail-order catalogs, and packaging are natural markets for the process. Gravure is also used to reproduce a variety of textures and patterns on decorative materials. Most of the simulated wood grains on inexpensive furniture, for example, are printed by gravure. New methods of manufacturing gravure cylinders using computer-controlled electronic engraving machines have reduced the time required to prepare a set of cylinders, but they are still far more expensive than lithographic printing surfaces.

Intaglio printing is a specialized process related to gravure that employs engraved rotary printing surfaces of steel to print currency, bonds, stock certificates, and high-quality business stationery. Ink is transferred from engraved recesses on the printing surface directly to sheets of paper transported through the press. Intaglio printing excels at reproducing artwork that consists of fine lines and small solid areas. It cannot be used to reproduce photographic images or to print large unbroken solids. The use of paste ink and deeply recessed printing surfaces gives intaglio printing a distinctive raised texture. (Powdered resins can be heat-fused to freshly printed wet lithographic or letterpress inks to simulate this effect at far less expense, which is why “engraved” business cards and stationery are usually produced in this manner.)

SCREEN PRINTING

Originally called silk-screen printing because of its silk-based stencils, screen printing has become important in the production of a wide array of manufactured items, including decorative panels, printed circuit boards, touch-sensitive switches, plastic containers, and printed garments. Stencils for commercial screen printing are usually produced by photomechanical means. A fine synthetic fabric or metal mesh is stretched over a rectangular frame, and a photopolymer coating is applied to the entire surface. Exposure of the photopolymer through a film positive causes it to harden in the areas not intended to print. The unexposed material is then washed away to create the open areas of the stencil. In the printing press, this screen is pressed against the surface to be printed, and ink is forced through the open areas of the stencil with a rubber squeegee.

Presses for screen printing range from simple manual devices for the small-scale printing of T-shirts and banners to large sheet-fed presses for multicolor, high-volume commercial applications. The process is distinguished by its ability to print finely detailed images on practically any surface, including paper, plastics, metals, and three-dimensional surfaces. It is also the only major printing process that is routinely used to produce images that are not meant to be viewed. The circuit patterns in touch-sensitive switch panels, for example, are screen-printed with special conductive inks.

ELECTRONIC PRINTING PROCESSES

All the processes previously discussed employ a fixed printing surface that transfers the same pattern of ink during each cycle of the press. Simple physical ink-transfer mechanisms allow these processes to operate at high speed. Because of the high cost of making a set of plates, mounting them on the press, and running the press until the printing is in register (properly aligned) and colors are correct, these processes require fairly long press runs to be economically feasible. For short-run printing—especially of highly variable information, electronic processes are more economical. These processes do not use printing plates, and they produce good reproductions without wasting paper.

Electrophotographic Printing.

Modern electrostatic office copiers have a printing surface that can be instantaneously formed by photographing or scanning an original. The surface is coated with a photoconductive material such as selenium or cadmium sulfide. In the dark, a photoconductor acts as an insulator, retaining a charge of static electricity. Areas of the surface illuminated in a camera or by a laser beam become conductive and lose their charge. The remaining areas retain their charge, attracting oppositely charged particles of colorant called toner. The toner is then transferred to a piece of paper or plastic using electrostatic forces rather than pressure. This cycle is repeated for each copy, making the process far too slow and complicated for mass printing

applications. For small quantities, however, some color electrophotographic printers can reproduce color originals with image quality that approaches that of offset lithography.

Ink-jet Printing.

A computer-controlled array of ink nozzles can produce images on a moving sheet or a web of paper. Simple ink-jet printers are used routinely to print variable information such as the expiration dates on food packages or address labels on direct mail pieces, and are sometimes installed on the end of a conventional printing press. Sophisticated color ink-jet printers are able to produce lithographic-quality reproductions in extremely short runs.

Microcapsule Printing.

This technology uses paper impregnated with billions of microscopic capsules of liquid photopolymer-based dye. The paper is exposed to light reflected from an original image, and the dyes inside the capsules harden in proportion to the amount of light they receive. The exposed paper is then pressed through steel rollers against a receiver paper, and varying amounts of unhardened dye are deposited on the receiver to form an image. The process can be used to make high-quality color reproductions in small quantities.

Thermal Sublimation and Wax-Transfer Printing.

Computer-controlled arrays of heating elements can transfer dyes or wax layers from a plastic ribbon to a piece of receiver paper. The high cost of materials and the slowness of thermal processes have restricted their use to applications in which only a few copies are required.

The emerging relationship between traditional printing and electronic printing is more complementary than competitive. Digital color printing processes are increasingly used to predict the appearance of images before they are processed into films and plates for lithography, gravure, or relief printing, thus reducing the likelihood that changes will be necessary after the job has reached the press.

USER DETAILS:

For stamp cancellation process, the user may be person from age group of 20-50 yrs old.

With minimum education can be 10^{th} pass.

May or may not have good vision

He can easily change dates and can do the maintenance of cancellation device

DESIGN INSIGHT:

Same workstation can be used for letter sorting.

Cancellation process consumes time around 1-2 hrs, workstation is in used only for cancellation process. Rest of the time when there is no cancellation happening the workstation remains idle and cannot be used for any other application.

Letter sorting is one of the important processes and it also requires workstation. So a combined workstation is designed on which letter cancellation and letter sorting both the operations can be carried out comfortably.

DESIGN REQUIREMENT:

A discussion with Mr. Bali - CPMG (Chief Post Master General) VT-Mumbai, resulted in following design insights. As per their observation the cancellation print is not good so they insisted on good printing quality having uniform ink distribution and speed of operation. Also there should be some provision for monument/landmark/historical cancellation, which will attract the users and will remind them about their visits or occasions. Thus special type of cancellation came into picture.

Details are as follows:

Good printing quality

-as in existing method print was not good & indentation resulted in disturbance on letter/content in pocket.

Proper ink distribution

-in existing method ink collection & deposition was not uniform which resulted in improper ink ditribution

Cancellation with good speed

-existing method was having cancellation speed of 80 letters/min approx

Not depended on electricity/manually operated

-due to availability of electricity

Special Cancellation

Historical/monument/landmark cancellation

-cancellation having picture, which will remind some memories and thus attract users.

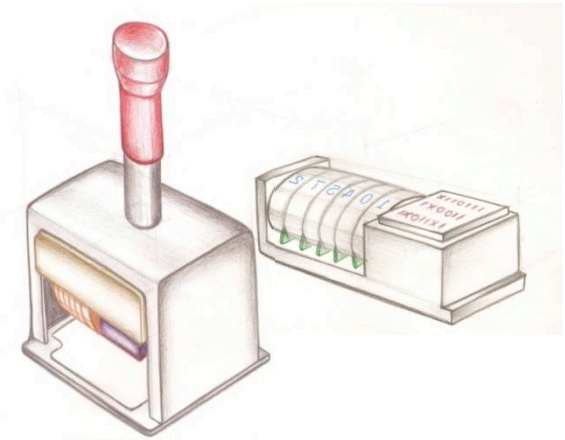
Festival cancellation

-cancellation with picture of celebration & joy during various festivals.

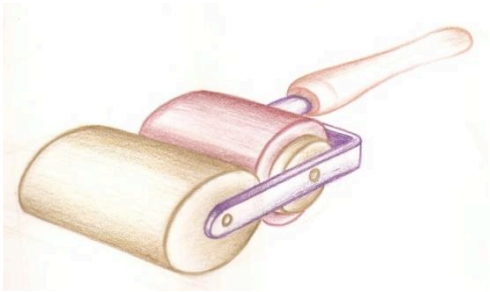
INITIAL IDEATION WHICH STARTED FROM DAY ONE...

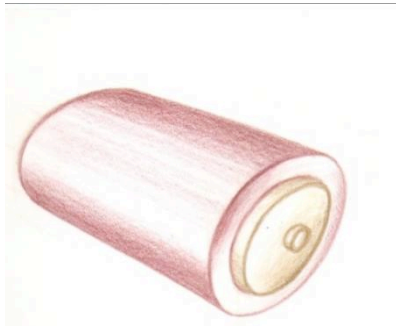
With various design insights, thought of some of the handy mechanism, can be seen in following figures.

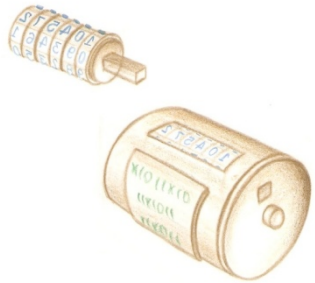
1. Self inking mechanism, easy for date change and attached post details



2. Roller mechanism, self inking with provision for date change







Advantages: These were portable designs, free hand movements were possible.

Disadvantages: Hand operation which leads to pressure difference further leads for improper prints, also for increasing speed of operation these were not suitable.

DESIGN BRIEF:

Final design should provide good print quality with uniform ink distribution.

It is a manually operated mechanism/device and should not require electricity.

Speed of operation should increase.

Operation will include user convenience such as easy feeding, ease of location etc.

It should reduce noise.

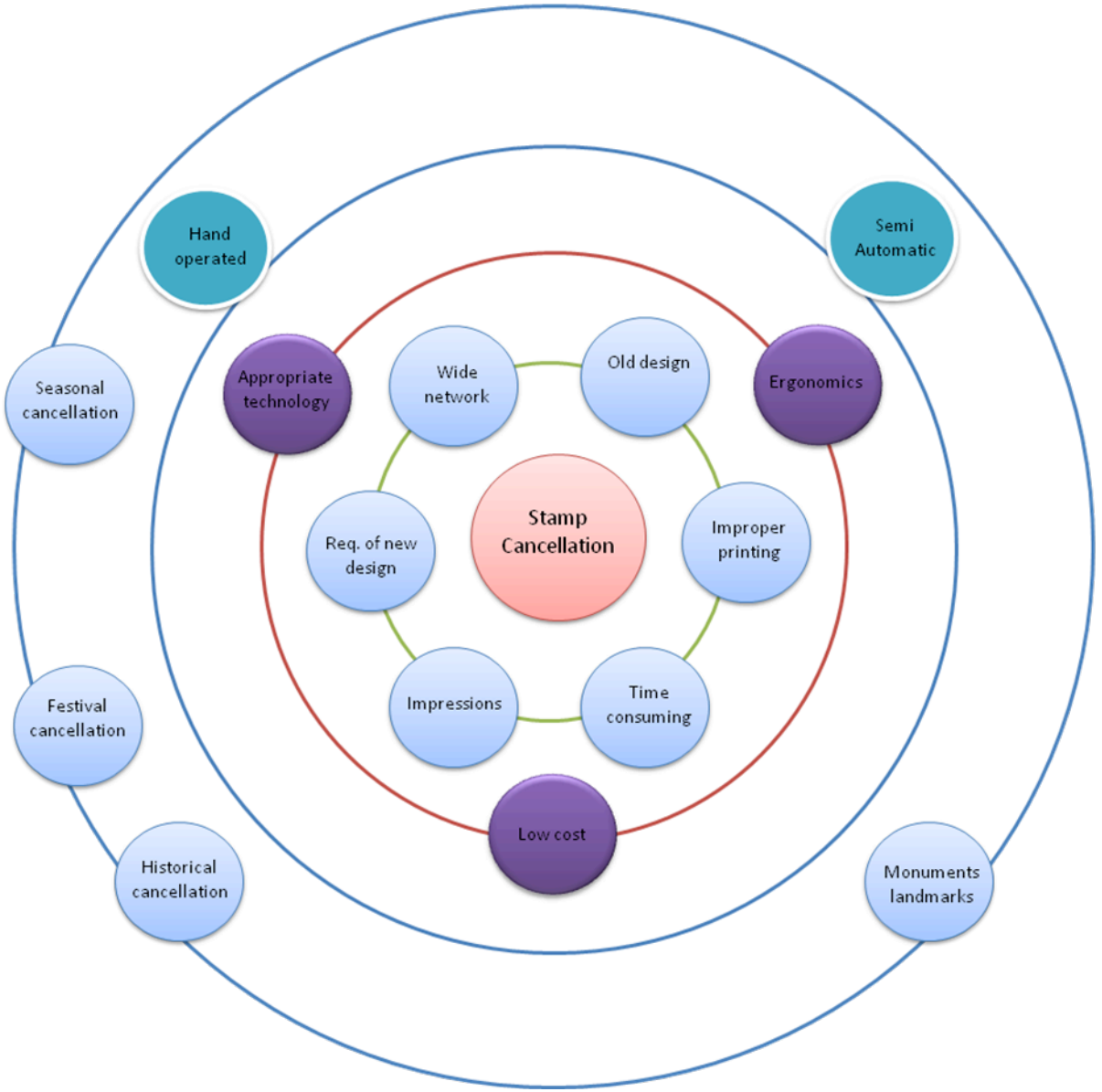
It should also have provision for landmark/monument/historical cancellation i.e. special cancellation.

IDEATION:

Ideation is started once the design brief is made...

During ideation around 55 different ideas were generated, ideation was done considering various metaphors, analogies such as direct, indirect, fantasy etc..

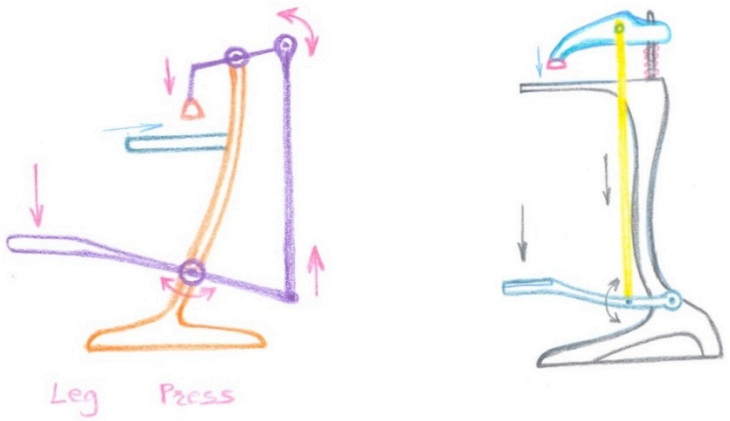
- Ideation
  - Metaphors
  - Analogies
    - Direct
    - Indirect
    - Fantasy


Hand operated
Semi Automatic
Seasonal cancellation
Appropriate technology
Wide network
Old design
Ergonomics
Req. of new design
Stamp Cancellation
Improper printing
Impressions
Time consuming
Low cost
Festival cancellation
Historical cancellation
Monuments landmarks

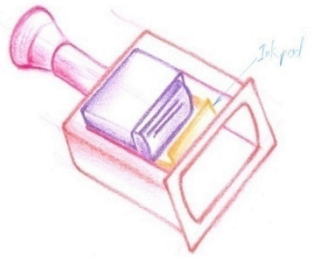
Cluster 1:

This cluster was having similar ideas with reciprocation method.

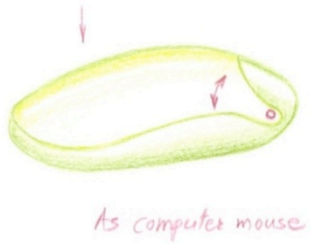
These are leg press mechanisms, using linkages/pivots



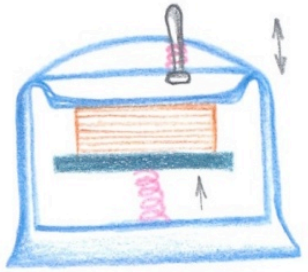
Simple portable device similar to numbering machine, its self inking mechanism.



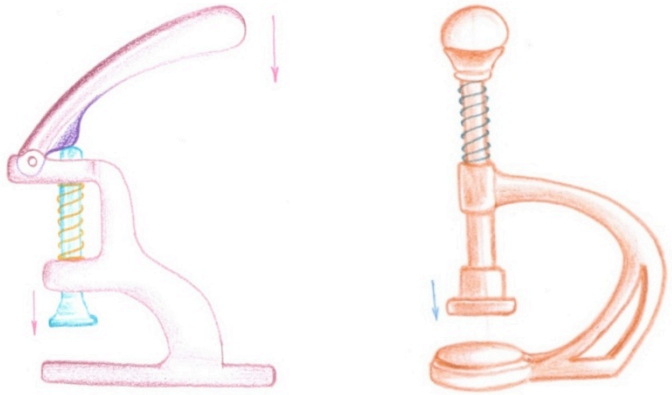
Device with cancellation on pressing, as mouse click



Hand operated mechanism; letters are pressured from bottom and stamping from top



Simple press, spring loaded mechanism. It is hand operated.

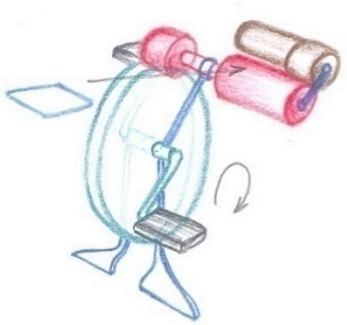


This will have circular ring having numbers for easy date changing

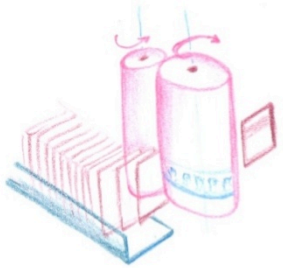
Cluster 2

This cluster was based on roller mechanism, having various ideas using rollers.

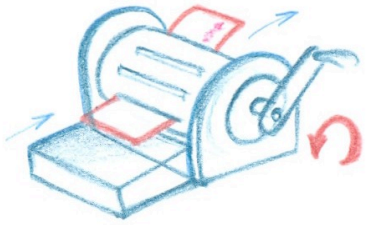
This is pedal operated mechanism, rotary motion is supplied through rollers



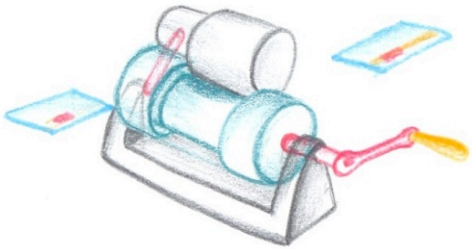
Letters are passed from two vertical rollers and thus gets cancelled



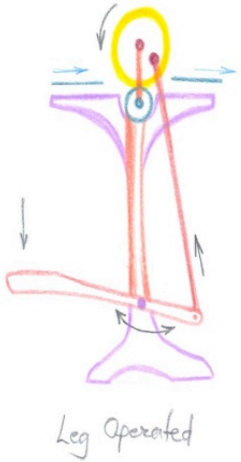
This is hand operated mechanism, letters are inserted in ports and gets cancelled



Hand operated machine, letters are inserted in between two rollers as shown

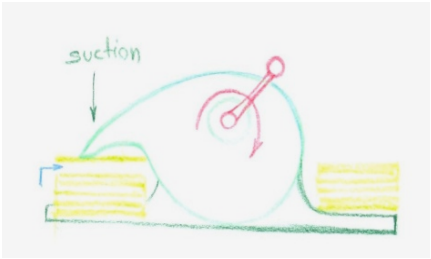


This is leg operated mechanism; rollers are rotated due to leg press using linkages

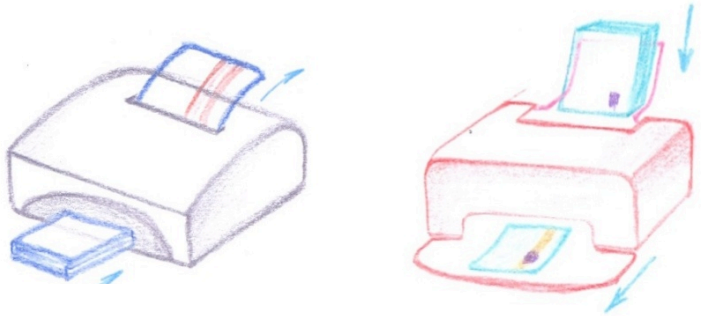


Hand operated machine, letter gets inserted in machine due to suction created,

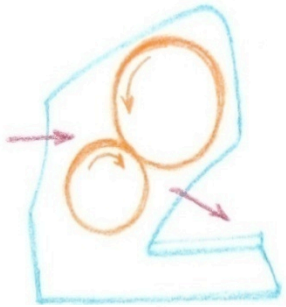
And further gets cancelled.



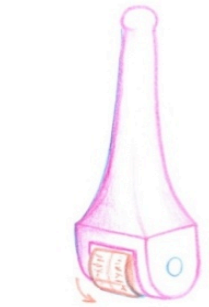
Machines with front bottom and top feeding for cancellation



Mechanism showing path of letters, and cancellation through rollers



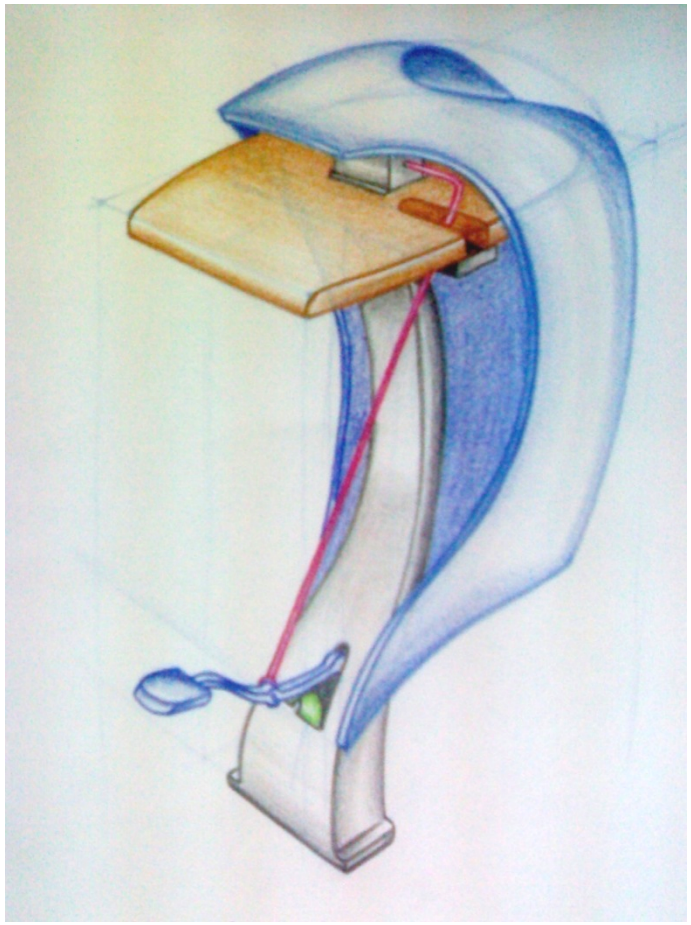
Portable hand operated device, several letters can be cancelled with one roll action

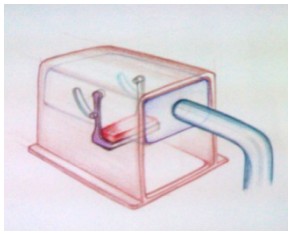


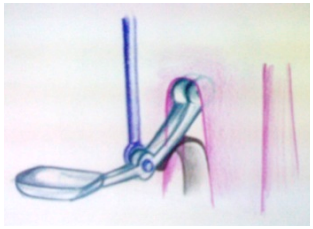
CONCEPTS:

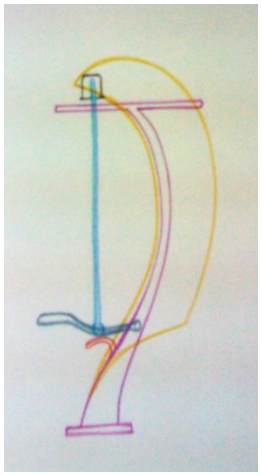
Concept 1

This is leg operated mechanism, mainly using reciprocation principle. Required details are shown in figure below. It is having self inking mechanism (similar principle which is used in numbering machines).





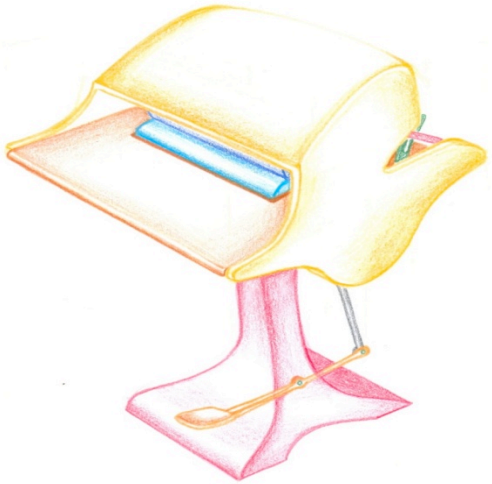


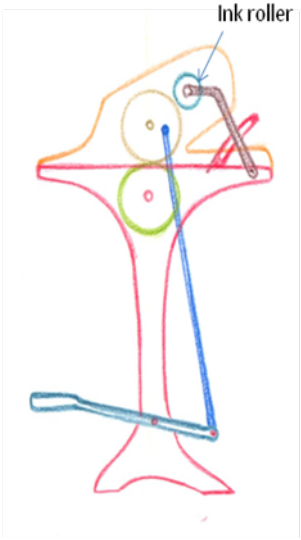


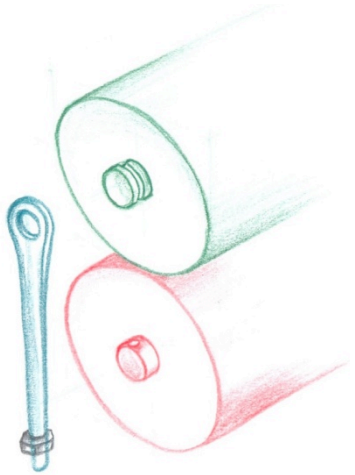
Concept 2

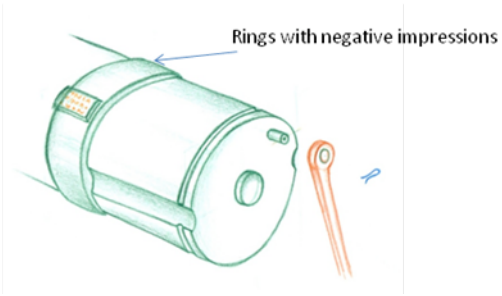
This is leg operated machine which works on different roller. Letter is passed between two rollers, one roller is having negative impression on cancellation and other for uniform pressure. Seperate ink roller is provided for ink distribution.

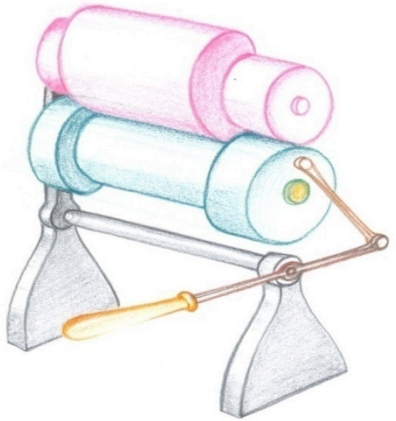
Details can be seen below.











CONCEPT EVALUATION:

After completion of concepts, further step is to evaluate concepts and compare to get the best concept.

These are compared on various aspects such as print quality, ease of location, sound reduction, convenience etc..

The evaluation chart is shown below..

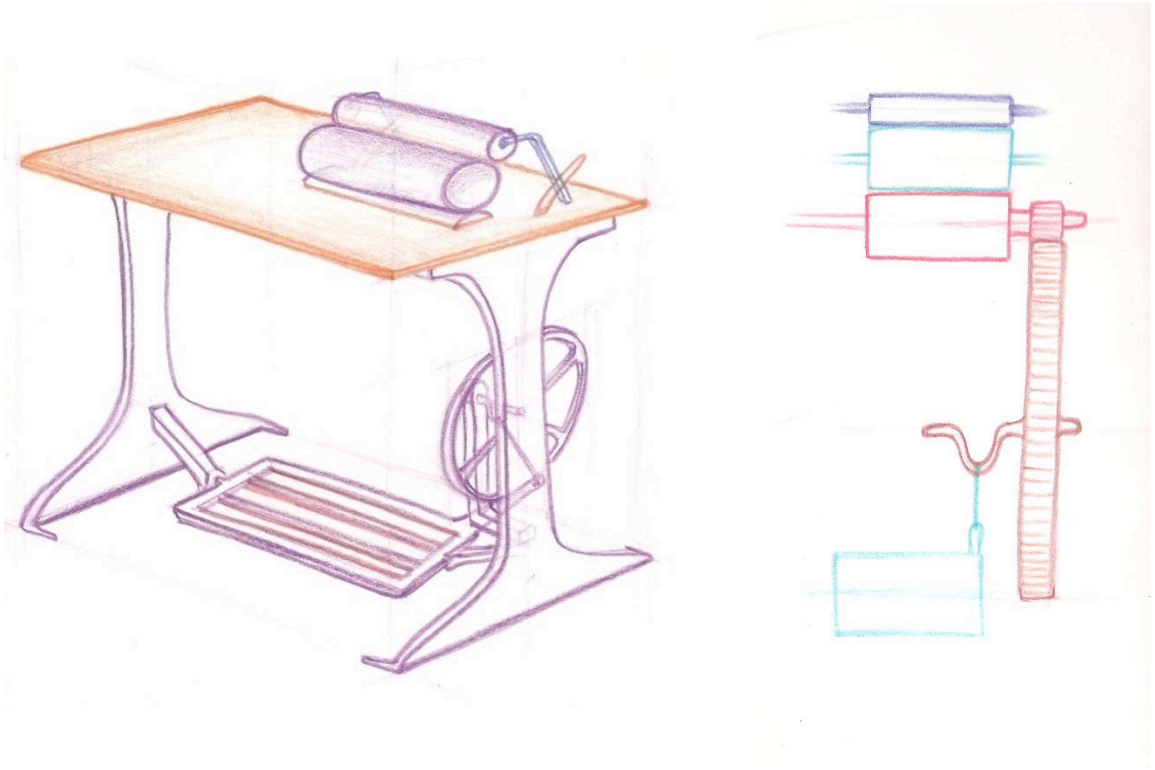
	Print quality	Ease of location	feeding	Sound reduction	convenience	speed	Automation possibility
Concept 1 Recipro.	6	7	5	6	5	6	5
Concept 2 Roller	8	8	7	8	7	8	8

Concept 2 is selected; it is having roller based mechanism which can give proper printing, uniform ink distribution and comparatively good speed.

Further some concept refinement is done, for uniform circular motion a flywheel is added. This flywheel provides uniform circular motion which is transferred to the rollers..

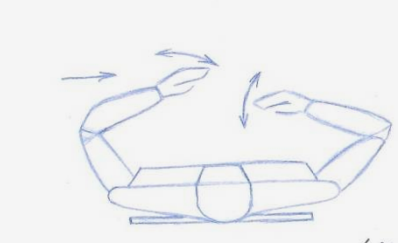
Motion can be transferred using toothed gears as shown.

Initial sketch considering refinement is shown below...



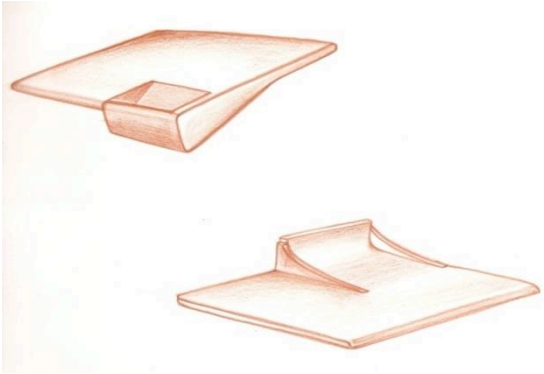
WORK STATIONS:

In this mechanism work station plays important role, so considering less hand movements and proper storage for letters some sketches were drawn...



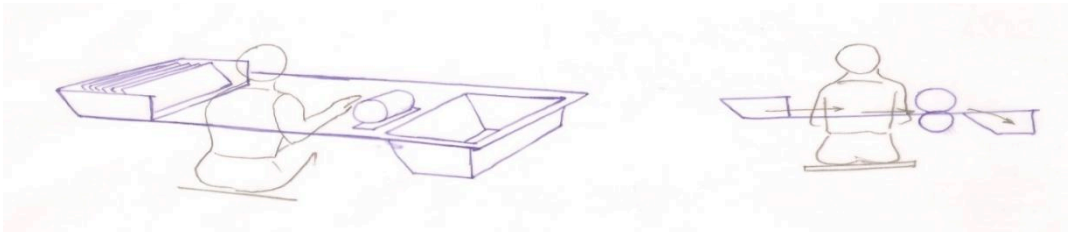
Tried various possible movements for hands and location for letters

Ease for accessing letters and proper feeding and further storage after cancellation

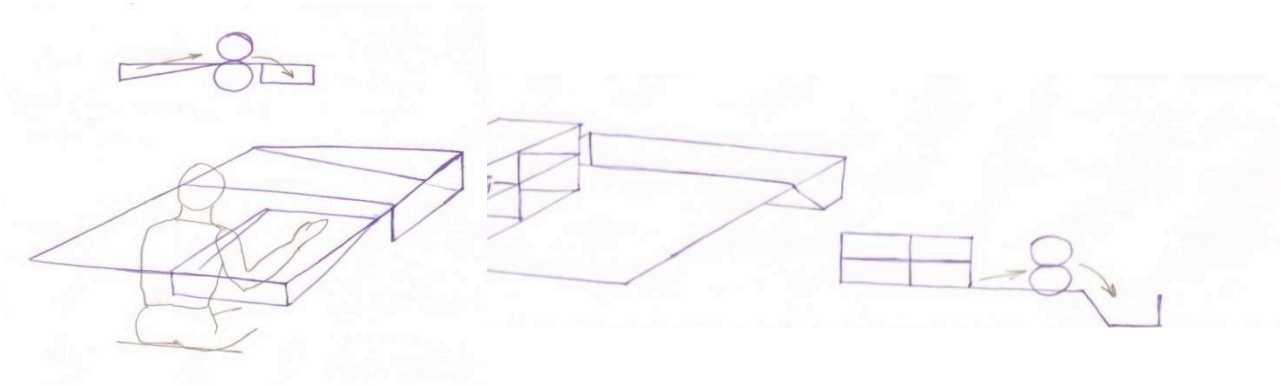


Started with ideation considering above factors

Some of the pics are as follows..



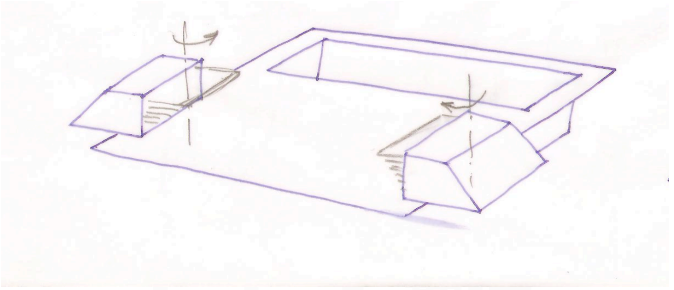
Person doing cancellation with side wise hand movements



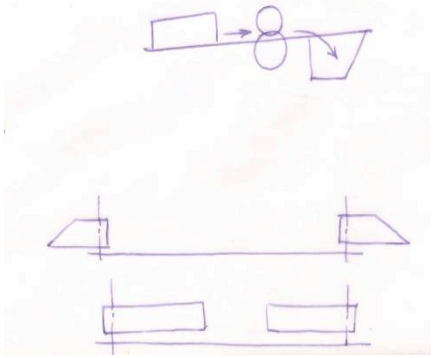
Canellation by front feeding, also provision for letter storage can be seen.

Movable boxes for letter storrage provided.

Opposite side of box is inclined, so letter position makes easy for accesing

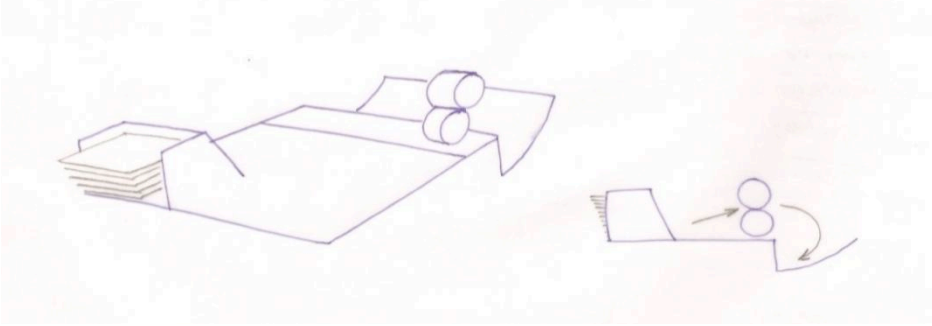


They can be folded inside when not in use.



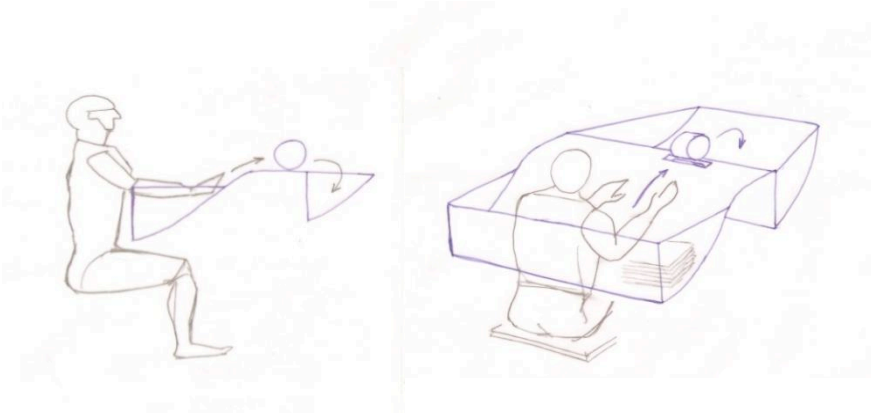
Front cancellation, and space for letter deposition,

Provision for easy access for letters as shown.



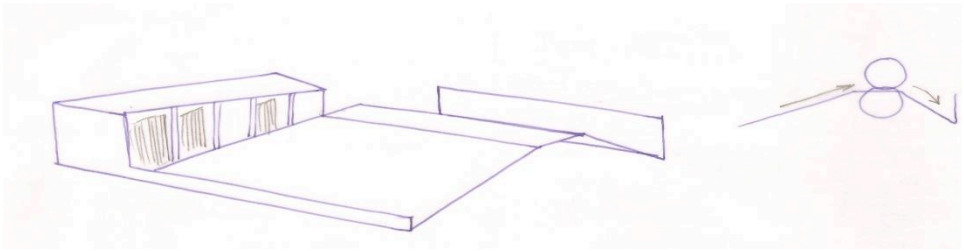
Front feeding cancellation, provisions for letter stocks and letter deposition.

Easy to locate and feed



Front feeding cancellation, inclination on table is provided

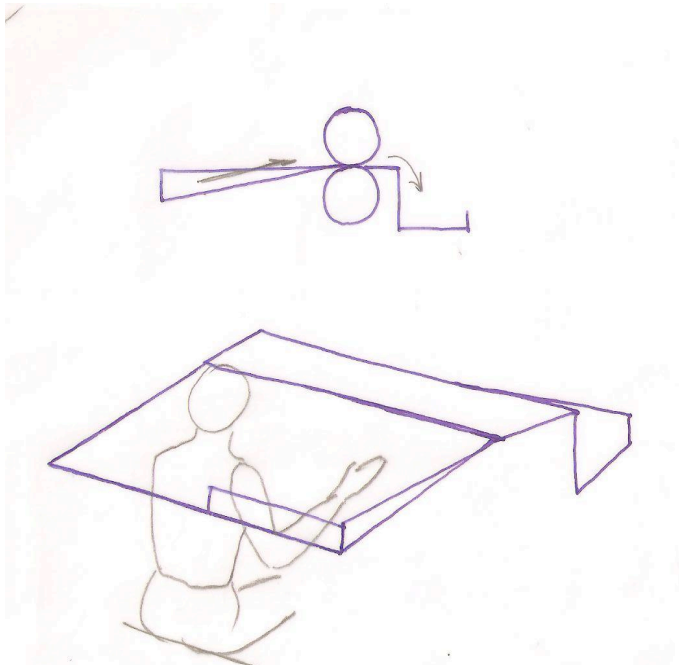
on both sides as shown.



From the various ideas for workstations it leaded to two concepts

Concept A

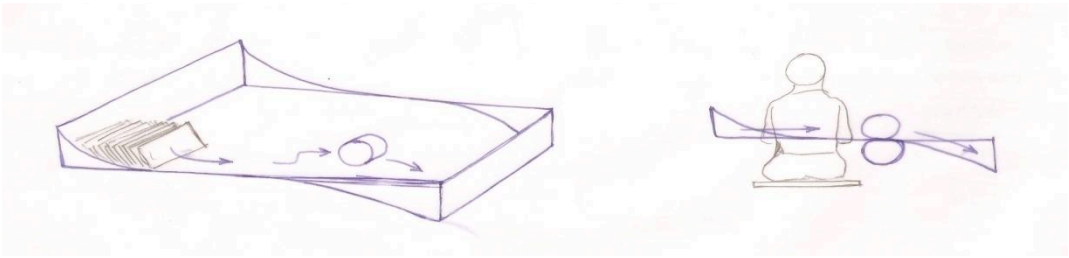
In this concept the operator has to see straight and feed in forward direction as shown below



This is front feeding workstation, having provision for letter access and deposition after cancellation.

Concept B

In this concept, hand movements are side wise which can be seen below



Space for letter storage for cancellation, and after cancellation can be seen. Letters are passed from the rollers for cancellation.

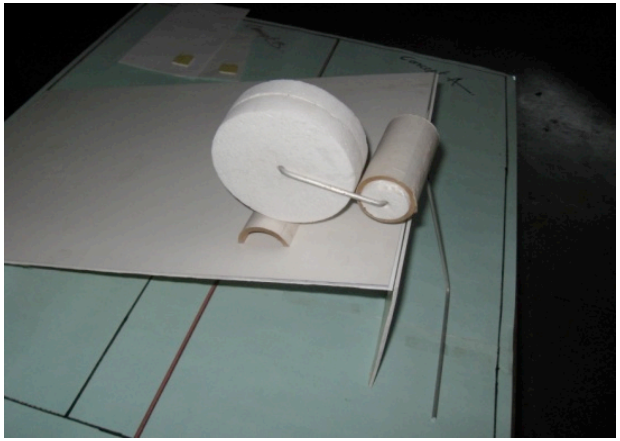
SITUATION ENACTING:

After reaching to these concepts, situation enacting was done.

This is to get the exact idea of operation and to get exposure to live situation further leading to selection of final concept/workstation..

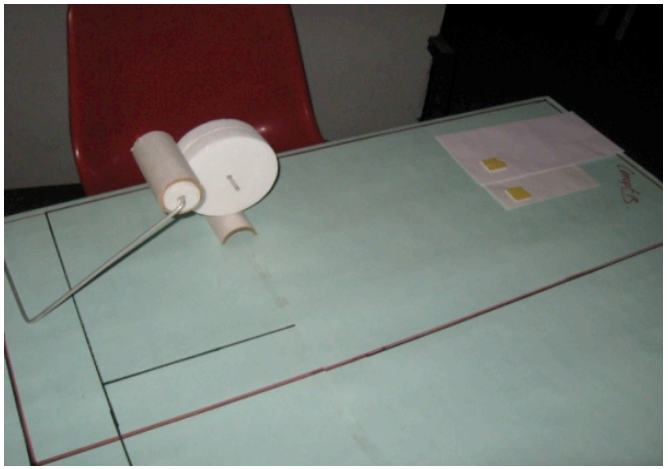
Arrangement for two concepts can be seen below..

Concept A



This is front feeding mechanism, position of rollers are in front of eyes at a particular height thus convenient for positioning letters properly.

Concept B



This is side wise feeding mechanism, in this case the hand movements are very less thus convenient for feeding letters and easy positioning.

Sufficient space for letter storage during cancellation and after cancellation i.e. deposition.

After doing enacting Some features from concept A and some concept B was assembled considering the following points...

- Less hand movements
- Comfort in operation
- Less effort in feeding
- Easy to locate

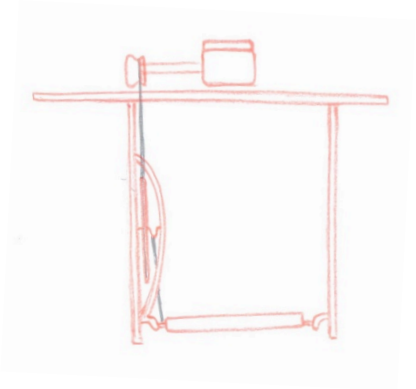
It is having table top of 55X100height about 72cm and front feeding mechanism.

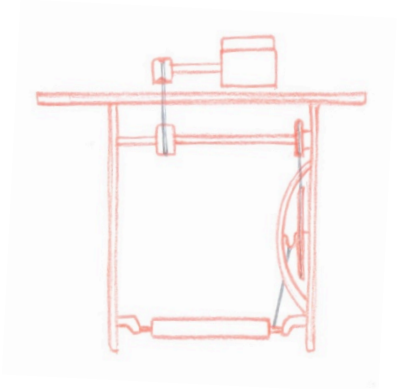
Arriving at final concept

- For Better print quality
- Initially considered Offset inks as considered as best for good printing
- Having provision for Historical, monument, landmark prints/cancellation
- Speed of operation increased
- Human comfort

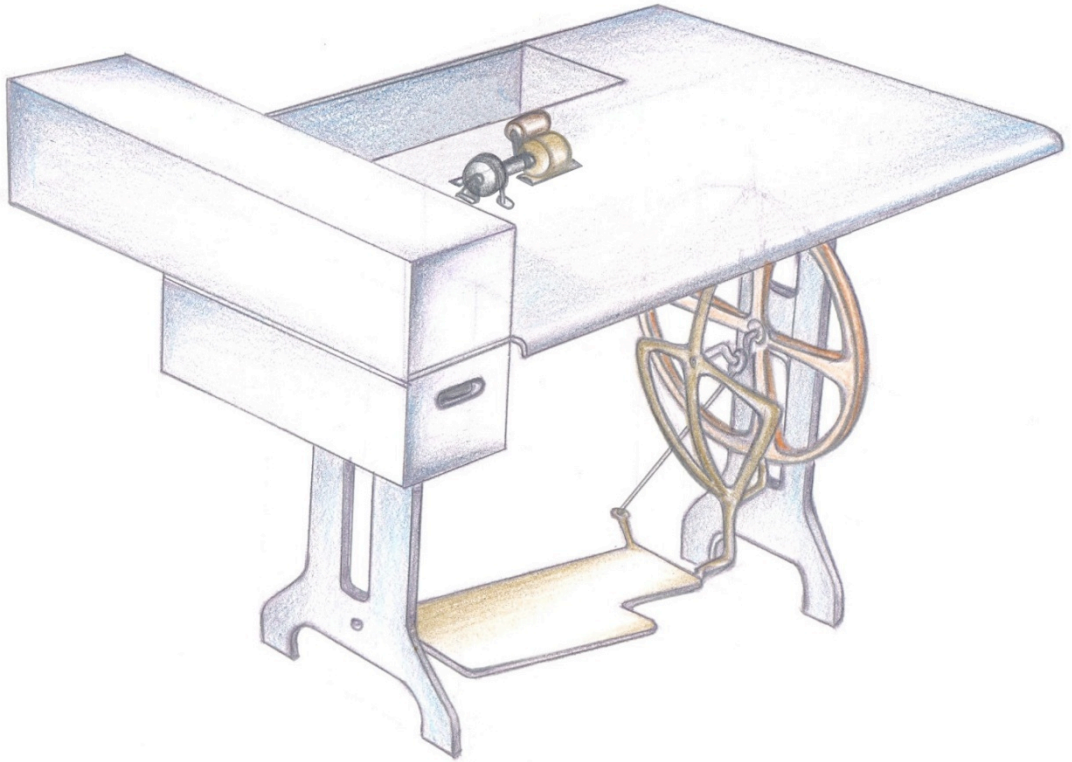
Transferring the motion

To give rotary motion to the rollers, following mechanisms were considered





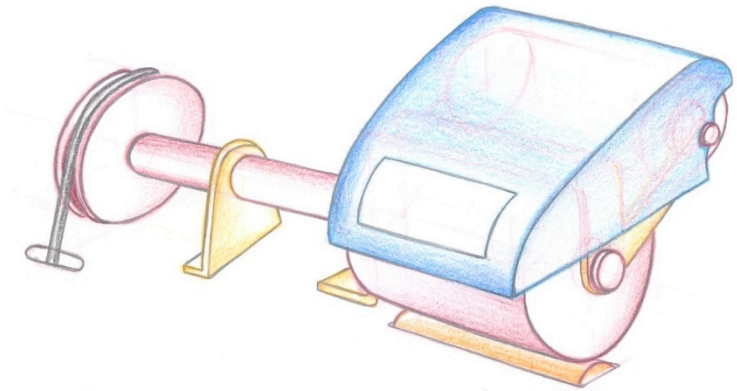
FINAL CONCEPT RENDERING:

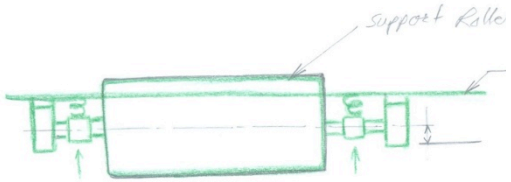


CONCEPT DETAILING:

A: Print mechanism

A cover is provided on the rollers to protect it from dust.

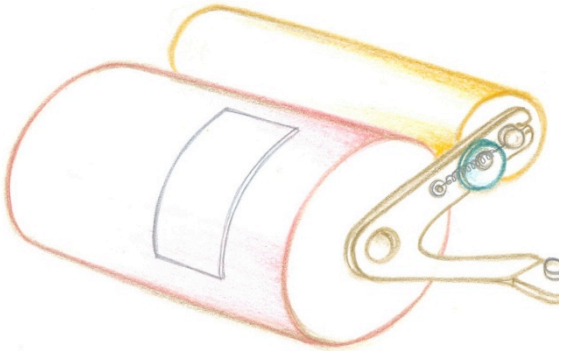




Roller below the print roller for pressure, letter passes between print roller and bottom roller which is spring loaded as letter thickness may vary. It has a stopper so that it doesn't touches the print roller.

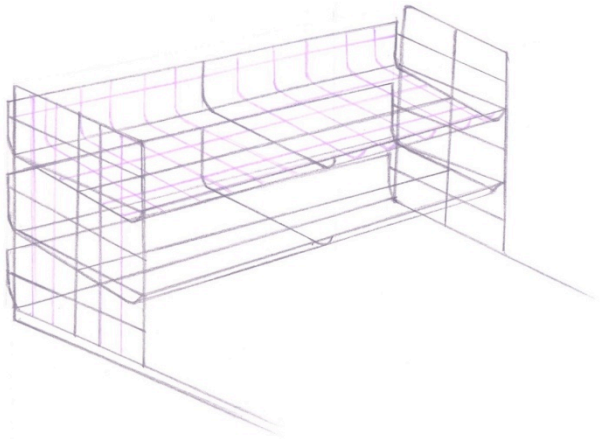
Above is the ink roller and the bigger roller is the print roller

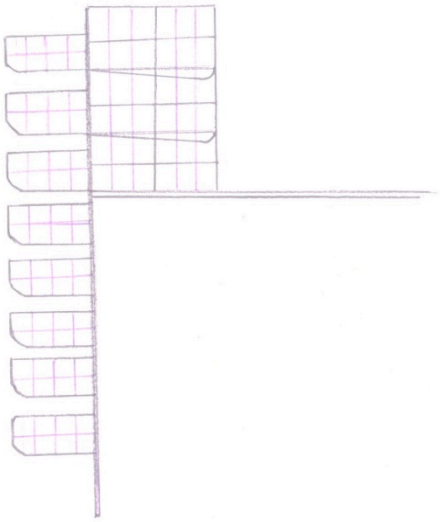
Spring mechanism to adjust ink roller pressure.



B: Rack mechanism for letter storage

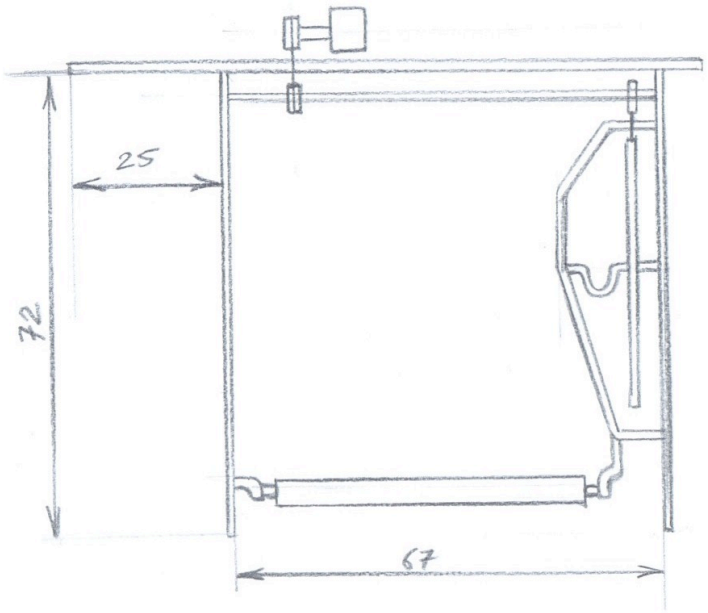
Wireframe rack for easy access and storage of letters to be cancelled

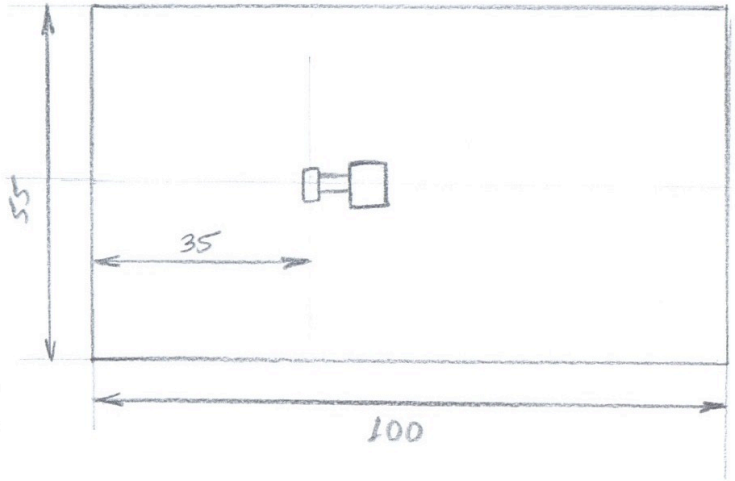




Storage for letters in wireframe rack outside the table

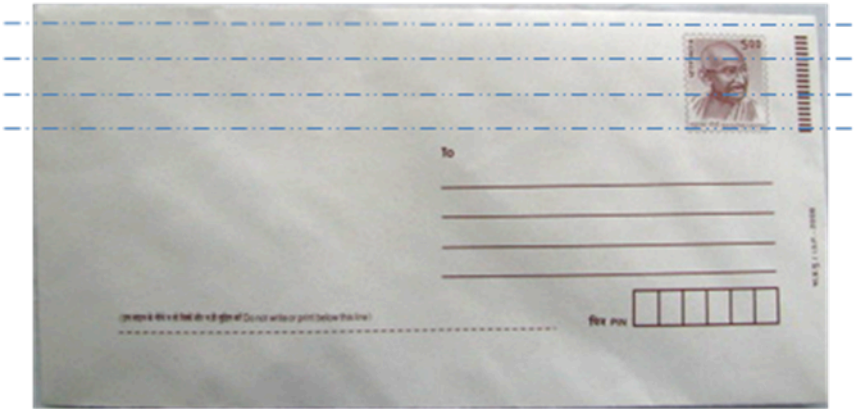
Printing roller will have diameter of 4.5 cm (circumference 14 cm), as the smallest letter has length of 14 cm.





WAYS OF CANCELLATION

In roller mechanism, there were two possibilities of cancellation. Vertical cancellation and horizontal cancellation, vertical cancellation was cutting the name and address, so horizontal cancellation is selected.



DIFFERENT PRINTS OF CANCELLATION:

Smallest size of stamp is around 2X2cm so the empty space should not exceed than 2X2 else print may miss the stamp.

Cancellation with post office details and

Horizontal lines for cancellation

Cancellation with vertical lines and horizontal date

Post office details and date horizontal

And curved pattern for cancellation

Dots for cancellation and post office details horizontal

Provision for special cancellations such as

landmarks, historic, monuments are possible.

Vertical lines for cancellation

Also we can introduce advertisement in cancellation

And that can be charged some amount

Finalising technology for printing:

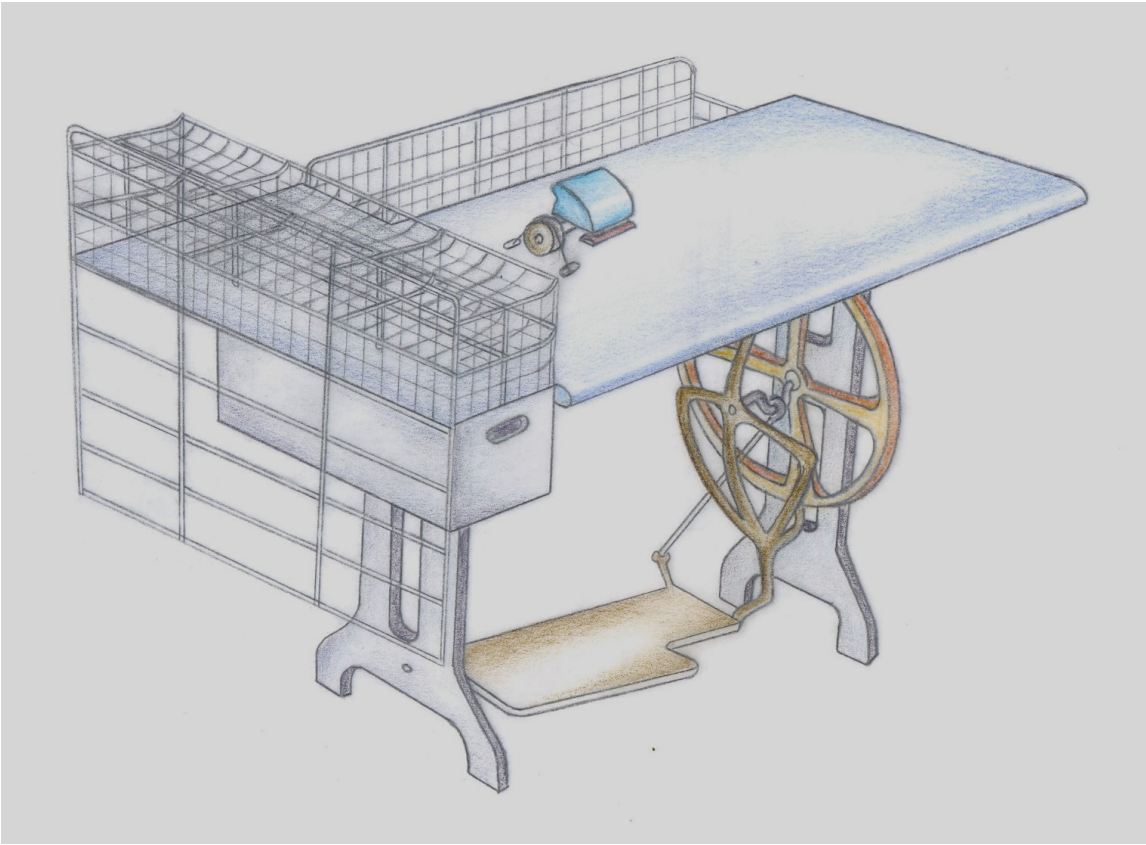
As per the speed required rubber roll printing technology was finalised, other technologies were mostly for automated machines with very high speed and in this case the machines is manually operated with comparably low speed.

Rubber roll printing:

This consists of a print roller with negative impression on its cylindrical face, an ink roller with pressure adjustment. The print roller picks the ink from the print roller and then transfers it on the paper. Negative impressions are made up of silicon rubber, and ink roller is a spongy porous foam rubber. Aqueous ink is used, which is used in Flexography printing for printing on cartons. Thus the cancellation is carried out.

A similar mechanism is shown.

Refinement Work:

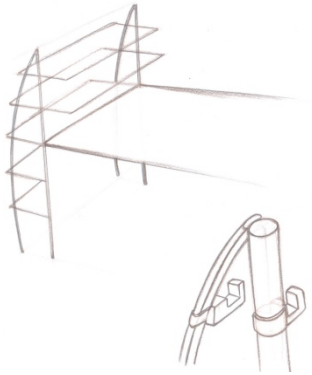


It is having steel wire racks from inside and thick wires so that portable racks can be hanged from outside. Cancelled letter gets collected in wireframe box.

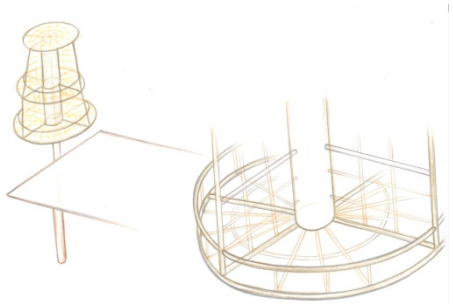
EXPLORATIONS FOR CONVINIENCE:

Sliding trays for letter storage, these can move inward and outward direction.

Grooves shown will be provided for guiding the trays.

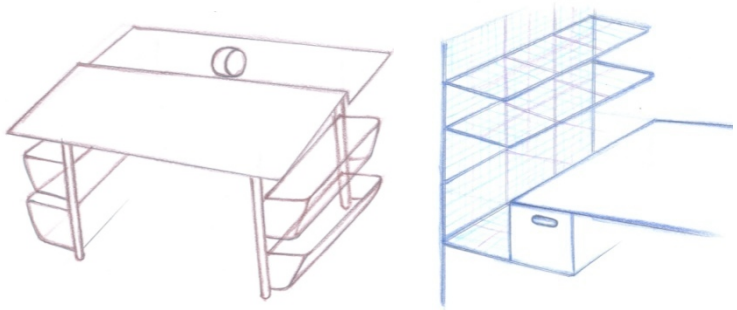


Provided with a circular wireframe racks which can rotate, partitions are provided for keeping different type of letters.



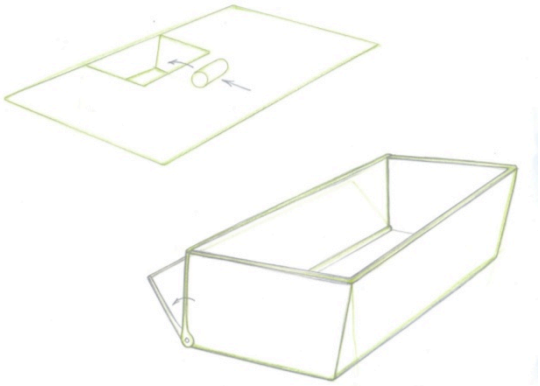
Provided with racks under table on both sides for letter storage

In other Fig slot is provided so that letter can be stacked and they will not create any disturbance during cancellation.



Curvature provided on the front side of table for maximum utilisation of space. Letters can be stacked in the racks provided in the front. Drawers are given on both sides; also wireframe racks on the right side can be seen.

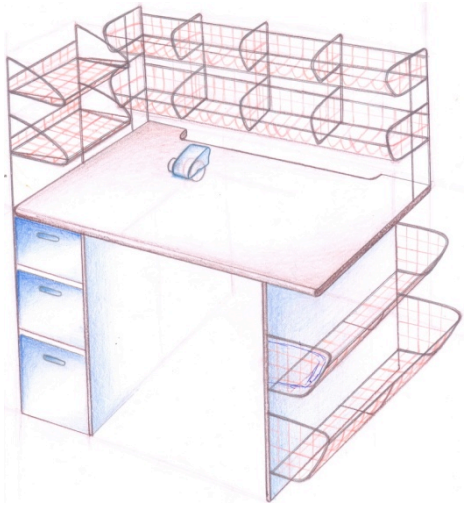
In this arrangement the deposition box will have door on opposite side for opening and collection of cancelled letters can be done



On the opposite side, provided with rod on which wire frame bags can be hanged. The letter after cancellation will get deposited in this bag and further it can be replaced by empty bag.

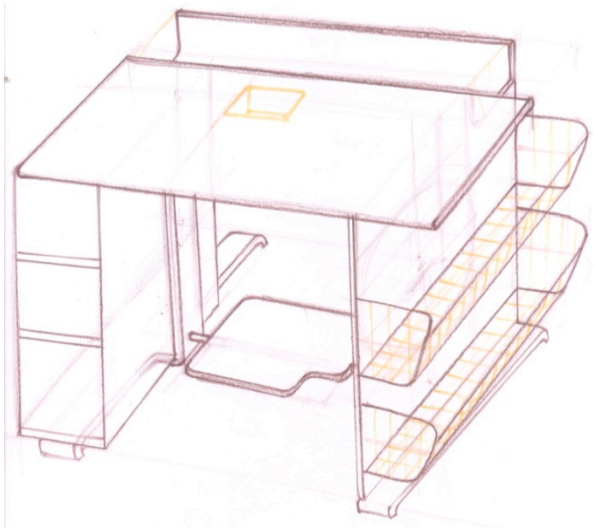
After assembling various features, the changed workstation is shown.

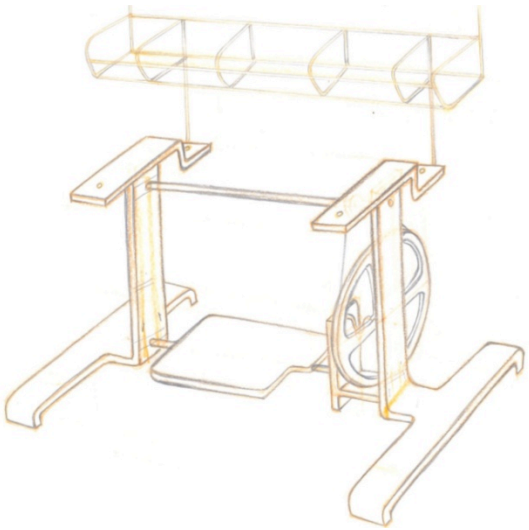
It is having racks on front, top left and right side. Also provided with drawers, under table on left side.



Further this is provided with a cut in table to form rectangular box, so that letters will fall in it after cancellation. And further these letters can be moved to right side and they will fall in the big wireframe tray.

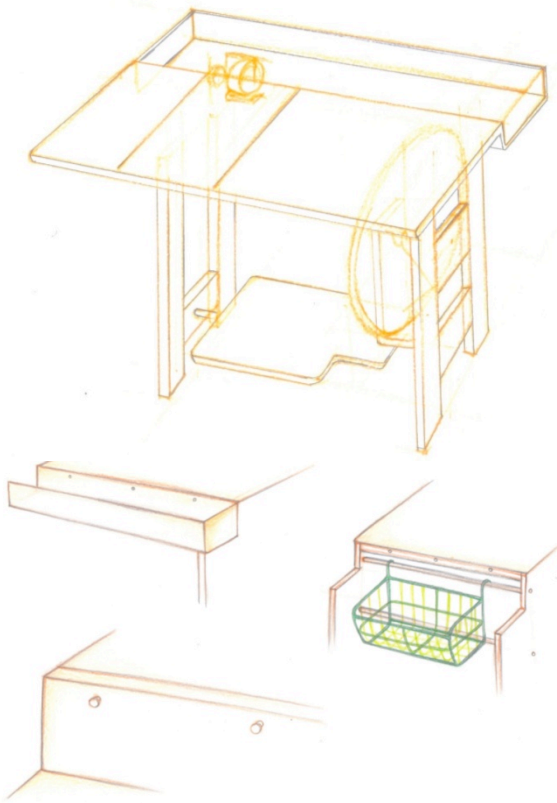
Support arrangement for trays can be seen in next figure.





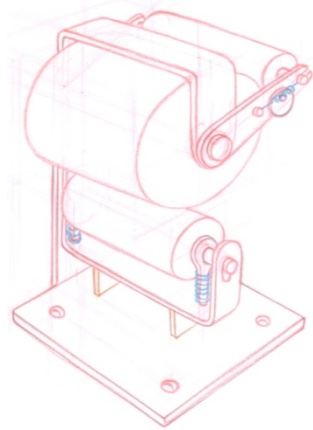
Further changes were made in legs and support, rectangular frame are used.

As this process includes ink, so for proper cleaning a rectangular metal plate below the mechanism is provided as shown in figure.



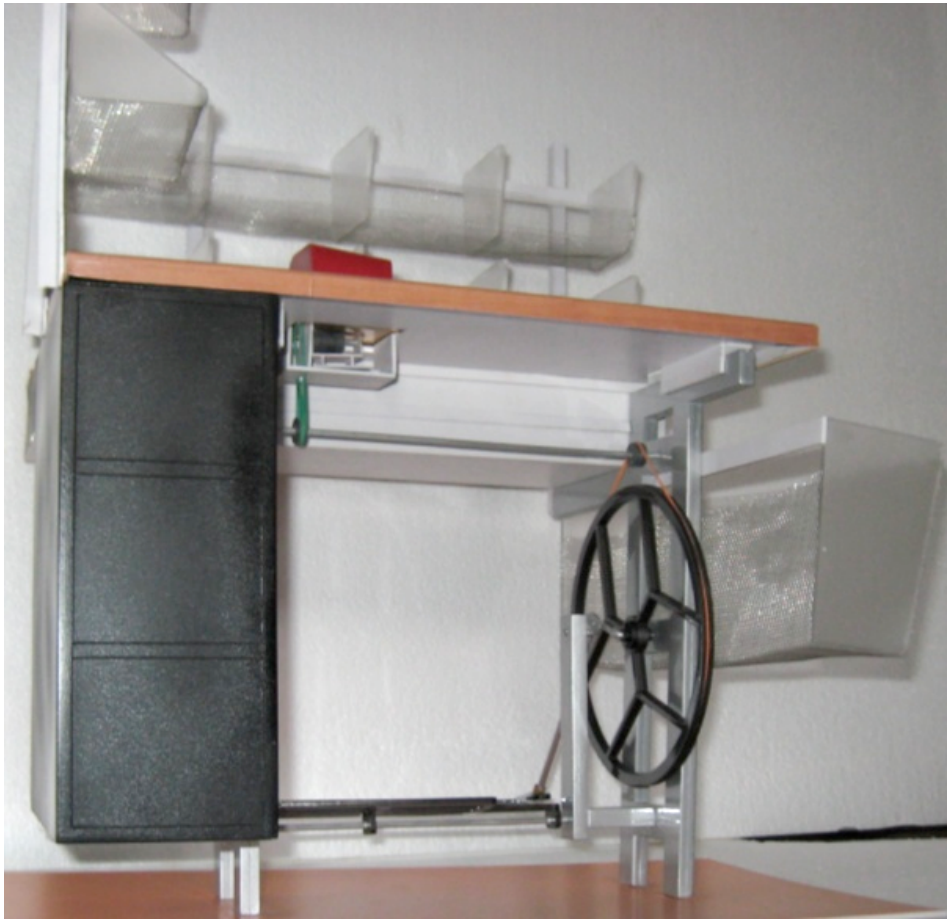
Provided with screws for easy removal of the rectangular box in case the workstation is having sufficient space around so bags can be hanged on the rod provided.

Mechanism for cancellation can be seen, it has ink roller on top. The print roller is in the middle which is connected to the shaft and pressure roller at the bottom. The pressure roller will be spring loaded and it will move upwards up to a certain distance thus avoids touching the print roller. Spring is provided to take care of letters of varying thickness. Base plate is provided so that it can be easily fixed on the table and can be easily removed for maintenance purpose.

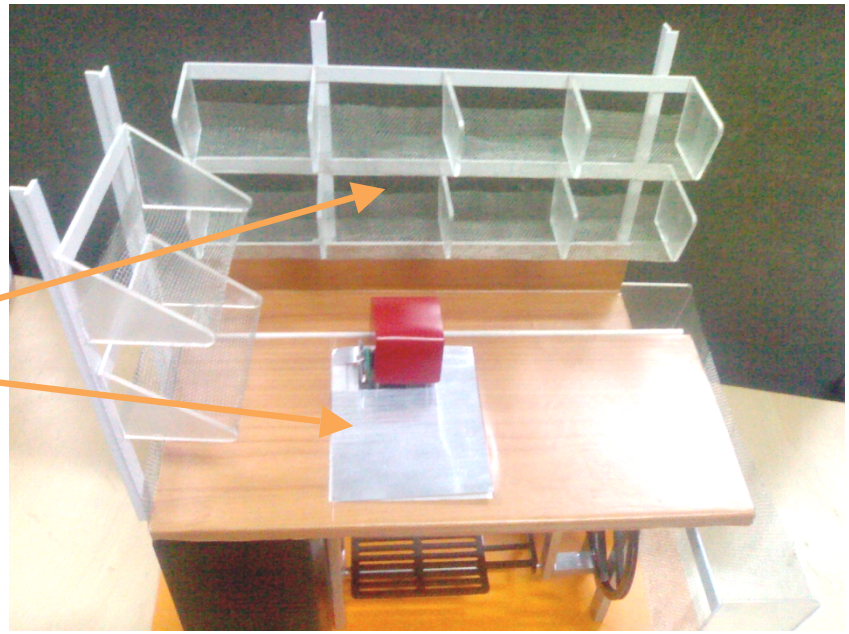


FINAL PRODUCT:

Following figures are of the prototype of final design after refinements.



Some of the details can be seen in figures.



Racks for letter sorting

Metal plate for easy cleaning of spilled ink

A cover is provided over the mechanism to protect it from dust.

A working test mechanism was made as shown aside.

SALIENT FEATURES:

Final design is a pedal operated mechanism, and printing is carried out using rollers. Flywheel provides uniform torque and motion is transferred from pedal through flywheel to the print roller. Speed of operation can be controlled by pedal. Electric Motor can be further connected to this mechanism for automation.

Core Benefits:

- Good print quality
- Increased Speed of operation
- Convenience in feeding
- Special cancelation possibility
- Same table can be used for letter sorting
- Easy maintenance
- Right-left handed both can operate

REFRENCES:

www.**indiapost**.gov.in

indiapost.nic.in

www.**indianpost**.com

en.wikipedia.org/wiki/**Cancellation**

www.patentstorm.us/patents/6672623.html

http://en.wikipedia.org/wiki/Cancellation_(mail)

http://en.wikipedia.org/wiki/Postage_stamps_and_postah_history_of_India

http://en.wikipedia.org/wiki/Cancellation_%28mail%29#Pictorial_cancellations

www.coxrail.com/cancellation

www.linxglobal.com

www.walesprint.com/print_technology.php

www.rubberstamp.uk.com/DateTime.php#Electronic

www.max-ltd.co.jp/company_e/index.html

www.caxton-print-supp.co.uk/numbering%20boxes.htm